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Anatomy of Credit-Less Recoveries

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Abstract

The recovery from the global crisis that erupted in 2007 shows that the decoupling between real and financial variables during the business cycle can lead to negative and long-lasting consequences for the economy. A key feature of the past global crisis in many countries is that the recovery in aggregate output has not been accompanied by a contemporary pick-up in lending flows to the private sector, rendering the recovery *credit-less*. This paper uses data on output and credit to study the relative roles of demand and supply drivers of credit growth during economic recoveries on a sample of advanced and emerging countries between 1980 and 2014. Using a simple endowment economy model, the paper shows that credit-less recoveries are correlated with liquidity shocks in real and financial markets and with the pace of private sector deleveraging. The empirical analysis shows that during these episodes demand-side frictions played a relatively larger role in predicting the occurrence of the episodes, reflecting weak demand for liquidity by the private sector in the aftermath of the crisis.

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Anatomy of Credit-less Recoveries*

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*Authors are reported in alphabetical order of last names; the findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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1 Introduction

There is a unanimous consensus among economists on the central role played by bank lending in supporting economic activity, especially in the aftermath of severe economic downturns. Recent economic history shows that credit flows are characterized by boom-bust cycles which can lead to high market volatility and damaging consequences for the economy (Claessens *et al.* 2011). Financial frictions play a crucial role in determining the shape of these cycles and during recessionary episodes they can magnify the effects of macroeconomic fluctuations. The recent global crisis that erupted in 2007 sparked renewed interest on the drivers of such frictions and different methodologies have been developed to model new narratives of business and financial cycles. It remains unclear, however, whether these frictions translate into shocks to the demand or to the supply of credit (Adrian *et al.* 2011).

A key feature of the recent global crisis is that in many countries worldwide the recovery in aggregate output has not been accompanied by a contemporary pick-up in bank lending flows, rendering the recovery *credit-less*. During these episodes GDP growth is found to be on average between 2 and 3 percent lower than during normal recoveries, and investment remains weak and below pre-crisis levels with potentially negative long-term effects for the economy. A recent growing body of literature focusing on the liquidity-output nexus during recoveries shows that the decoupling between credit and output is not uncommon. On average, between 19 and 26 percent of all recoveries occur in the absence of a pick-up in lending flows (Abiad *et al.* 2011; Bijsterbosh and Dahlhaus, 2011 and Sugawara and Zalduendo, 2013). Deepening the understanding of credit-less recoveries is important to analyze the underlying frictions and demand-side dynamics at play during these episodes. In addition to exhibiting systematic lower growth and investment performance, recent literature shows that credit-less recoveries may also reflect inefficient reallocation of credit among sectors, with resources shifting away from sectors more dependent on external financing (Coricelli and Frigerio, 2015). During these episodes GDP growth is found to be on average between 2 and 3 percent lower than during normal recoveries, and investment remains weak and below pre-crisis levels with potentially negative long-term effects for the economy.

Credit-less episodes provide an ideal experiment to test whether financial frictions are predominantly supply or demand-driven, and to study their impact on the liquidity-output nexus during recoveries. At a theoretical level, credit-less recoveries could be the outcome of demand or supply-side constraints. Demand-side constraints to credit growth can arise from the reluctance of firms and households to resume borrowing in the aftermath of a recession due to weak growth and employment prospects. At the same time, weak credit demand could be driven by a deterioration of borrowers' credit-worthiness position or excessive debt levels. On the contrary, supply-side constraints manifest

through higher lending costs and could be the outcome of a temporary shortage of liquidity following a crisis accompanied by financial sector stress and excessive pressure on banks' balance sheets. In this context, failure to restore adequate liquidity levels may result in a tightening of credit supply to the economy.

The paper uses a novel panel dataset on output and domestic bank credit for a sample of advanced and emerging countries between 1980 and 2014 to analyze the role of demand and supply-side drivers of bank lending growth during credit-less recoveries. We argue that during these episodes the evidence points to the prevalence of demand-side frictions to credit growth, reflected in lower demand for liquidity by the private sector in the aftermath of recessions. During these episodes output recovery takes place while the economy is deleveraging, *i.e.* the stock of credit is decreasing. However, as in Biggs *et al.* (2009) we show that as long as the pace of deleveraging is decreasing a rebound in output can occur in the presence of negative credit growth.

Our work is carried out in two steps. In the first one, we model credit-less recoveries in a simple endowment economy framework featuring representative infinitely lived households. In this model, credit dynamics are a function of the policy rate and of liquidity shocks. These shocks reflect frictions in financial intermediation and affect the value of liquidity needed to finance consumption and investment.

In the second step, we test empirically the hypotheses. We first exploit simple information on the correlation between prices and output during the recession phase of the cycle to identify demand and supply driven recessions originating in the real and financial markets. Subsequently, we examine the role of demand and supply-driven recessions in influencing the likelihood of a credit-less recovery in our sample of advanced and emerging countries.

Related literature: Our work builds on the theoretical literature on credit constraints and is closely related to empirical studies on financial crises and credit-less recoveries. From an economic theory perspective, the relationship between output and credit has been analyzed in the context of macroeconomic equilibrium models featuring real and financial markets. A large body of literature concerned with the notion of *financial accelerator* (Bernanke and Gertler, 1989; Bernanke, Gertler and Gilchrist, 1999 and Kiyotaki and Moore, 1997) has documented the channels through which financial markets affect the real economy. In these models, the interaction between real and financial variables stems from the need of firms to access funds in credit markets. Due to financial market imperfections, firms' ability to access liquidity is dependent on the value of their financial wealth, which is assumed to be pro-cyclical. Shocks affecting the economy impact on borrowers' credit-worthiness and on their ability to access funds to finance investment, contributing to amplify the magnitude of business cycle fluctuations.

The financial amplification mechanism can work through distinct channels, which can potentially affect both the demand and supply of liquidity in the economy. When credit constraints arise from high collateral requirements (Kiyotaki and Moore, 1997), a drop in the value of collateral during recessions limits borrowers' ability to access funds resulting in a contraction in the amount of credit supplied. At the same time, a tightening of agents' borrowing capacity can lead consumers to increase precautionary savings, while reducing consumption and ultimately credit demanded (Guerrieri and Lorenzoni, 2011). Recent empirical literature has also investigated the link between lending standards, informational asymmetries and access to credit during the business cycle. For example, Dell'Ariccia and Marquez (2006) present a framework showing that when informational asymmetries in loan markets become less severe, as may occur during the expansionary phase of the cycle, lending standards become less stringent. This leads to higher credit growth and to increased financial systemic vulnerability.

Credit demand and supply can also be affected by excessive leverage in the economy. A high debt overhang can make firms and households reluctant to resume borrowing in the aftermath of recessions, keeping credit demand low. Similarly, excessive indebtedness among financial intermediaries, including banks can prevent their ability to secure liquidity in the inter-bank market, thus affecting the liquidity supplied to the economy (IMF, 2013).

Chada *et al.* (2010) study how liquidity effects affect monetary conditions in a simple endowment economy model, providing a comprehensive strategy to analyze the demand and supply drivers of liquidity levels in the economy.

Our work also contributes to the recent empirical literature on credit-less recoveries, examining the lending-growth nexus during the business cycle. The first authors to document these episodes were Calvo *et al.* (2006). In their seminal work on post-collapse crisis recoveries in emerging countries they name these episodes Phoenix Miracles, as output is found to "rise from its ashes" without any recovery in the stock of credit. The recovery in output is explained by a process of financial engineering whereby firms discontinue long-term investment projects in order to restore liquidity to finance activity amidst financial constraints.

More recent studies document significant cross-country heterogeneity in the distribution of post-crisis performance. Using the same sample of crisis episodes of Calvo *et al.* (2006), Huntley (2008) re-examines the evidence on post-crisis performance using GDP per-capita data. The path of post-crisis recoveries is characterized by a bi-modal distribution leading to two different types of recoveries: slow and fast recoveries. Sixty percent of all recovery episodes are found to take place in five years, accompanied by strong investment levels, credit and consumption; in the remaining cases, output

recovery takes place in 15 years or more without any rebound in domestic credit.[1]

Credit-less recoveries are also a central feature of business cycles in advanced countries (Abiad *et al.* 2011; Claessens *et al.* 2009) and tend to follow recessions accompanied by financial sector stress, including boom-busts in credit markets. Analyzing the financial cycles of a sample of advanced economies, Claessens *et al.* (2008) show that recessions associated with strong credit contractions and house prices busts tend to be more severe and last longer. More often than not, following these episodes a recovery of the real economy occurs ahead of improvements in financial conditions. Similarly, Abiad *et al.* (2011) show that when credit-less recoveries are preceded by systemic banking crises, their frequency is more than three times higher. If a credit boom *and* a banking crisis precede the recovery, the relative frequency of such episodes in the sample of countries under analysis increases to 77 percent.

Other macroeconomic indicators positively correlated with the probability of credit-less recovery are the size of output contractions and the extent of external adjustment during the recession phase of the cycle (Sugawara and Zalduendo, 2013 and Bijsterbosch and Dahlhaus, 2011). During credit-less episodes sectors more dependent on external finance tend to grow disproportionately less then during normal recoveries (Abiad *et al.* 2011) and resources tend to depart from sectors which are more (bank) credit dependent (Coricelli and Frigerio, 2015).

Our work differs significantly from current studies. While existing literature predominantly focuses on the macroeconomic conditions preceding credit-less recoveries, our analysis focuses on the study of demand and supply dynamics underlying credit patterns during crisis episodes, using price-output correlations to disentangle the relative contributions of distinct (demand and supply) frictions during the recession phase. In particular, the work contributes to the above mentioned literature in several ways. First, it is among the first works to provide a comprehensive theoretical framework to analyze credit-less recoveries, which places major emphasis on the role of demand and supply side frictions in credit markets to explain liquidity dynamics during the recovery phase of the cycle. Second, it employs a novel panel database of crisis episodes between 1980 and 2014 - including data covering the global financial crisis - to examine the relative contributions of demand and supply drivers of credit growth. By analyzing distinct drivers of output recovery, our work shows that subdued lending activity in the aftermath of recessionary episodes, reflects (on average) weak demand for liquidity by the private sector. These results suggest that when constraints to credit growth are mainly demand-driven, policy interventions aimed at stimulating aggregate demand making full usage of the fiscal and monetary levers should be prioritized.

The remainder of the paper is organized as follows. Section 2 presents the model and the testable

[1] The role of cross-country hetereogenity during credit-less recoveries has also been documented by Ayyagari, Demirgüç-Kunt and Maksimovic (2011).

assumptions. Section 3 describes the data and the empirical strategy and then discusses the results and presents the robustness analysis. Finally, section 4 concludes.

2 Model

To analyze the liquidity-output nexus during economic recoveries we extend the theoretical framework of Chadha *et al.* (2010). We analyze the demand and supply drivers of liquidity levels and growth in the economy. At the beginning of the period households, who are both consumers and entrepreneurs, receive an exogenous endowment, y_{t-1}. Following receipt of the endowment, any deposit transfer obtained from the previous period, returns from maturing bonds, return on capital, the representative household decides how to allocate its wealth over real (cash) deposits $\frac{d_t}{p_t}$, investments, $I_t = k_t - k_{t-1}$, and a one-period nominal bond, b_t. The household then receives its nominal endowment income, $p_t y_t$, which cannot be spent until the following period.

