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# The Riskiness of Credit Origins and Downside Risks to Economic Activity

Prepared by Claudio Raddatz, Dulani Seneviratne, Jérôme  
Vandenbussche, Peichu Xie, and Yizhi Xu

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**The Riskiness of Credit Origins and Downside Risks to Economic Activity**

Prepared by Claudio Raddatz, Dulani Seneviratne, Jérôme Vandenbussche, Peichu Xie, and Yizhi Xu \*

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**ABSTRACT:** We construct a country-level indicator capturing the extent to which aggregate bank credit growth originates from banks with a relatively riskier profile, which we label the Riskiness of Credit Origins (RCO). Using bank-level data from 42 countries over more than two decades, we document that RCO variations over time are a feature of the credit cycle. RCO also robustly predicts downside risks to GDP growth even after controlling for aggregate bank credit growth and financial conditions, among other determinants. RCO's explanatory power comes from its relationship with asset quality, investor and banking sector sentiment, as well as future banking sector resilience. Our findings underscore the importance of bank heterogeneity for theories of the credit cycle and financial stability policy.

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WORKING PAPERS

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## Acronyms/Glossary

BLS ..... Bank Lending Standards

CA ..... Current Account

EDF ..... Expected Default Frequency

FCI ..... Financial Conditions Index

GDP ..... Gross Domestic Product

GFC..... Global Financial Crisis

GUO ..... Global Ultimate Owner

IFS .....International Financial Statistics

LLP .....Loan Loss Provisions

OLS.....Ordinary Least Squares

NPL.....Nonperforming Loans

RCA .....Riskiness of Credit Allocation

RCO .....Riskiness of Credit Origins

# I. Introduction

Abundant empirical evidence supports the view that periods of large aggregate credit expansions tend to be followed by adverse macroeconomic outcomes and the occurrence of financial crises (Jorda et al. 2011, Schularick and Taylor 2012, Mian et al. 2018, among others), especially when the credit expansion takes place in an environment of easy financial conditions and buoyant credit sentiment (Krishnamurthy and Muir 2017, López-Salido et al. 2017, Kirti 2021, Adrian et al. 2022, Greenwood et al. 2022). However, existing cross-country empirical studies focus on aggregate measures of the volume and price of credit and leave aside the role that the composition of credit origination and lender heterogeneity may play in aggregate risk-taking and financial stability.

Anecdotal evidence suggests that faster bank-level credit growth during a boom is associated with worse performance during the ensuing bust and that the strength of financial institutions driving the expansion matters for future aggregate outcomes. During the Global Financial Crisis (GFC), several iconic failures were financial intermediaries that had followed a very aggressive expansion strategy. In the United States, Countrywide Financial and Washington Mutual became the first and third largest mortgage originators over a short period before the crisis, lost billions on subprime exposures, and had to be resolved in 2008 (United States Senate, 2010). Spanish savings banks, which were at the epicenter of the Spanish banking crisis a decade ago, had experienced a continuous rise in their loan market share in the run-up to the crisis (Santos, 2018). Anglo-Irish Bank, the only Irish bank nationalized during the Irish banking crisis of 2008–2010, had the fastest pre-crisis credit growth among major Irish banks (Regling and Watson, 2010). Going further back in time, during the credit boom in Finland and Sweden in the early 1990s, the most aggressive lenders were the weakest in capitalization and underlying profitability (Englund and Vihriala, 2010).

Theoretical models of financial amplification and financial crises have long recognized the importance of accounting for heterogeneity across economic agents (Bernanke and Gertler 1989; Kiyotaki and Moore 1997; Brunnermeier and Sanikov 2014)<sup>2</sup>. It is only recently that some macrofinancial models have focused on heterogeneity across financial intermediaries and shown how this heterogeneity matters for the dynamics of aggregate risk-taking and financial stability (Geanakoplos 2010, Korinek and Nowak 2017, Coimbra and Rey 2018 and 2023).

In this paper, we provide novel empirical evidence that the extent to which the growth in aggregate bank lending activity concentrates in riskier banks varies over the credit cycle and, more importantly, that it helps predict downside risks to economic growth.<sup>3</sup> Furthermore, we provide country-level and bank-level analyses to explore the mechanisms underlying our key result.

Specifically, using a large sample of 3071 banks across 42 countries over the 1990–2019 period, we construct an aggregate measure of the extent to which credit is originated by relatively riskier banks (as measured by the within-country, relative z-score), taking inspiration from the approach of Greenwood and Hanson (2013) for

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<sup>2</sup> These models generally impose conditions that lead to the separation of heterogeneous agents in borrowers, lenders, or intermediaries in equilibrium. Most traditional models either assume that each sector is represented by a single agent or that there is perfect risk sharing within a sector, so that heterogeneity within a sector—that is, across borrowers or financial intermediaries—does not matter.

