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What is the Impact of a Major Unconventional Monetary Policy Intervention?*

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Abstract: How does the credible announcement of an unconventional monetary policy intervention affect bank lending standards during crises? We use a major central bank announcement, the "whatever it takes" speech of the European Central Bank President that boosted the capital of banks, as a natural experiment. We compare changes in lending standards of subsidiaries of euro area versus other banks in a third country, Mexico. The speech reversed a prior trend of euro area banks augmenting their risk-taking via loan growth, lending rates, and credit risk. Our findings show that policies that amount to capitalization can reduce risk-taking in times of stress, adding a new dimension to the bank capital channel.

Keywords: Monetary Economics
JEL Classification: E51, G21, F34

Resumen: ¿Cómo afecta un anuncio creíble de una intervención de política monetaria no convencional a los estándares de crédito bancario durante las crisis? Para contestar esta pregunta, se utilizó un anuncio importante del presidente del Banco Central Europeo, "whatever it takes", que impulsó el capital de los bancos. Se comparan los cambios en los estándares de crédito de las filiales de bancos de la zona del euro con los de otros bancos en México. Se encontró que el discurso revirtió una tendencia previa de los bancos de la zona del euro a aumentar el riesgo al moderar el crecimiento de los préstamos, aumentar las tasas de interés y reducir el riesgo crediticio. Los resultados muestran que políticas que favorecen la capitalización de los bancos pueden reducir la toma de riesgo en tiempos de tensión, lo que añade una nueva dimensión al canal de capital bancario.

Palabras Clave: Economía Monetaria

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1. Introduction

By ensuring the availability of ample liquidity to banks during periods of high stress, a central bank can prevent contagion and improve the financial strength of the banking system. As the economic capital of banks increases, the provision of liquidity can shore up overall financial stability. As such, the lender of last resort is a standard monetary tool. However, liquidity interventions could be risky. If the intervention does not contain the crisis and bank capital continues to deteriorate, the additional liquidity can add to moral hazard, allowing banks to engage even more in risky behavior, fostering zombie lending and gambling for resurrection. This can end up with the central bank and the government bearing large costs (BIS, 2014). A crucial component of these liquidity interventions is credibility. Here the announcement of a policy could have a decisive impact on behaviours. In our context, by promising in a credible manner to intervene if needed, the central bank could halt runs on banks and thereby support bank capital as debt holders have less reason to fear multiple equilibriums (Goldstein and Pauzner, 2005).[1]

The financial strength of banks has long been recognized to matter more generally, not just in crises, for lending and the transmission of monetary policy to the real economy (Peek and Rosengren, 2000; Jimenez, Ongena, Peydro and Saurina, 2012). Better capitalized banks are able to lend *more* for various reasons, including lower funding costs and the ability to better withstand shocks (Berger and Bouwman, 2013).[2] And in the context of a fragile banking system, an increase in capitalization, due to, for instance, a central bank intervention, may reverse risk-shifting, leading to less but safer lending. As shown by Jensen and Meckling (1976), lower-capitalized firms can have greater incentives to take risks at the expense of debt holders, a "risk-shifting" behaviour that was first analyzed for banks by Dewatripont and Tirole (1994). When an undercapitalized bank takes on more risky exposures, shareholders extract value from debt holders

[1] While for simplicity we use the word interventions rather than the lengthier "credible announcement of interventions," the credibility of the announcement is crucial to its effect. There is a long- and well-established literature in monetary economics showing how credibility is essential for central banks, notably to achieve their inflation objectives (Cukierman, 1992).

[2] For a review of empirical bank-specific studies, see Boissay, Cantú, Claessens, and Villegas (2019). And for a review of macro-financial models, see Dou, Lo, Muley and Uhlig (2020).

(Blattner, Farinha and Rebelo, 2023).[3] Conversely, a large increase in bank capital could reduce this risk-shifting, resulting in less lending overall but relatively more lending to safer borrowers.

The above trade-offs make it crucial to assess the impact of large central bank interventions on bank lending and risk. This assessment poses a series of challenges. First, it requires an unexpected and large-scale intervention. Second, it needs to disentangle the effects of "demand" (what happens to the borrowers) from those of "supply" (what happens to the banks) factors. Third, it would need to address the endogeneity inherent to the large intervention being a response to changing economic conditions and then affecting these conditions.