2.1 Households

At the beginning of each period, households maximize their utility:

$$\max U = \mathbb{E}_t \sum_{i=t}^{\infty} \beta^{i-t} \ln c_i, \tag{1}$$

where β is the intertemporal discount rate, $\mathbb{E}_t$ are expectations formed at time t and c_i is the consumption level. The representative household is also subject to the cash-in-advance constraint:

$$c_t \leq \frac{d_{t-1}}{p_t} \tau_{t-1}. \tag{2}$$

implying that the current consumption of liquidity-constrained households is financed by cash deposits accumulated in the previous period (d_{t-1}). A stochastic shock to liquidity, τ_{t-1}, reflecting frictions in financial intermediation alters the value of liquidity, $\tau_{t-1} d_{t-1}$, which in turn impacts on consumption in the following period.

The individual budget constraint is:

$$c_t + (k_t - k_{t-1}) + \frac{s_{t+1}}{p_t} b_{t+1} + \frac{d_t}{p_t} = \frac{p_{t-1} y_{t-1}}{p_t} + \frac{b_t}{p_t} + i_{k,t} k_{t-1} + \frac{d_{t-1}}{p_t} \tau_{t-1} \tag{3}$$

where the nominal bond in time $t+1$ yields a unit of currency, a nominal return equal to i_{t+1} and a price of $s_{t+1} = \left(\frac{1}{1+i_{t+1}}\right)$. The Lagrange multiplier on the first constraint is denoted $\lambda_{1,t}$ and to the second one as $\lambda_{2,t}$. Differentiating with respect to c_t, b_{t+1}, d_t and k_t, brings to the following first

order conditions:

$$\frac{1}{c_t} = \lambda_{2,t} + \lambda_{1,t}, \tag{4}$$

$$\lambda_{1,t}\frac{s_{t+1}}{p_t} = \beta\mathbb{E}_t\frac{\lambda_{1,t+1}}{p_{t+1}}, \tag{5}$$

$$\frac{\lambda_{1,t}}{\tau_t} = \beta\mathbb{E}_t\lambda_{2,t+1}\frac{p_t}{p_{t+1}} + \beta\mathbb{E}_t\lambda_{1,t+1}\frac{p_t}{p_{t+1}}. \tag{6}$$

$$\lambda_{1,t} = (1 + i_{k,t})\beta\mathbb{E}_t\lambda_{1,t+1} \tag{7}$$

Using (4) and rearranging expression (6) yields:

$$\lambda_{1,t} = \beta\tau_t\mathbb{E}_t\frac{1}{c_{t+1}}\frac{p_t}{p_{t+1}} \tag{8}$$

Given (8) we can express the inter-temporal equilibrium condition (5) as:

$$\mathbb{E}_t\frac{c_{t+2}}{\beta c_{t+1}} = \mathbb{E}_t\frac{\tau_{t+1}}{\tau_t}\frac{p_{t+1}}{p_{t+2}}(1 + i_{t+1}) \tag{9}$$

This shows that under the optimal equilibrium path, households' consumption will depend on deviations in the nominal interest rate, inflation and liquidity shocks.[2]

2.2 Consumption, Credit and Spreads

The log-linearized form of the optimality condition in (9) can be expressed as:

$$\triangle c_{t+2} = i_{t+1} - \triangle p_{t+2} + \triangle\tau_{t+1}, \tag{11}$$

implying that consumption growth is tilted by liquidity shocks in financial markets and by the current stance of monetary policy.[3] Similarly, the cash in advance constraint (2) implies that deposit growth in $t + 1$ yields the following:

[2] The set of optimality conditions (5) and (7) also imply the following asset equation:

$$\mathbb{E}_t\frac{(1 + i_{t+1})}{p_{t+1}}\lambda_{1,t+1} = \mathbb{E}_t\frac{(1 + i_{k,t})}{p_t}\lambda_{1,t+1} \tag{10}$$

according to which at the optimum, a household is indifferent between the two assets (capital and bonds) since the expected benefit in terms of utility is the same.

[3] We omit the expectation operator for notational convenience.

$$\triangle c_{t+2} = \triangle d_{t+1} - \triangle p_{t+2} + \triangle \tau_{t+1} \tag{12}$$

i.e. in the short-term, deviations of consumption from its long-run path will be determined by the policy rate and the liquidity premium. By equating (11) and (12):

$$\triangle d_{t+1} = i_{t+1} \tag{13}$$

which shows that in the long run higher deposit growth increases the nominal rate.

In this model the liquidity shock creates a gap between the policy rate, i_t, and the cost of liquidity provision by commercial banks, i_t^m. Specifically, the external finance premium, efp_t, depends on the financial market shocks:

$$i_t - i_t^m = efp_t = \tau_t^d + \tau_t^s = \tau_t. \tag{14}$$

where τ_t is a composite supply/demand financial shock and $\tau_t = \rho_\tau \tau_{t-1} + \varepsilon_{\tau,t}$ with $\rho_\tau < 1$ and $\varepsilon_{\tau,t}$ is a normally distributed error term. Under the simplified assumption that banks transform deposits into loans, we introduce the growth of credit as a function of the growth of deposits. Under this framework, any change in credit growth, $\triangle d_t^s$, will depend on the market interest rate, i_t^m:

$$\triangle d_t^s = i_t^m \tag{15}$$

Therefore, any deviation between the actual growth of credit from the one expected by the monetary authority when setting the policy rate, i_t, will depend on the efp_t:

$$\triangle d_t^s - \triangle d_t = i_t^m - i_t = efp_t = \tau_t^d + \tau_t^s \tag{16}$$

which implies:

$$\triangle d_{t-1}^s - \triangle d_{t-1} = \tau_{t-1}^d + \tau_{t-1}^s \tag{17}$$

i.e. the historical disequilibrium in the credit market will depend on the occurrence of liquidity demand or supply shocks.

2.3 Firms

The consumer good is produced by firms owned by households in a competitive market via the production function:

$$c_t = k_t \tag{18}$$

We assume that $k_t = f(d^s_{t-1})$, *i.e.* capital is affected by the credit level provided by commercial banks to firms which becomes effective one period ahead due to the sluggish response of investments in long-term capital (Smets and Wouters, 2007; Faccini and Yashiv, 2015). Investments are therefore given by:

$$I_t = (k_t - k_{t-1}) = \frac{\left(d^s_{t-1} - d^s_{t-2}\right)}{p_t} \tag{19}$$

and consumption is:

$$c_t = \frac{d^s_{t-1}}{p_t}$$

We now analyze the effects of the growth of credit in the aggregate economy.

2.4 Credit Growth and the Aggregate Economy during Recessions

In our model, output is the sum of consumption and investments:

$$y_t = c_t + I_t \tag{20}$$

By replacing (18) and (19) in (20) we obtain an expression for nominal output, $y_t p_t$:

$$y_t p_t = d^s_{t-1} + \left(d^s_{t-1} - d^s_{t-2}\right) \tag{21}$$

Hence, as stressed by Biggs *et al.* (2009), output is correlated with both the flow and the *change* in the flow of credit in the economy. The latter is named credit impulse. Expressing the above expression in terms of changes, nominal output growth is:

$$\triangle y_t + \triangle p_t = \underbrace{\overset{-}{\triangle d^s_{t-1}}}_{Deleveraging} + \left(\underbrace{\left(\overset{+}{\triangle d^s_{t-1} - \triangle d^s_{t-2}}\right)}_{Credit\ Impulse}\right) \tag{22}$$

Equation (22) implies that when the economy is deleveraging, *i.e.* $\triangle d^s_{t-1} < 0$, output will decrease. However, as long as deleveraging occurs at a decreasing rate (or if its pace slows down), $\triangle d^s_{t-1} < \triangle d^s_{t-2} < 0$, a recovery in output can occur in the presence of negative credit growth. In fact, while the reduction in the *stock* of credit impacts directly on investment in long-term capital and therefore on potential output, any development in the *flow* of credit may explain the business cycle rebounding effects during recoveries.

Next, we model inflation dynamics assuming that current inflation depends on the output gap in previous periods and on the occurrence of demand and supply shocks. Negative values of the output gap in $t-1$, $\left(y_{t-1} - y_{t-1}^{F}\right)$, signal that the economy is operating below its potential, and accumulating unused capacity which firms can absorb during the recovery phase:

$$p_t = p_{t-1} + \kappa \left(\underbrace{y_{t-1} - y_{t-1}^{F}}_{Unused\ Capacity} + z_{t-1}^{d,s} \right) \tag{23}$$

$z_{t-1}^{d,s}$ are a real demand/supply shock during the recessionary phase that affects the accumulation of unused capacity in $t-1$ and, therefore, inflation in period t. We assume the following autoregressive processes $z_t^d = \rho_d z_{t-1}^d + \varepsilon_{d,t}$, $z_t^s = \rho_s z_{t-1}^s + \varepsilon_{s,t}$ with ρ_d,$\rho_s < 1$ where $\varepsilon_{d,t}$ and $\varepsilon_{s,t}$ are normally distributed error terms. Finally, we allow for hysteresis in potential output:

$$y_{t-1}^{F} = y_{t-2} + z_{t-2}^{d,s} \tag{24}$$

i.e. potential output is not only a function of past demand/productivity shocks, $z_{t-2}^{d,s}$, but also a function of past actual output, y_{t-2}. Following the recent crisis episodes worldwide a number of economic institutions and research hubs, such as for example the IMF (2009) and the European Commission (2009) and researchers, see for example Pisani-Ferry and van Pottelsberghe (2009) and Furceri and Mourougane (2009), have emphasised the negative effects of deep economic recessions on potential output. To this extent, we extend the basic model by allowing the path of potential output to be influenced by lagged actual output. Therefore, by replacing (24) in (23):

$$\triangle p_t = \kappa \left(\triangle y_{t-1} + \triangle z_{t-1}^{d,s} \right) \tag{25}$$

in an economic downturn the term in round brackets will reflect change in unused capacity. In the empirical section we define output growth, $\triangle y_{t-1}$, as $(y_{t-1} - y_{t-2})$ where y_t is real GDP.

2.5 Testable Implications

By replacing $\triangle p_t$ from (25) in (22) we derive the following evolution of aggregate demand:

$$\triangle y_t = \left(\triangle d_{t-1}^{s}\right) + \left(\triangle d_{t-1}^{s} - \triangle d_{t-2}^{s}\right) - \kappa \triangle y_{t-1} - \kappa \Delta z_{t-1}^{d,s} \tag{26}$$

The supply of credit $\triangle d_{t-1}^{s}$ implied by (17) is:

$$\triangle d_{t-1}^{s} = \triangle d_{t-1} + \left(\tau_{t-1}^{d} + \tau_{t-1}^{s}\right) \tag{27}$$

Credit flow between $t-1$ and $t-2$ is obtained by adding and subtracting $\triangle d^s_{t-2} = \triangle d_{t-2} + \left(\tau^d_{t-2} + \tau^s_{t-2}\right)$ on the LHS and RHS of (27):

$$\left(\triangle d^s_{t-1} - \triangle d^s_{t-2}\right) = \left(\triangle d_{t-1} - \triangle d_{t-2}\right) + \left(\triangle \tau^d_{t-1} + \triangle \tau^s_{t-1}\right) \tag{28}$$

where $\triangle \tau^d_{t-1}$ and $\triangle \tau^s_{t-1}$ denote supply/demand financial shocks during the recessionary phase.