<sup>3</sup> In the paper, we use the expressions “riskier bank” and “weaker bank” interchangeably.

capturing the composition of aggregate debt issuance across heterogeneous borrowers. We present evidence that our measure, which we label the Riskiness of Credit Origins (RCO), rises when aggregate credit growth increases and when financial conditions become looser. In addition, we provide complementary bank-level evidence documenting the underlying mechanism at the micro level. These patterns in the cross-section of bank risk-taking over the credit cycle captured or proxied by RCO are not only of intrinsic interest as a characterization of the cycle, but they also help shed further light on why large credit expansions present a risk for financial stability.

We show that an increase in RCO predicts downside risks to GDP growth, even after controlling for key determinants previously highlighted in the literature, including aggregate credit growth and financial conditions. The magnitude of the effects we document is sizable. A one-standard-deviation increase in RCO shifts the left tail of the average cumulative two-year-ahead GDP growth distribution by about 30 basis point in our baseline specification. Our findings are robust to a battery of robustness tests that include using additional controls (including an aggregate measure of banking sector riskiness), an alternative measure of bank-level riskiness, a restricted sample of banks in the analysis, or an alternative quantile regression estimation method.

Finally, we explore three possible —and somewhat related— channels underlying our key finding. We first examine a credit quality channel. At the micro level, we investigate whether riskier banks lend more to riskier borrowers, leading to a weaker future loan portfolio performance, and how this relationship depends on bank-level relative credit growth. We document that banks that expand credit relatively faster experience a greater increase in loan loss provisions and nonperforming loan ratios later and that this increase is even stronger when the bank is ex-ante riskier (that is, when it has a lower relative z-score). At the macro level, we also analyze whether RCO's explanatory power for downside risks to growth is affected by the inclusion of a variable capturing a riskier allocation of credit (Brandao Marques et al. 2022) in the specification. We find that it does at horizons up to two years.

A second plausible channel is sentiment. In the spirit of López-Salido et al. (2017) who proxy credit sentiment by financial variables that predict future changes in credit spreads, we examine whether RCO predicts future changes in aggregate bank lending standards and financial conditions. We find that it does at horizons up to two years for bank lending standards and financial conditions. Both findings strongly support a sentiment channel.<sup>4</sup>

Finally, RCO could capture a dimension of aggregate banking sector vulnerability related to the distribution of bank-level vulnerabilities. By construction, RCO measures the extent to which banks that are relatively riskier contribute to the expansion of banking sector credit. While the relative nature of the inputs to the measure does not imply a mechanical relationship, we speculate that periods when RCO is elevated, especially if they persist, could result in a larger fraction of an economy's loan portfolio being concentrated in riskier banks. To the extent that riskier banks are more likely to reduce their lending in the future in response to an adverse shock, and that borrowers face frictions when trying to shift lenders, this could result in an aggregate contraction in lending and activity. In support of the existence of this third channel, we find that bank riskiness is a determinant of future bank-level lending activity following large negative shocks. We also find that RCO predicts leftward shifts of the

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<sup>4</sup> Note that although the credit quality and banking sector sentiment channels bear some resemblance, they are conceptually distinct. In the credit quality channel, poor future aggregate performance is due to a deterioration of lending quality by riskier banks. In the banking sector sentiment channel, poor future aggregate performance is could be due a deterioration in lending quality across the board.

extreme left tail of banking sector stock returns, which is also consistent with the presence of a resilience channel.<sup>5</sup>

The rest of the paper is structured as follows. Section II discusses the theoretical underpinnings of the relationship between bank riskiness, risk-taking, and credit cycle, and reviews the relevant theoretical and empirical literatures. Section III introduces our measure of the RCO. Section IV analyzes its co-movement with aggregate changes in bank credit and provides related bank-level evidence. Section V documents RCO's predictive power for future downside risks to growth while Section VI presents our analysis of the three possible channels underlying this relationship. Section VII concludes. Appendices provide additional information on data sources, variables construction, sample construction, and additional robustness analyses.

## II. Theoretical Underpinnings and Further Links to the Literature

The relationship between bank riskiness—the probability that a bank will default on its obligations—and risk-taking is theoretically ambiguous. On the one hand, classic risk-shifting incentives due to limited liability (Jensen and Meckling 1976) naturally generate a positive association between the two.<sup>6</sup> In addition, low bank capitalization reduces the incentives to monitor loan quality because of market imperfections (Holmstrom and Tirole 1997; Allen et al. 2011).<sup>7</sup> Even if bank creditors are aware of these incentives and ask for compensation through a higher cost of bank debt or attempt to exert discipline on managers through greater reliance on runnable demand deposits (Calomiris and Kahn 1991; Diamond and Rajan 2000, 2001), the existence of deposit insurance or implicit government guarantees could limit market discipline or efficiency (Gorton and Huang, 2004; Farhi and Tirole, 2012). On the other hand, the threat of runs may be a strong incentive for banks to avoid risk-shifting behavior (Jacklin and Battacharya, 1988; Diamond and Rajan, 2000; Iyer et al., 2016). The ability of bondholders to impose covenants (Ashcraft, 2008) or regulatory constraints may also limit the ability of banks to take risks (Dewatripont and Tirole 2012).