We define the probability of credit-less recoveries as the joint probability that $\Delta y_t > 0$ and $\triangle d_t \leqslant 0$. The determinants of this probability can be identified from the reduced form model implied by the three equations (26), (27) and (28):

$$\Pr\left(\Delta y_t > 0,\ \ \triangle d_t \leqslant 0\right) = f\left(\begin{array}{c} \underbrace{\overset{-}{(\triangle d_{t-1})}}_{Deleveraging},\ \underbrace{\overset{+}{(\triangle d_{t-1} - \triangle d_{t-2})}}_{Credit\ Impulse},\ \underbrace{\overset{-}{\triangle y_{t-1}}}_{Unused\ Capacity}, \\ \underbrace{\overset{+}{(\triangle \tau^d_{t-1}}, \overset{+}{\triangle \tau^s_{t-1})}}_{Financial\ Demand/Supply\ Frictions},\ \underbrace{\left(\overset{+}{\Delta z^d_{t-1}}, \overset{+}{\Delta z^s_{t-1}}\right)}_{Real\ Demand/Supply\ Frictions} \end{array}\right) \tag{29}$$

Hence our testable implications on the drivers of credit-less recoveries imply deleveraging, credit impulse, underutilization capacity or dominance of frictions in real/financial demand and supply during recessions. As we document in Figure 1 during credit-less episodes, real GDP growth was on average lower than during "credit-with" recoveries. Indeed, investment and consumption are the two components of demand mostly affected by the bounce-back effect channelled by changes in liquidity, as illustrated in the model above.

3 Liquidity Shocks and the Shape of The Recovery: Empirical Analysis

3.1 Data, Methodology and Stylized Facts

Our sample includes 42 advanced and emerging economies, covering the period between 1980 and 2014.[4] Crises episodes and credit-less recoveries are identified following a methodology similar to Braun and Larrain (2005) and Abiad *et al.* (2011). A contraction in output is considered as a

[4] The sample of advanced economies includes: Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, New-Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom and United States. The sample of emerging economies includes: Algeria, Argentina, Brazil, Chile, China, Colombia, Hungary, India, Indonesia, The Republic of Korea, Malaysia, Mexico, Peru, Philippines, Poland, The Russian Federation, South Africa, Thailand, Turkey, Ukraine, Uruguay and Venezuela.

crisis episode each time the HP-filtered cyclical component of real GDP falls one standard deviation below the mean. Letting t be the year of the trough of the crisis, a recovery is defined as the first four years following the crisis trough t. The business cycle was then described around the peak, the trough and the recovery of the cyclical component of GDP. To define credit-less recoveries we use a methodology similar to Bijsterbosch and Dahlhaus (2011), employing five different definitions of credit-less recoveries. These are summarized in Table 1. According to definition 1 a recovery is defined as credit-less if the annual growth of domestic (real) bank credit is negative during the first three years of the recovery (*i.e in* $t+1, t+2$ and $t+3$); in the case of definition 2, a recovery is defined as credit-less if the annual growth rate of domestic real credit is negative during the first two years of recovery (*i.e in* $t+1$ and $t+2$). In the case of definition 3, a recovery is defined as credit-less if the annual growth rate of domestic real credit is negative during the first year of recovery (*i.e in* $t+1$). According to definition 4, a recovery is defined as credit-less if the *average* annual growth rate of domestic real bank credit is negative during the first four years of the recovery (*i.e.* between $t+1$ and $t+4$); In the case of definition 5, a recovery is defined as credit-less if the *average* annual growth rate of real bank credit is negative during the first four years of the recovery, starting from t+2 (*i.e.* between $t+2$ and $t+5$).

Using definition 2, we identify 113 output collapses of which 21 - or more than 18 percent - showed a credit-less recovery. Tables 3 and 4 present a full list and description of the growth performance of these episodes.

Descriptive evidence shows that stressed credit conditions significantly impacted the pace of recovery in the sample of countries, a result in line with findings of previous empirical literature on credit-less recoveries (Abiad et al. 2011; Bijsterbosch and Dahlhaus, 2011). Our analysis confirms that credit-less recoveries bring significant costs. Figure 1 documents that during these episodes, real GDP growth was on average more than 2 percent lower than during "credit-with" recoveries; investment and consumption were the two most hard hit components of demand, growing on average 4.3 and 1.7 percent less.

Figure 3 presents descriptive statistics on the number of demand and supply-driven recessions, and credit-less recoveries over time in the sample of advanced and emerging countries. In the real sector of the economy, we find that demand and supply driven recessions are homogeneously distributed over the crisis episodes that occurred between 1980 an 2014, with the exception of the time window of 2007-2014 when demand driven recessions prevailed. In the financial sector, supply driven recessions prevailed during the crisis episodes that occurred between 1980 and 2006, while demand driven recessions were dominant in the time window 2007-2014.

We then move to assess how credit-less episodes are linked to the nature of the preceding recession,

i.e. whether they are driven by changes in supply or demand conditions in the financial and real sectors. In this paper, to identify (real and financial) demand and supply driven recessions, we follow the literature on the cyclical relationship between output and prices (den Haan, 2000; Cooley and Ohanian, 1991; Pakko, 2000; Smith, 1992 among others). To identify *real* (demand and supply) driven recessions, we draw upon information on prices and output growth during the recession phase of the crisis episodes identified in our sample. In a model with flexible price-adjustment, during recessions in which supply-side drivers dominate, the correlation between inflation and output growth is negative; when demand-side drivers prevail, the same correlation is assumed to be positive. If the whole process only takes a short period of time, we will typically observe changes in quantities and relatively stable prices so the correlation will be smaller or close to zero. Since we are focussing on changes in demand and supply during the whole recessionary phases it is reasonable to assume that the correlation will reflect long term changes in demand and supply conditions with a resulting non zero correlation between output and prices.

To identify *financial* (demand and supply) driven recessions, we exploit data on credit growth and on the external finance premium (EFP).[5] The underlying assumption is that a negative correlation between the EFP and credit growth during the recession phase signals the prevalence of supply-side constraints to lending, whereby increases in borrowing costs are accompanied by a contraction in credit flows. On the contrary, a positive correlation between the two variables would signal a demand-side constraint, as contractions in the demand for credit would lead to lower borrowing costs (provided that credit supply remains unchanged). If the whole process only takes a short period of time, we will typically observe changes in liquidity but smaller changes in the cost of liquidity provision. That implies a stable EFP and smaller (or close to zero) correlation between liquidity and EFP. Table 2 provides descriptive statistics on the correlation between price and quantities in the real and financial sectors for our sample of countries.

To investigate the channels of the relationship between credit and output during recoveries, we employ a fixed effects Probit model similar to Abiad *et al.* (2011), where the dependent variable reflects the probability that the recovery will be credit-less. Let a credit-less episode $Y_{i,t}$ in country $i = 1, 2, ..., N$ in time $t = 1, 2, ..., T$ be modeled by:

$$Y_{it}^* = \mathbf{X}_{it}'\boldsymbol{\beta} + u_{it} \qquad\qquad Y_{i,t} = I(Y_{it}^* > 0) \tag{30}$$

Where Y_{it}^* indicates the occurrence of a credit-less recovery in country i in time t, and Y_{it} is an

[5] The external finance premium (EFP) signals the tightness of borrowing constraints and is calculated by taking the difference between the bank lending rate and the risk-free rate at which short-term government bonds are issued. The variable is constructed using data on bank lending and risk-free rates sourced from the International Financial Statistics (IFS/IMF) database.

indicator function transforming Y_{it}^* into a dummy variable signaling the occurrence of a credit-less recovery. $\mathbf{X}_{it}$ is a vector of regressors including drivers of credit-less recoveries. We assume that the error term u_{it} in equation (30) has a normal distribution with unit variance.

Model (30) makes no assumption on the correlation between country-specific time-invariant effects and the model's covariates $\mathbf{X}_{it}$. In order to take into account the role of panel-level correlation, we also estimate the same model with *a)* a random effects Probit model and *b)* a Mundlak-type (1978) correction model. While the assumption under the random effects estimator is that the panel-level entities are uncorrelated with the independent variables, Mundlak's correction model introduces an alternative assumption on the characteristics of the country-level specific effects. In Mundlak (1978), the country-specific effects in the error term $u_{it} = \delta_i + \epsilon_{it}$ are related to the time-invariant averages of the model's independent variables:

$$\delta_i = \mathbf{X}_i'\boldsymbol{\zeta} + v_i \qquad\qquad E(\delta_i \mid \mathbf{X}_i) = \mathbf{X}_i'\boldsymbol{\zeta} \tag{31}$$

Where $\mathbf{X}_i$ is the time invariant average of each covariate $\mathbf{X}_{it}$. The full model can be described by the following specification:

$$Y_{it}^* = \mathbf{X}_{it}'\boldsymbol{\beta} + \mathbf{X}_i'\boldsymbol{\zeta} + v_i + \epsilon_{it} \tag{32}$$

In equation (32), the term v_i is assumed to be random and uncorrelated with the model's covariates $\mathbf{X}_{it}$. The coefficient vector $\boldsymbol{\beta}$ estimates the effect of $\mathbf{X}_{it}$ on the probability of a recovery being credit-less, holding the panel level means fixed in time. As the covariates reflect the characteristics of the recessions *prior* to the credit-less episode, this addresses potential endogeneity problems of all regressors in the fixed and random effects models.

3.2 Explanatory Variables

Our work analyzes the drivers of credit-less recoveries looking separately at the demand and supply-side contributions to credit growth in real and financial markets. It focuses on the role of the following covariates in predicting the occurrence of a credit-less recovery:

Demand-side covariates

GDP growth: The inclusion of this variable aims at capturing a "bounce-back" effect, as in Bijsterbosch and Dahlhaus (2011). In equation (29), negative values of this variable signal that the economy is operating below its potential, and accumulating unused capacity which firms can absorb during the recovery phase. This in turn may limit their need for new borrowing keeping demand for credit low.

Real demand shock dummy variable: This is a dichotomous variable taking the value of 1 if the

correlation between output growth and inflation during the *recession* phase is positive; 0 otherwise. As explained in section 2, in our model real demand shocks impact aggregate demand through their effect on accumulation of unused capacity by firms. This variable aims at testing whether low aggregate demand following the recession could make the private sector reluctant to resume borrowing to finance consumption or investment, leading to a contraction in the demand for credit and a higher likelihood of credit-less recovery.

Financial demand shock dummy variable: This variable aims at capturing the role played by demand-side constraints to credit growth during the recovery. It consists of a binary variable taking the value of 1 if the correlation between the external finance premium (EFP) and credit growth is positive during the *recession*; 0 otherwise. Contractions in the demand for credit can result, for example, from a deterioration of borrowers' balance-sheets, which limits agents' ability to access new funding.

Supply-side covariates

Real supply shock dummy variable: This is a dichotomous variable taking the value of 1 if the correlation between output and inflation during the recession is negative; 0 otherwise. Inclusion of this variable is motivated by the aim of investigating whether or not the occurrence of a real supply shock in the economy increases the likelihood of a credit-less recovery.

Financial supply shock dummy variable: This is a dichotomous variable taking the value of 1 if the correlation between the external financial premium (EFP) and the growth of domestic private credit is negative during recessions; 0 otherwise. A crisis episode accompanied by a financial supply shock can lead to excessive pressure on financial intermediaries' balance-sheets. In turn, this may affect overall levels of liquidity available for lending and lead to increases in borrowing costs.

Credit flow: This variables represents the annual growth rate of domestic bank credit ($\triangle d_{t-1}$). A reduction in the amount of credit in the economy, what we call deleveraging, reduces output. We expect this variable to be negatively correlated with the probability of a credit-less recovery.

Credit impulse: As suggested by Biggs *et al.* (2009), a contraction in credit flows reduces output. However, if credit reduces at a decreasing rate ($\triangle d_{t-1} < \triangle d_{t-2}$), a credit impulse effect ($\triangle d_{t-1} - \triangle d_{t-2}$), may partially offset the negative effect on output resulting from deleveraging, $\triangle d_{t-1}$.[6]

There are additional factors that can potentially impact economic conditions in the aftermath of a crisis, hence credit dynamics during the recovery. For example, if crisis episodes are preceded

[6] Assume that a crisis in $t-1$ causes a contraction in credit and credit growth turns negative. If in year t, the pace of de-levering slows then $\triangle d_t$ or credit flow still remains negative but $\triangle d_t - \triangle d_{t-1}$ or credit impulse turns positive. It is then possible that the growth of cyclical GDP is positive and there is an economic recovery that is accompanied by "de-leveraging" but is supported by a positive credit impulse.

by a credit boom, then credit dynamics during the recovery may look different than the case where the crisis was preceded by average credit growth. Similarly, credit dynamics during recoveries are influenced by policy responses affecting monetary aggregates. An expansionary monetary stance similar to the one that occurred in the Euro area following the global crisis contributes to increase liquidity levels and leads to more favorable funding conditions. To control for these conditions, we include two additional dummy variables, one signaling the occurrence of a credit boom prior to the crisis and another one controlling for the presence of a monetary expansion during the crisis.[7]

Our empirical strategy allows to test the hypotheses on credit-less recoveries through a comprehensive framework of analysis featuring demand and supply side covariates, while at the same time controlling for country specific factors influencing the drivers of credit growth.

3.3 Main results

Our first step consists in estimating the fixed effects Probit model (30) on the entire sample of advanced and emerging countries. Table 5 presents probit estimations for demand-side drivers of credit-less recoveries. Countries with negative GDP growth have a higher probability of experiencing a credit-less recovery. During economic downturns financially constrained firms may be able to accumulate unused capacity, which can be used during the recovery phase to restore activity[8]. Because of this "bounce-back" effect, larger contractions of GDP during the recession increase the likelihood that production can recover without need of further lending, as firms have access to unused capacity limiting their need for lending during the recovery phase of the cycle. In a similar way, large GDP contractions can make households reluctant to resume borrowing during the recovery, especially in the presence of a weak growth outlook. In our estimates, the occurrence of a real demand-side shock does not significantly increases the probability of credit-less recovery episodes. When looking at credit growth dynamics, estimates indicate that the recovery in output during these episodes has a closer relationship with the change in the flow of credit (i.e. $\triangle d_{t-1} - \triangle d_{t-2}$ or what is named *credit impulse* in our model) rather than with the change in the stock of credit.[9] In other words, our results show that a rebound in output can occur in the presence of negative credit growth (or when the economy is deleveraging). However, in order to have an economic recovery, credit must be

[7] Both of these variables are taken fom Laeven and Valencia's (2008) database on banking crisis. Credit booms are identified as those during which the deviation of credit-to-GDP ratio relative to its trend is greater than 1.5 times its historical standard deviation and its annual growth rate exceeds 10 percent, or years during which the annual growth rate of the credit-to-GDP ratio exceeds 20 percent. Monetary expansions are computed as the change in the monetary base between its peak during the crisis and its level one year prior to the crisis.

[8] This result is also in line with the findings of Sugawara and Zalduendo (2013) and Bijsterbosch and Dahlhaus (2011).

[9] Biggs et. *al.* (2009) were the first authors to refer to a credit impulse effect deriving from the change in the pace of deleveraging and these results are in line with their findings.

reducing at a decreasing rate (i.e. the pace of deleveraging is decreasing) so the credit impulse turns positive and this effect may partially offset the negative consequences of deleveraging. This happens as investments in long-term capital respond sluggishly to credit, so when deleveraging slows down output can face a rebounding effect during the recovery phase.

Our model, in line with Biggs *et al.* (2009), confirms the nature of the output-credit link during recoveries, showing that the rebound economic activity is linked to the change in the flow rather than in the stock of credit. In principle, beyond the assumed sluggish effect on capital investments, the positive credit impulse effect can also reflect an improvement in general economic activity supported by other factors such as real exchange rate devaluations or enhanced non-bank financing. The question of whether the reduction in the pace of deleveraging reflects improvements in general economic activity, or if it directly affects aggregate output growth, represents an interesting path for new research.

The occurrence of a financial demand shock significantly increases the probability of credit-less episodes. This confirms that demand-side frictions in financial markets may have indeed an important role in contributing to weak credit growth during the recovery phase of the cycle in the sample of countries. These frictions may manifest in diverse ways across countries. For example, in financial markets low demand for credit can be the result of a deterioration of borrowers' creditworthiness, or of the reluctance of the private sector (firms and households) to resume borrowing in the presence of negative growth and employment prospects for the economy. However, these results do not exclude that supply constraints may have also played a role during recoveries. This is likely the case for recoveries preceded by financial sector stress (e.g. banking crises) which impact on financial intermediaries' availability of liquidity for lending purposes. Our aim in this analysis is to demonstrate that during these episodes, demand constraints to credit growth weighed more than supply-side frictions.

Table 5 shows that the occurrence of a credit boom prior to the crisis increases the likelihood of a credit-less recovery in our sample of countries, a result in line with the findings of Abiad et *al.* (2011). We expect that following a rapid increase in credit growth prior to the crisis, the economy will need to deleverage, leading to low credit demand in the aftermath of the recession.

The likelihood of a credit-less recovery is influenced by policy responses during the crisis. Monetary policy expansions during the crisis increase the probability of a credit-less recovery, suggesting that more favorable funding conditions resulting from an accomodating monetary stance did not support the pick-up of credit flows to the private sector. This suggests that the failure of credit growth to pick-up during these episodes may have resulted from weak demand for liquidity by the private sector, corroborating our hypothesis of demand-driven credit-less recoveries presented above.

To take into account the role of a potential correlation between panel-level entities and indepen-

dent variables, we estimate the same model using a random effects panel Probit specification and a Mundlak-type specification. Results are presented in columns 2 and 3 of Table 5. Results obtained with these specifications are in line with the fixed effects model estimations, although some of the coefficients vary in significance levels. The outcome of the Hausman test (p-value $= 0.92$) implies that the null hypothesis that the models yield similar coefficients is not rejected at any reasonable significance level, and that the random effect model yields a more efficient estimator of the probability of credit-less recovery. We perform an additional test on the panel-level means of the Mundlak error-correction model presented in column 3 of Tables 5. The p-value of the test is 0.60 suggesting that the time-invariant unobservables are not related to the independent covariates, and that the model satisfies the random effects model assumptions.

In our sample, seven (or 33 percent) of the overall credit-less recoveries occurred after the global financial crisis erupted in 2007. This period has been characterized by a sharp contraction in credit in many countries worldwide, driven by both demand and supply factors. To assess how our results change when these observations are removed, we estimate our model excluding recovery episodes that occurred after 2010. Results are presented in Tables 7 and 8. Although some of our coefficients vary in significance, overall results are in line with our estimates and confirm that on average demand-side factors have a stronger predictive power on credit-less recoveries.

Table 6 presents estimation results obtained analyzing supply-side drivers of credit-less recoveries. Evidence from the real side of the economy confirms that negative GDP growth increases the probability of credit-less episodes. Recessionary episodes featuring real supply shocks increase the likelihood of credit-less episodes. When looking at the role played by financial sector drivers of credit growth, findings show that supply-side shocks in financial markets did not play on average a significant role in favoring the occurrence of credit-less recoveries. Although we cannot exclude the possibility that in many crisis episodes, especially those associated with banking crises, disruptions in the supply of credit may have played a role in keeping credit low during the recovery, our results suggest that on average credit-less episodes have been an outcome of subdued demand for liquidity by the private sector in the aftermath of the crisis.

Columns 2 and 3 of Table 6 present estimations of the random effects panel Probit specification and a Mundlak-type specification. Similarly to above, we perform a Hausman test for the hypothesis that the differences between the coefficients of the fixed and random effects models are not systemic, finding a p-value of 0.86. Testing at the 5 and 10 percent significance levels, the null hypothesis that both the fixed and random effects models yield similar coefficients is not rejected.

Estimation coefficients presented in Table 5 and Table 6 are not interpretable using standard inference methods. As the next step, we compute the marginal effects for changes in the explanatory

variables. Table 11 reports the marginal effects of the probability of credit-less recovery and Figure 4 presents the predicted probabilities of credit-less recovery using our demand and supply-side models. The coefficients of the the marginal effects and patterns of predicted probabilities for different values of the model's covariates confirm our results. They show that when a recovery is preceded by a demand shock in financial markets, the average probability of a credit-less recovery is 6 percent higher. There are no significant effects found for supply-side shocks.

3.4 Robustness

This section performs a robustness analysis of the models presented in the previous section. The goal is to assess the overall performance of the models in predicting credit-less episodes. The analysis is carried out following two procedures similar to Bijsterbosch and Dahlhaus (2011). As a first step, we assesses the sensitivity of the results presented in the previous section to an alternative definition of credit-less recovery. According to this one, a recovery is identified as credit-less when annual real credit growth is negative during the first three years of recovery. Model estimations for the demand and supply-side of the economy are presented in Table 9 and Table 10. For each model, most of the signs of the covariates remain unchanged, although some of the regressors vary in significance levels. Overall, results suggest that the models are robust to alternative definitions of credit-less recoveries.

As a second step, we analyze the baseline models' predictive performance by calculating type I and type II errors (or false positive and false negative respectively).[10] Calculating these errors requires setting a positive outcome threshold α. Letting p_i be the model's predicted probability for observation i, and x_i a binary variable signaling the occurrence of the actual outcome. The classification signals a false positive (type I error) if $p_i \geqslant \alpha$ and $x_i = 0$. On the contrary, if $p_i < \alpha$ and $x_i = 1$, it signals a false negative (type II error). Following the literature, we set the thresholds α equal to 30, 40 and 50 percent. Table 12 reports type I, type II errors and overall success rates for the models presented in section 3.2 for different thresholds values of α. By setting $\alpha = 0.5$, the models have a success rate between 88 and 87 percent. The probability that the models incorrectly predict a credit-less episode (type I error) is 5.3 and 4.5 percent for the demand and supply-side models respectively. The probability that the models fail to predict a credit-less episode (type II error) is between 27 and 33 percent for the demand and supply-side respectively. Overall, the analysis suggests that both models have a good predictive power.

[10] A similar analysis is also done by Bijsterbosch and Dahlhaus (2011) and Sugawara and Zalduendo (2013), to assess the predictive ability of a probabilistic model of credit-less recoveries.