Regardless of the sign of the relationship between bank riskiness and risk-taking in ordinary bank credit market conditions, riskier banks' incentives for risk-taking are likely relatively greater during buoyant aggregate credit expansions for various reasons. First, theoretical models with rational agents indicate that lending standards are procyclical because of endogenous variation in the profitability of screening or the information on the quality composition of borrowers (Ruckes 2004; Dell'Ariccia and Marquez 2006), or because of loss in institutional memory (Berger and Udell 2004). Since screening benefits are arguably lower for weaker banks because of the

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<sup>5</sup> We also explore whether RCO's predictive power for downside risks to growth is affected by the inclusion of the skewness of the distribution of bank leverage (Coimbra and Rey, 2018) in the specification, and find no consistent evidence that it does. As a by-product, we also find that the leverage skewness measure is not statistically significant in our regression results.

<sup>6</sup> Like other types of firms, banks protected by limited liability have such incentives because of the option value of equity: a bank taking a risk will reap the benefits when the gamble pays off and will leave its creditors holding the bucket when it does not. These incentives are stronger when bank solvency is lower.

<sup>7</sup> Conversely, under limited liability, banks with higher risk appetite choose to be more leveraged and riskier (Coimbra and Rey, 2023).



debt overhang problem (Myers 1977), the relaxation of standards in good times is likely stronger among them. In Coimbra and Rey (2023), lower aggregate funding costs encourage banks with a higher risk appetite to expand their credit provision and leverage relatively more. Second, with boundedly rational agents, the price of risk is too low during the expansionary phase of the credit cycle because of diagnostic expectations (Bordalo et al. 2018) or neglect of crash risk (Baron and Xiong 2017). The resulting easier access to debt financing would facilitate risk-taking by banks with relatively higher incentives to engage in this behavior.

Altogether, these theoretical considerations suggest that the credit cycle should be an important driver of cross-sectional differences in bank risk-taking through loan portfolio growth, which is what our RCO measure captures. Yet this hypothesis has so far remained untested. Coimbra and Rey (2018) construct the within-country skewness of the leverage distribution across banks. Their indicator is an aggregate measure of banking sector riskiness based on a single dimension (bank leverage), while ours captures two dimensions by combining the bank-level riskiness dimension with information on the flow of credit to create an indicator of the RCO at any given point in time.

On the empirical side, our cyclical analysis relates to prior bank-level evidence suggesting an association between bank riskiness and bank risk-taking. Igan and Tamirisa (2008) and Igan and Pinheiro (2011) find that weaker banks grow their loan portfolios more slowly than stronger banks in normal times but grow them at the same pace as other banks during credit booms. Our loan growth regression results echo theirs, but our empirical specification is more parsimonious, and our key macro driver is aggregate credit growth rather than a dummy capturing episodes of credit booms. Our cyclical analysis also relates to the literature on the risk-taking channel of monetary policy, in which various papers have used granular supervisory data to show that looser monetary policy induces banks to take more risk and that this effect depends on bank solvency (Jimenez et al. 2014, Dell’Ariccia et al. 2017). We complement this literature by focusing on a broader sample of countries and on the credit cycle rather than on changes in monetary policy.

The main analysis in our paper relating RCO to downside risks to GDP growth is directly connected to the banking crisis literature (Gourinchas et al. 2001, Obstfeld 2012, Schularick and Taylor 2012, Dell’Ariccia et al. 2016, Jordà et al. 2021, among others) and the growth-at-risk literature (Giglio et al. 2016, Adrian et al. 2019, Adrian et al. 2022) which have investigated the role played by aggregate credit growth, financial conditions, and standard aggregate banking soundness indicators in driving adverse macrofinancial outcomes. We add to these literatures by demonstrating the important role of the origins of bank credit.

Our micro analysis of the asset quality channel builds on several empirical papers that have examined the bank-level relationship between size of loan growth and subdued future performance. These papers have shown that banks whose loan portfolio grows fastest (relative to domestic peers) suffer from a relatively weaker performance within a few years, regardless of whether performance is measured by the non-performing loan ratio (Jimenez and Saurina 2006; Chavan and Gambacorta 2019), loan loss provisions (Foos et al. 2010), stock returns, or return on assets (Fahlenbrach et al. 2018). We complement these studies, all focused on single countries, by examining this relationship in a broad sample of countries and, most importantly, by showing that bank-level riskiness amplifies the effect of relative size of loan portfolio growth in affecting future performance. In addition, in a smaller sample of banks, we document that ex ante credit quality (measured by the share of leveraged loans issuance in total loan issuance) is greater in banks that are riskier and grow their loan book relatively faster. Our discussion of the asset quality channel at the country level relates to the macro

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