4 Conclusions

The disruption of bank lending following the global financial crisis that erupted in 2007 resulted in sharp output contractions in both emerging and advanced countries. This brought up the question of how the duration of credit tightening and impaired bank intermediation affect output and its recovery patterns. Recent trends in private sector deleveraging and balance-sheet adjustment suggest that subdued credit growth during the recovery represented an obstacle for growth. Against this background, policy responses have been substantial, ranging from increases in fiscal spending, sizable monetary expansions, and bank recapitalizations.[11] Despite these interventions, in many countries worldwide recoveries have been weak, and often accompanied by a modest pick-up in credit flows.

In their pioneering study on sudden stops in capital flows, Calvo *et al.* (2006) were the first authors to document credit-less recoveries in emerging markets, naming them Phoenix Miracles. Subsequent empirical literature shows that these episodes are a common feature of business cycles in both advanced and emerging economies, and that they bring relevant costs for countries. Output growth is between 2 and 3 percent lower than during "normal" recoveries, and it takes longer for it to recover to its pre-crisis levels.

An open question remains whether weak credit growth is a result of demand or supply constraints to lending activity. Providing evidence on this point is important not only for economic theory but also for policy design. The lack of comprehensive empirical evidence in this area has limited economic research in providing detailed insights on the role of policy responses following these episodes.

The primary goal of this work was to analyze demand and supply drivers of bank credit growth during economic recoveries. Building on Chadha *et al.* (2010), we analyze how liquidity shocks impact on credit conditions in an endowment economy model. In our framework, credit-less episodes are correlated with demand and supply shocks in real and financial markets and with the pace of private sector deleveraging. As in Biggs et al. (2009), we show that a recovery in output can occur in the presence of negative credit growth as long as the pace of deleveraging is decreasing. We use panel data on output, credit and the external finance premium for a sample of 42 advanced and emerging countries between 1980 and 2014 to identify demand and supply shocks in real and financial markets. Through panel Probit model techniques we analyze the relative impact of these shocks in predicting the onset of a credit-less recovery.

Findings show that in the sample of advanced and emerging countries, stagnant credit growth during credit-less recoveries has been (on average) primarily demand-constrained. These episodes appear the outcome of weak demand for liquidity by the private sector in the aftermath of recessionary

[11] See for example Jiménez et al. (2017) for evidence on the effect of countercyclical bank capital buffers and credit supply.

episodes. Our results confirm that during these episodes output growth is correlated with the pace of private sector deleveraging and that firms may be able to restore activity by accessing unused capacity accumulated during the recession, while postponing additional credit-intensive investments. These results, however, do not exclude that bottlenecks to the supply of credit have also contributed to sluggish credit growth. This likely occurred during recessionary episodes accompanied by financial sector stress (*e.g.* banking crisis) leading to contractions of liquidity levels and higher lending costs.

These results are relevant from a policy perspective and show that demand stimuli policies during credit-less recoveries are likely to lead to higher growth. To the extent that credit-less recoveries are undesirable outcomes from a growth perspective, policy measures should aim at preventing large contractions in aggregate demand and at promoting macroeconomic stability ex-ante. In the case of occurrence of these episodes, fiscal and financial sector policy can tackle directly demand constraints to credit growth. For example, low demand for credit may be caused by high collateral requirements or by excessive private sector indebtedness. In these cases, policy responses should prioritize measures aimed at loosening collateral rules and favoring debt restructuring keeping demand for credit low.

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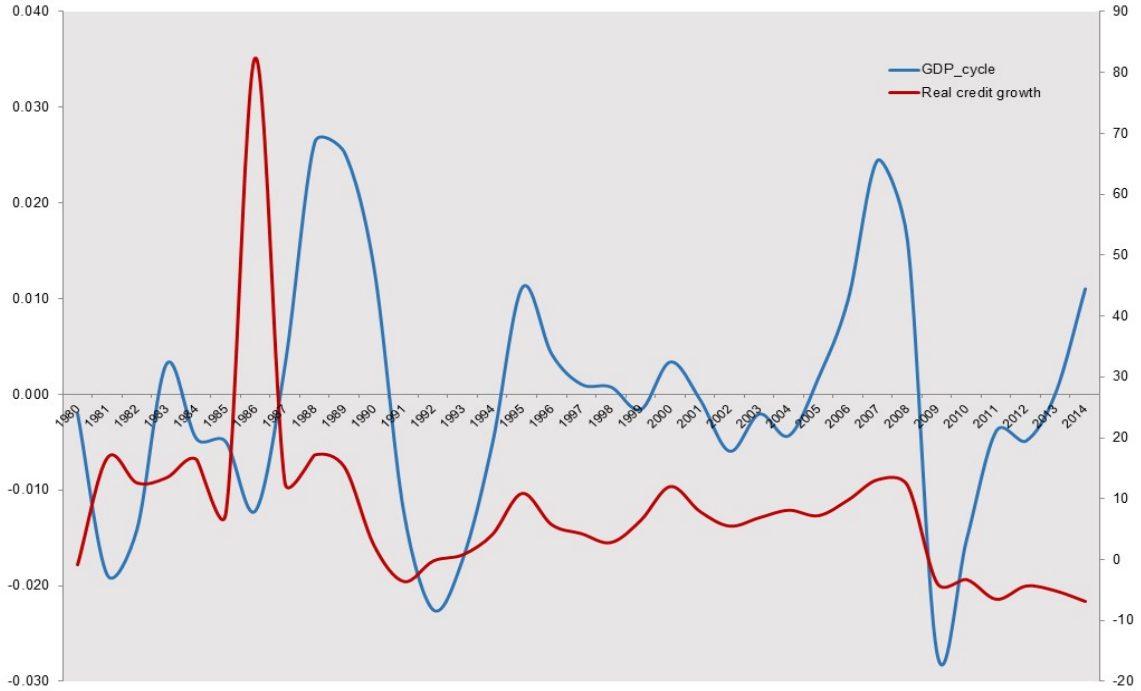
Figure 1: The business and the financial cycles,1980 - 2014

United kingdom



Thailand

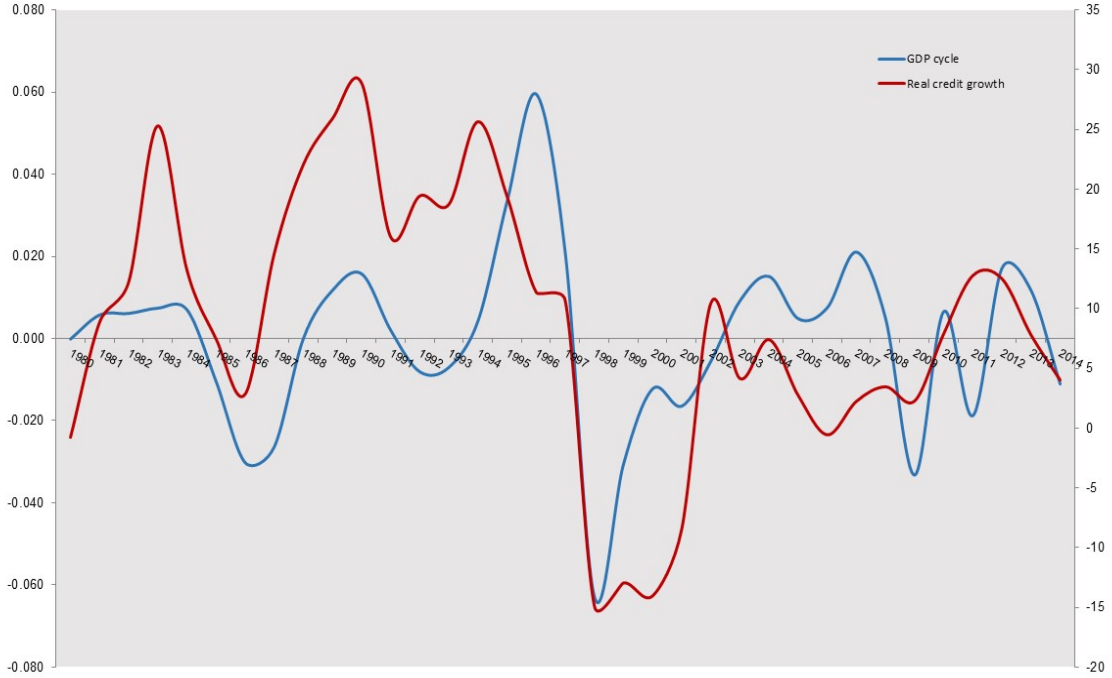
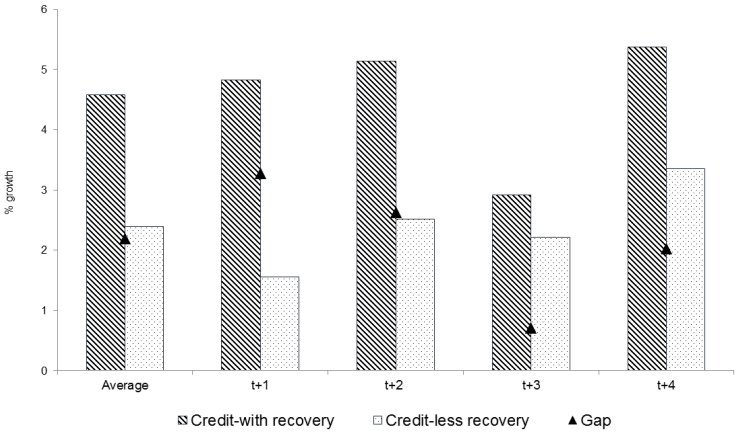


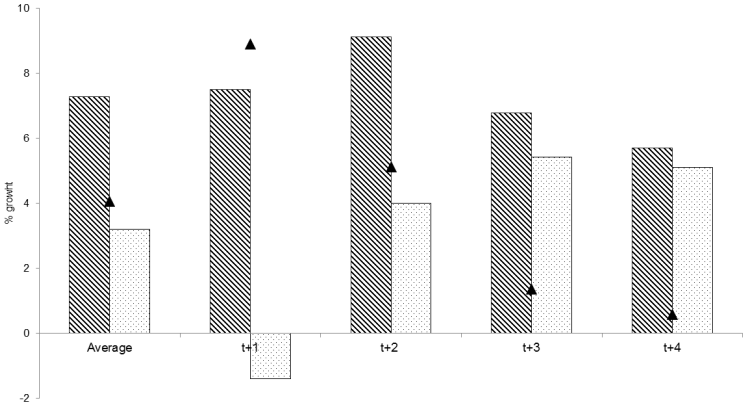
Figure 2: Anatomy of Credit-less Recoveries

Average percentage (%) growth during recoveries, 1980-2014

GDP



Investment



Consumption

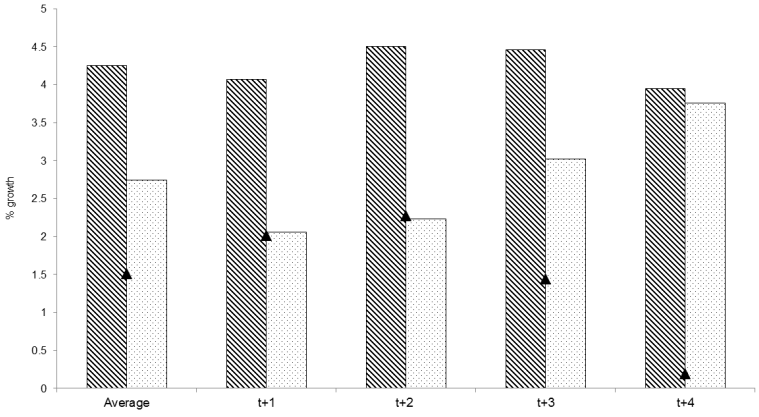
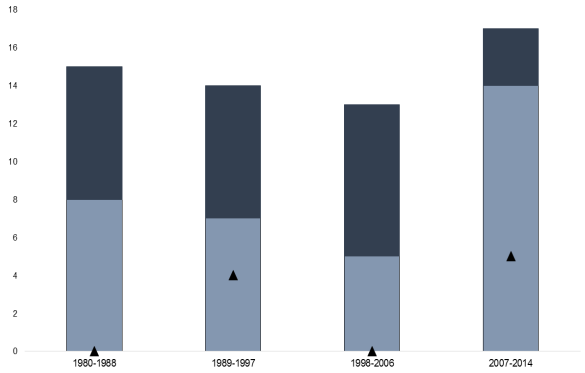


Figure 3: Frequency of Aggregate Shocks and Credit-less Recoveries

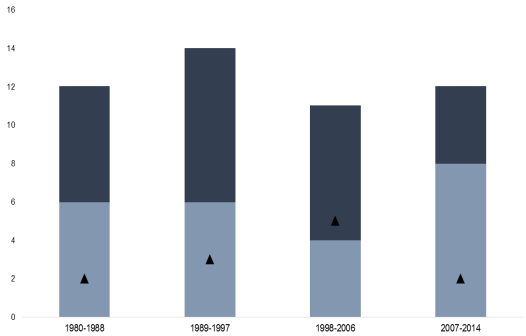
Number of demand and supply shocks and credit-less recoveries, by year and country group

Real Sector

Advanced countries



Emerging countries



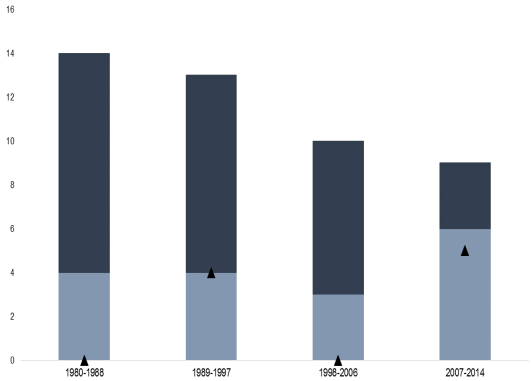
Supply shocks

Demand shocks

Credit-less recoveries

Financial Sector

Advanced countries



Emerging countries

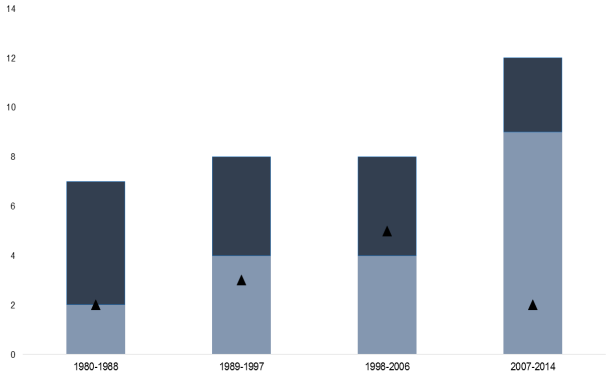


Figure 4a: Predicted probabilities with 95% CI

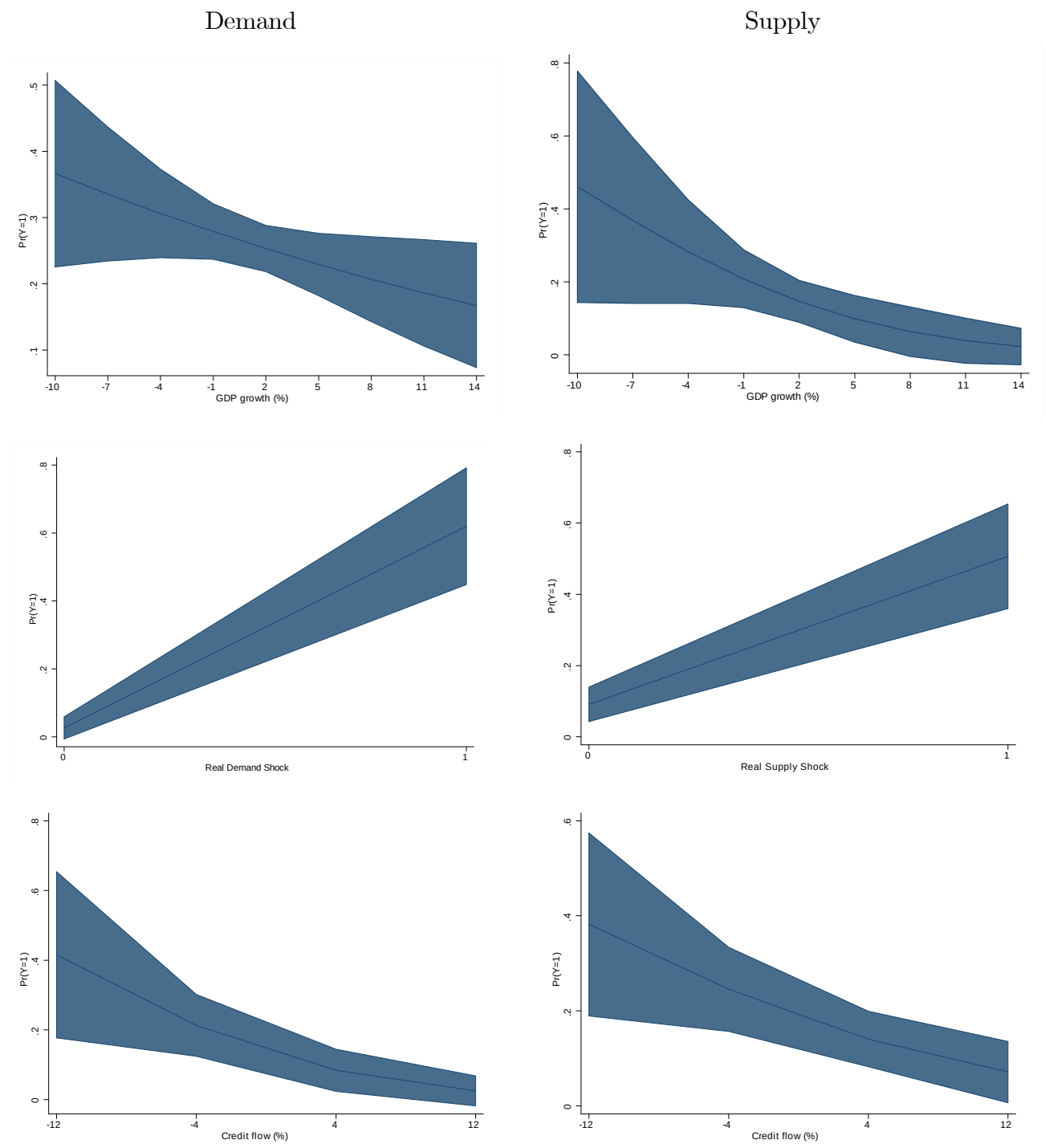


Figure 4b: Predicted probabilities with 95% CI

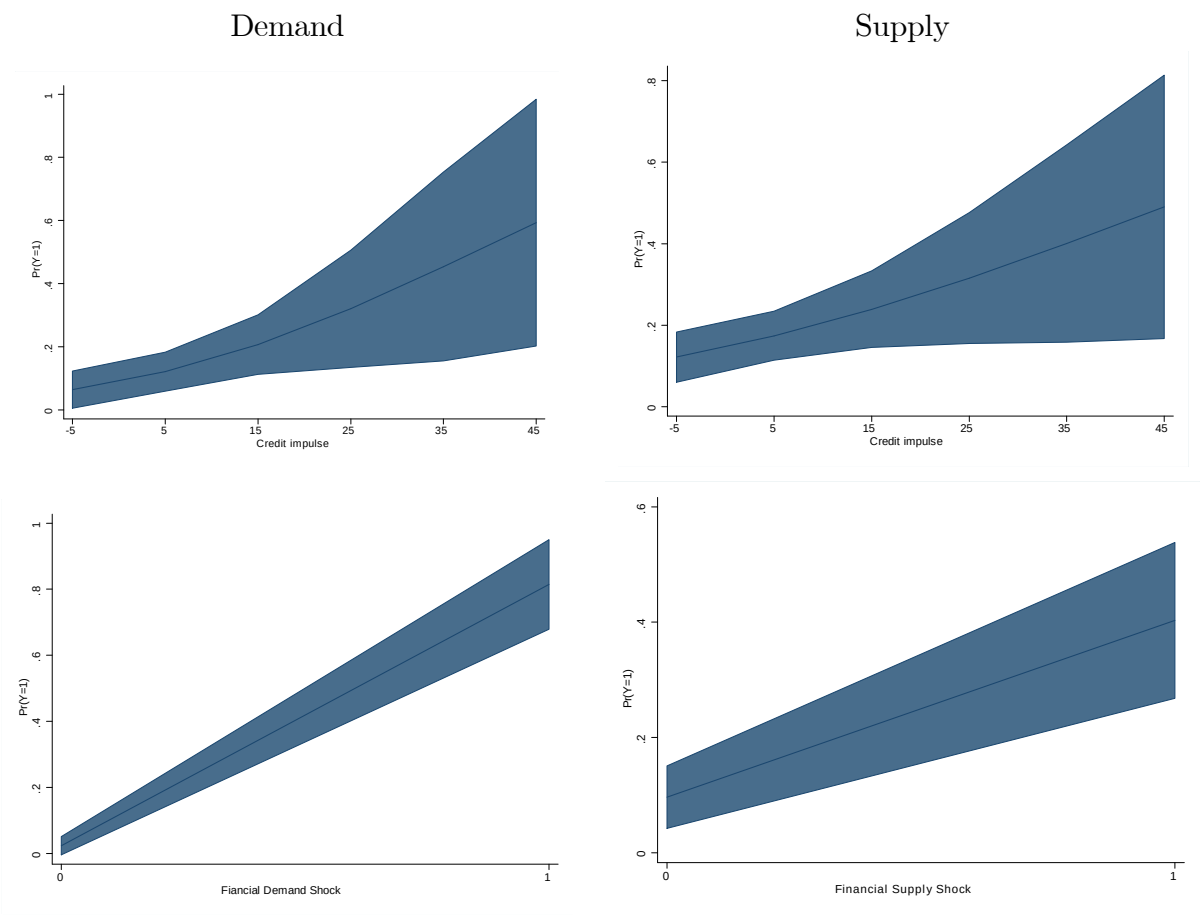


Table 1: Frequency of credit-less recoveries

Sample	No. of recoveries	Credit-less Def. 1	Credit-less Def. 2 Def. 2	Credit-less Def. 3	Credit-less Def. 4	Credit-less Def. 5
Advanced countries						
Number	55	5	9	15	7	10
Percentage (%)	51	9	16	27	12	18
Emerging countries						
Number	52	7	12	26	15	10
Percentage (%)	48	13	23	50	29	19
Whole sample						
Number	107	14	21	41	22	20
Percentage (%)	100	13	19	38	20	18

Note: According to Definition 1 a recovery is defined as credit-less if the annual growth rate of domestic real bank credit is negative during the first three years of the recovery (i.e t+1,t+2 and t+3);. In the case of Defintion 2, a recovery is defined as credit-less if the annual growth rate of domestic real credit is negative during the first two years of recovery (i.e t+1 and t+2). Based on Defintion 3, a recovery is defined as credit-less if the annual growth rate of domestic real credit is negative during the first year of recovery (i.e t+1). According to Definition 4, a recovery is defined as credit-less if the average annual growth rate of domestic real bank credit is negative during the first four years of the recovery (i.e. between t+1 and t+4); In the case of Definition 5, a recovery is defined as credit-less if the average annual growth rate of real bank credit is negative during the first four years of the recovery, starting from t+2 (i.e. between t+2 and t+5).

Table 2: Price-quantity correlations during recessions

Sample	Correlation output gap/inflation	Correlation EFP/Credit growth
Advanced countries		
1980-1990	0.05	−0.29
1991-2000	−0.06	−0.33
2001-2014	0.33	0.04
Emerging countries		
1980-1990	−0.06	−0.22
1991-2000	−0.25	0.09
2001-2014	0.41	0.32
Whole sample		
1980-1990	−0.00	−0.25
1991-2000	−0.15	−0.12
2001-2014	0.37	0.18

Note: The table reports correlation coefficients between output gap growth and inflation and between the external finance premium (EFP) and credit growth during the recession phase of the cycle. The length (years) of the recession varies by country.

Table 3: Credit-less Recoveries and Growth Performance in Advanced Countries

Country	No. of Output Collapses	Peak to Recovery Dates	Credit-less Recovery	GDP Growth (%) at peak	GDP growth (%) during recession	GDP growth (%) Trough to Peak	GDP Growth (%) During Recovery	Credit Growth (%) During Recovery
Australia	2	1981 − 1987	*No*	3.35	0.54	−5.58	4.13	15.41
		1990 − 1996	*No*	3.52	0.00	−3.13	3.98	7.80
Austria	3	1983 − 1991	*No*	2.97	1.55	−1.61	3.74	7.29
		2000 − 2007	*No*	3.36	1.25	−2.61	2.95	5.02
		2008 − 2013	*No*	1.54	−3.37	−5.34	1.45	0.05
Canada	3	1981 − 1986	*No*	3.50	−3.02	−6.52	3.75	2.10
		1989 − 1996	*No*	2.37	−0.37	−1.52	2.89	3.58
		2007 − 2013	*	2.00	−0.76	−4.71	2.56	*
Denmark	4	* − 1985	*No*	*	*	*	3.63	10.13
		1986 − 1997	*No*	4.94	0.78	−5.03	3.68	1.43
		2000 − 2007	*No*	3.74	0.55	−3.35	2.42	9.72
		2007 − 2013	*Yes*	0.82	−2.90	−5.91	0.40	−2.32
Finland	2	1990 − 1997	*Yes*	0.67	−3.32	−1.41	4.51	−5.91
		2008 − 2013	*No*	0.72	−8.26	−8.98	0.75	3.34
France	4	1981 − 1991	*No*	1.07	1.97	1.49	3.26	6.92
		1990 − 1997	*No*	2.91	0.67	−3.52	2.03	−0.78
		2000 − 2007	*No*	3.87	1.29	−3.05	2.28	11.02
		2007 − 2013	*No*	2.36	−1.37	−5.30	1.22	1.41
Germany	2	2001 − 2009	*No*	1.69	0.29	−0.98	2.68	0.08
		2008 − 2013	*No*	1.08	−5.61	−6.70	2.11	4.76
Greece	3	1985 − 1991	*No*	2.50	−0.87	−4.76	2.79	−0.72
		2004 − 2009	*No*	5.06	0.59	−4.46	1.07	5.39
		2008 − *current*	*Yes*	−0.33	−6.30	−6.96	*	*
Iceland	3	1981 − 1987	*No*	4.26	0.00	−6.41	5.55	4.08
		1987 − 1996	*No*	8.54	−0.45	−11.91	2.45	3.5−
		2000 − 2007	*No*	4.72	2.31	−1.98	6.96	29.85
Ireland	4	1985 − 1990	*No*	3.08	−0.42	−3.51	6.04	8.82
		1990 − 1998	*No*	8.46	3.43	−2.71	9.74	31.76
		2000 − 2008	*No*	10.22	5.00	−5.82	4.00	23.0
		2007 − 2013	*Yes*	5.54	−3.90	−11.18	1.14	−7.90
Israel	2	1987 − 1998	*No*	7.18	5.07	−0.25	9.08	8.97
		2000 − 2007	*No*	8.94	0.45	−7.76	5.36	2.23
Italy	3	1980 − 1987	*No*	3.43	0.80	−2.26	3.01	3.74
		1989 − 1997	*Yes*	3.38	0.87	−4.24	2.04	−0.13
		2007 − 2013	*No*	1.47	−3.26	−6.95	−0.56	1.63
Japan	3	1985 − 1991	*No*	6.33	3.46	−2.22	5.35	7.69
		1991 − 1998	*No*	3.32	0.61	−2.46	1.03	3.48
		2007 − 2013	*No*	2.19	−3.28	−7.71	1.89	2.50
New Zeland	4	1981 − 1986	*No*	4.65	0.93	−3.72	3.15	11.55
		1986 − 1996	*No*	2.70	0.15	−1.59	4.93	8.66
		1996 − 2002	*No*	3.62	1.28	−3.01	4.14	3.31
		2007 − 2013	*	2.95	−0.93	−3.21	2.07	*
Norway	2	1980 − 1986	*No*	4.56	0.91	−4.32	4.90	19.84
		1997 − 2007	*No*	5.28	2.04	−4.36	2.97	*
Spain	3	1980 − 1990	*No*	2.20	1.70	1.04	4.81	9.90
		1991 − 1997	*No*	2.54	−0.05	−3.57	2.87	3.55
		2008 − *current*	*	1.11	−1.77	−2.78	*	*
Sweden	2	1990 − 1997	*Yes*	0.75	−1.45	−2.82	3.13	1.03
		2007 − 2013	*No*	3.40	−2.87	−8.58	2.40	3.63
Switzerland	3	1981 − 1987	*No*	1.60	−0.33	−0.96	2.53	5.41
		2000 − 2007	*No*	3.94	0.54	−3.89	3.50	5.75
		2008 − 2013	*No*	2.27	−2.12	−4.40	1.91	3.45
UK	3	* − 1985	*No*	*	*	*	3.02	12.55
		1988 − 1996	*No*	5.93	0.56	−5.48	3.56	5.04
		2007 − 2013	*Yes*	2.58	−2.32	−6.77	1.71	−4.79
USA	4	* − 1986	*No*	*	*	*	4.91	7.52
		1989 − 1995	*Yes*	3.68	0.92	−3.75	3.26	1.56
		2000 − 2006	*No*	4.09	1.38	−2.30	3.15	6.52
		2007 − 2013	*Yes*	1.77	−1.53	−4.55	2.16	*

Note: Tables 1 and Table 2 report average annual growth rates of real GDP and real domestic bank credit in selected advanced and emerging countriess. Asterisks (*) indicate missing data

Table 4: Credit-less Recoveries and Growth Performance in Emerging Countries

Country	No. of Output Collapses	Peak to Recovery Dates	Credit-less Recovery	GDP Growth (%) at peak	GDP growth (%) during recession	GDP growth (%) Trough to Peak	GDP Growth (%) During Recovery	Credit Growth (%) During Recovery
Algeria	3	$*-1985$	*No*	$*$	$*$	$*$	5.27	12.89
		$1985-1992$	*Yes*	3.69	-0.43	-4.7	0.74	-29.04
		$1992-1998$	*No*	1.80	-1.5	-2.7	3.52	-3.31
Argentina	2	$1987-1994$	*No*	2.90	-4.15	-5.30	9.08	17.43
		$1998-2006$	*Yes*	3.85	-4.86	-14.74	8.86	0.46
Brazil	3	$1980-1987$	*No*	9.11	-2.40	-11.52	6.20	$*$
		$1987-1996$	*No*	3.59	0.22	-4.06	4.15	-4.21
		$2008-2013$	*No*	5.01	-0.23	-5.25	3.99	12.32
Chile	2	$1981-1987$	*No*	4.73	-7.05	-8.52	6.82	1.03
		$2007-2013$	*No*	5.16	1.12	-6.19	5.31	7.95
China	2	$*-1986$	$*$	$*$	$*$	$*$	12.10	$*$
		$1988-1995$	*No*	11.30	5.80	-2.03	13.07	12.38
Colombia	4	$1981-1098$	$*$	2.26	2.24	0.82	4.67	$*$
		$1990-1997$	*No*	6.04	3.22	-3.67	4.13	5.98
		$1997-2003$	*No*	3.43	-1.91	-7.63	3.13	-5.32
		$2007-2014$	*No*	6.90	3.05	-2.92	5.18	12.67
Hungary	2	$*-1997$	*Yes*	$*$	$*$	$*$	1.97	-1.24
		$2008-2013$	*No*	0.83	-6.55	-7.39	0.67	-5.45
India	4	$1983-1991$	*No*	7.28	4.45	-3.32	5.54	4.03
		$1990-1997$	*No*	5.53	3.76	-0.78	6.45	6.19
		$1999-2006$	*No*	8.84	4.15	-5.04	8.58	17.50
		$2007-2012$	*No*	9.80	3.89	-5.91	7.61	9.35
Indonesia	1	$1997-2002$	*Yes*	4.69	-13.12	-17.82	3.46	-13.37
Korea	2	$*-1984$	*No*	$*$	$*$	$*$	9.43	11.85
		$1997-2002$	*No*	5.76	-5.71	-11.48	7.87	27.81
Malaysia	3	$1984-1991$	*No*	7.76	1.80	-2.37	9.38	5.56
		$1997-2002$	*Yes*	7.32	-7.35	-14.68	5.22	-0.70
		$2008-2013$	*No*	4.83	-1.51	-6.34	5.72	7.73
Mexico	3	$1981-1987$	*No*	8.77	-2.41	-12.96	1.08	2.09
		$1994-1999$	*No*	4.72	-5.75	-10.48	5.05	-1.94
		$2007-2013$	*No*	3.22	-1.68	-7.96	3.63	9.34
Peru	2	$1981-1987$	*Yes*	5.55	-5.31	-15.96	6.20	-8.11
		$1987-1994$	*No*	9.72	-8.91	-14.70	4.80	20.59
Philippines	1	$1983-1989$	*No*	1.87	-7.31	-9.18	5.17	2.52
Poland	1	$*-1995$	*No*	$*$	$*$	$*$	4.62	-1.73
Russia	3	$1991-1999$	*Yes*	$*$	$*$	$*$	-2.11	7.12
		$1997-2002$	*No*	1.4	-5.3	-6.7	6.55	11.34
		$2002-2013$	*No*	4.74	4.99	-12.56	3.37	7.63
South Africa	3	$1981-1987$	*No*	5.36	-1.11	-7.20	1.50	1.06
		$1989-1996$	*No*	2.39	-1.15	-4.53	2.95	4.43
		$2008-2013$	*Yes*	3.19	-1.53	-4.72	2.67	0.11
Thailand	3	$1984-1990$	*No*	5.75	5.09	-0.21	11.54	22.88
		$1996-2002$	*Yes*	5.65	-5.19	-13.28	4.65	-6.22
		$2007-2013$	*No*	5.43	0.49	-6.17	4.61	10.25
Turkey	3	$1993-1998$	*No*	7.65	-4.66	-12.31	6.28	12.12
		$2000-2005$	*No*	6.77	-5.69	-12.47	7.29	18.83
		$2007-2013$	*No*	4.66	-2.08	-9.49	6.06	23.19
Ukraine	2	$1992-1998$	*Yes*	$*$	$*$	$*$	-6.77	$*$
		$2008-2013$	*Yes*	2.3	-14.8	-17.1	2.4	-2.91
Uruguay	2	$1981-1987$	*No*	1.55	-10.01	-11.83	4.28	-4.96
		$1998-2006$	*Yes*	4.51	-3.86	-12.25	4.34	-17.17
Venezuela	3	$1988-1993$	*No*	5.82	-8.56	-14.39	5.63	0.67
		$2001-2007$	*No*	3.39	-8.30	-11.14	11.80	42.87
		$2008-2014$	*No*	5.27	-2.34	-6.76	3.71	$*$

Table 5: Determinants of Credit-less Recoveries: Demand-side Contributions

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.064*	−0.054**	−0.047**
	(0.038)	(0.022)	(0.021)
Real Demand Shock$_{recession}$	0.527	0.537	0.394
	(0.392)	(0.578)	(0.623)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.072***	−0.059***	−0.062***
	(0.026)	(0.019)	(0.021)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.035**	0.028***	0.029***
	(0.013)	(0.009)	(0.011)
Financial Demand Shock$_{recession}$	1.472***	1.252**	1.373***
	(0.333)	(0.487)	(0.517)
Developing dummy	−0.601	−0.168	−0.048
	(0.801)	(0.619)	(0.791)
Credit boom$_{recession}$	1.675***	1.580	1.688
	(0.501)	(0.990)	(1.120)
Monetary expansion	1.687***	1.753*	1.750*
	(0.497)	(0.919)	(0.983)
Constant	−1.006***	−3.336***	−4.215***
	(0.281)	(0.814)	(1.151)
Country Effects	Yes	No	Yes
Observations	179	450	450
Pseudo-Likelihood	-42.0	-73.3	-70.5

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. *Real demand shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is positive; 0 otherwise. *Financial demand shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is positive; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 6: Determinants of Credit-less Recoveries: Supply-Side Contributions

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.079**	−0.063***	−0.056**
	(0.035)	(0.022)	(0.022)
Real Supply Shock $_{recession}$	0.545	0.287	0.528
	(0.432)	(0.633)	(0.632)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.048***	−0.044***	−0.046***
	(0.018)	(0.012)	(0.014)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.022**	0.020***	0.021***
	(0.009)	(0.006)	(0.007)
Financial Supply Shock$_{recession}$	−0.272	−0.226	−0.228
	(0.389)	(0.541)	(0.486)
Developing dummy	−0.752	−0.222	0.157
	(0.700)	(0.528)	(0.577)
Credit boom$_{recession}$	2.116***	1.772**	1.912**
	(0.364)	(0.718)	(0.741)
Monetary expansion	1.607***	1.693**	1.667**
	(0.427)	(0.712)	(0.726)
Constant	−0.525*	−2.524***	−1.809*
	(0.287)	(0.745)	(0.951)
Country Effects	Yes	No	Yes
Observations	179	450	450
Pseudo-Likelihood	-53.6	-85.2	-80.5

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. *Real supply shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is negative positive; 0 otherwise. *Financial supply shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is negative; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 7: Determinants of Credit-less Recoveries: Demand-side Contributions
Prior to the global financial crisis (<2010)

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.005	−0.029	−0.014
	(0.030)	(0.026)	(0.025)
Real Demand Shock$_{recession}$	0.656	0.609	0.494
	(0.470)	(0.620)	(0.668)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.065**	−0.048***	−0.055***
	(0.029)	(0.017)	(0.020)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.031**	0.023***	0.026**
	(0.015)	(0.009)	(0.011)
Financial Demand Shock$_{recession}$	1.688***	1.338**	1.474***
	(0.433)	(0.597)	(0.653)
Developing dummy	−0.308	−0.092	−0.020
	(0.773)	(0.609)	(0.808)
Credit boom$_{recession}$	2.184***	1.803*	2.113*
	(0.842)	(1.037)	(1.195)
Monetary expansion	1.473**	1.790**	1.663*
	(0.658)	(0.837)	(0.915)
Constant	−1.209***	−3.425***	−4.185***
	(0.294)	(0.716)	(1.108)
Country Effects	Yes	No	Yes
Observations	144	375	375
Pseudo-Likelihood	-28.6	-58.7	-55.6

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. *Real demand shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is positive; 0 otherwise. *Financial demand shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is positive; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 8: Determinants of Credit-less Recoveries: Supply-Side Contributions
Prior to the global financial crisis (<2010)

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.085**	−0.068***	−0.055**
	(0.037)	(0.027)	(0.026)
Real Supply Shock $_{recession}$	0.543	0.292	0.522
	(0.508)	(0.688)	(0.682)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.056**	−0.405***	−0.048***
	(0.024)	(0.011)	(0.014)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.027**	0.019***	0.023***
	(0.012)	(0.006)	(0.007)
Financial Supply Shock$_{recession}$	−0.248	−0.175	−0.151
	(0.448)	(0.649)	(0.566)
Developing dummy	−0.650	−0.139	0.135
	(0.830)	(0.484)	(0.576)
Credit boom$_{recession}$	2.326***	1.645**	1.988**
	(0.659)	(0.755)	(0.821)
Monetary expansion	1.250**	1.536**	1.409*
	(0.576)	(0.732)	(0.788)
Constant	−0.055*	−2.413***	−1.828**
	(0.321)	(0.681)	(0.899)
Country Effects	Yes	No	Yes
Observations	144	375	375
Pseudo-Likelihood	-37.9	-67.5	-62.7

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. *Real supply shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is negative positive; 0 otherwise. *Financial supply shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is negative; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 9: Robustness Analysis: Demand-side Drivers of Credit-less Recoveries
Alternative definition of credit-less recovery (Def. 1)

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.008	−0.015	−0.009
	(0.044)	(0.030)	(0.029)
Real Demand Shock$_{recession}$	−0.068	−0.022	0.045
	(0.560)	(0.732)	(0.773)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.049**	−0.053***	−0.051**
	(0.024)	(0.019)	(0.020)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.014*	0.017***	0.016***
	(0.008)	(0.005)	(0.006)
Financial Demand Shock$_{recession}$	1.178***	1.046*	1.014*
	(0.434)	(0.539)	(0.560)
Developing dummy	−1.656**	−0.562	−0.481
	(0.783)	(0.733)	(1.079)
Credit boom$_{recession}$	1.998***	1.824*	1.791*
	(0.444)	(0.972)	(1.017)
Monetary expansion	0.700	0.510	0.576
	(0.496)	(0.921)	(0.999)
Constant	−1.708***	−3.309***	−2.687**
	(0.325)	(0.824)	(1.3232)
Country Effects	Yes	No	Yes
Observations	117	450	450
Pseudo-Likelihood	-32.6	-57.1	-55.5

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. A recovery is defined as credit-less if the annual growth of domestic bank credit is negative during the first 3 years of recovery. *Real demand shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is positive; 0 otherwise. *Financial demand shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is positive; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 10: Robustness Analysis: Supply-side Drivers of Credit-less Recoveries
Alternative definition of credit-less recovery (Def. 1)

	(1) Pooled Probit	(2) Panel Probit	(3) Mundlak Correction
GDP growth$_{t-1}$	−0.013	−0.030	−0.025
	(0.045)	(0.030)	(0.030)
Real Supply Shock $_{recession}$	0.939*	0.711	0.657
	(0.552)	(0.734)	(0.761)
Credit flow$_{t-1}(\Delta D_{t-1})$	−0.041*	−0.048***	−0.048***
	(0.022)	(0.013)	(0.015)
Credit impulse$_{t-1}(\Delta D_{t-2} - \Delta D_{t-1})$	0.012*	0.015***	0.015***
	(0.007)	(0.004)	(0.005)
Financial Supply Shock$_{recession}$	−0.525	−0.379	−0.213
	(0.514)	(0.626)	(0.595)
Developing dummy	−2.112*	−0.687	−0.372
	(0.828)	(0.717)	(0.943)
Credit boom$_{recession}$	2.400***	2.068**	2.069**
	(0.438)	(0.971)	(1.018)
Monetary expansion	0.635*	0.415	0.411
	(0.385)	(0.749)	(0.755)
Constant	−1.730***	−3.053***	−3.000*
	(0.332)	(1.025)	(1.807)
Country Effects	Yes	No	Yes
Observations	117	450	450
Pseudo-Likelihood	-35.2	-60.0	-57.9

Note: Regressions are Probit estimates, values in parenthesis are robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. A recovery is defined as credit-less if the annual growth of domestic bank credit is negative during the first 3 years of recovery. *Real supply shock* is a DV variable taking the value of 1 if during the recession, the correlation between output gap and inflation is negative positive; 0 otherwise. *Financial supply shock* is a DV taking the value of 1 if during the recession, the correlation between the EFP and credit growth is negative; 0 otherwise. *Credit boom* is a DV taking the value of 1 if during the recession the country experienced a credit boom, 0 otherwise. *Monetary expansion* is a DV taking the value of 1 if during the recession the country experienced a monetary expansion, 0 otherwise.

Table 11: Marginal Effects for Changes in Explanatory Variables

Demand-Side	Marginal Effects
GDP growth$_{t-1}$	-0.002*
	(0.001)
Real Demand Shock$_{recession}$	0.026
	(0.028)
Credit flow$_{t-1}$	-0.002**
	(0.001)
Credit impulse$_{t-1}$	0.001**
	(0.000)
Financial Demand Shock $_{recession}$	0.061*
	(0.032)
Developing dummy	-0.008
	(0.030)
Credit boom$_{recession}$	0.077
	(0.047)
Monetary expansion	0.085*
	(0.041)

Supply-Side	Marginal Effects
GDP growth$_{t-1}$	-0.002*
	(0.001)
Real Supply Shock$_{recession}$	0.013
	(0.029)
Credit flow$_{t-1}$	-0.002**
	(0.000)
Credit impulse$_{t-1}$	0.000*
	(0.000)
Financial Supply Shock $_{recession}$	-0.226
	(0.541)
Developing dummy	-0.010
	(0.024)
Credit boom$_{recession}$	0.081**
	(0.036)
Monetary expansion	0.078**
	(0.031)

Note: Marginal effects on Random effects probit estimates, values in parenthesis are standard errors. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Type I and II errors for different values of α

	α=0.3	α=0.4	α=0.5
Demand			
Type I error (%)	11.4	8.4	5.3
Type II error (%)	12.5	16.6	27.0
Success rate (%)	88.2	89.3	88.8
Supply			
Type I error (%)	11.4	7.6	4.5
Type II error (%)	25	29.1	33.3
Success rate (%)	84.9	86.5	87.1