To overcome these difficulties, we exploit a unique combination of events, data and methods. First, we resort to one of the largest central bank interventions ever undertaken, making the action sufficiently important to have a material and long-lasting impact, European Central Bank (ECB) President Mario Draghi's July 2012 "whatever it takes" (WIT) speech.[4] The WIT speech dramatically changed the markets' perception of the capitalization of the banks going forward. Second, we avoid confounding effects by studying lending conditions in Mexico, as the country provides an appropriate setting with enough presence of both euro area banks and stable local banks.[5] Third, we exploit very granular data on all lending relationships between banks and individual borrowers, which allows us to control for all other factors and cleanly measure the effects of the WIT on borrowers.

Our setup allows us to test two main hypotheses.[6] First, a "moral hazard" hypothesis, whereby WIT led euro area banks to take on more risk and lend more to riskier borrowers. Second, a "risk containment" hypothesis, whereby euro area banks' recapitalization was associated with them lending less to risky borrowers.

Our results lend support to the risk containment hypothesis. We show that prior to the WIT euro area banks have been augmenting their overall lending and pricing their

[3] The rationale is that the value of equity holders' claims increases with leverage and volatility.
[4] The WIT speech was delivered in London, on July 26, 2012.
[5] Bank of Mexico (2012).
[6] On the robustness section we also analyze a third possible hypothesis which could be consistent with some of our findings.

loans more aggressively compared to other banks operating in Mexico. We find that WIT led to a sharp turnaround in lending standards of euro area banks: Following the WIT euro area banks decreased their lending volume growth to firms (relative to other banks) by around 1.5 % points per month (i.e., a 10% decrease over 6 months), and raised their lending rates by about 30 basis points (relative to other banks). To gauge the economic magnitude of the effect, absent WIT the additional lending by euro area banks amounted during our treatment period to almost 1% of the 2012 Mexican GDP.

A key additional dimension lending support to the "risk containment" hypothesis is the change in banks' risk-taking after the WIT. To assess this change, we analyze the evolution in the composition of borrowers based on their risk score. We first show that in the run up to the WIT, euro area banks were more likely to grant riskier loans than non-euro area banks were. Yet, following the WIT, we document a shift by euro area banks towards safer firms as they lend less to the riskier borrowers. In short, the WIT led to more cautious lending by euro area banks.

In this way, we shed light on how a major unconventional monetary policy action can, by increasing the economic capital of banks, restore prudent behavior and reduce risk-taking, also in their foreign subsidiaries. Of note, our results also apply to the subsample of small firms and those in the service industry, which is important because these firms tend to operate locally, suggesting that our results are not driven by real economic shocks spilling over from the euro area to Mexico. Finally, euro area banks' behavior in their home country was consistent with that in Mexico. Our findings are confirmed by several robustness tests, including various forms of winsorizing, changes in time windows, alternative groupings of the control sample and placebo tests.

The remainder of the paper is organized as follows. Section 2 discusses the contribution to the literature, Section 3 describes the institutional setting in Mexico, the dataset, and the main hypotheses. Section 4 presents the buildup period and the empirical design. Section 5 provides the main empirical findings. Section 6 presents additional test, robustness results and alternative explanations. Section 7 offers concluding remarks.

2. Contribution to the literature

The key contribution of our work is that we can derive robust implications about the effects of specific unconventional monetary policy intervention using a setup with a clean identification that avoids other factors contemporaneously affecting banks and borrowers. Our results, that WIT dampened the risk-shifting incentives of lower-capitalized banks by increasing their soundness, add to the theoretical evidence on the role of bank capital in ameliorating risk-shifting incentives.[7] Our analysis provides a new perspective to the topic, illustrating how unconventional monetary policy can increase the financial strength of banks and help reverse risk-shifting incentives.[8] If credible and large enough, such intervention can boost bank financial strength by reducing uncertainty and increasing the value of assets held by banks. They can then reduce risk-shifting and benefit the economy at large (Karadi and Nakov, 2021; Martinez-Miera and Suarez, 2012).

Our work also relates to the literature on the lender of last resort policies of central banks. Historically, one major reason for the emergence of central banks has been the need for liquidity support during periods of stress (Thornton, 1802; Bindseil, 2019). By providing liquidity, or standing ready to do so, a central bank can stem a run on an individual bank and prevent its unnecessary failure (Diamond and Dybvig, 1983). Ensuring the availability of ample liquidity to the banking system can avoid contagion during periods of stress and increase a banking system's overall stability (Allen and Gale, 2000; Freixas, Parigi and Rochet, 2000). In addition, such support can provide the time needed to arrange an orderly resolution of troubled banks (CGFS, 2017). However, as noted for a long time, liquidity provision can mean unintended consequences, including moral hazard (Bagehot, 1873). As such, support involves trade-offs.

These theories about the effects of central bank liquidity injections are put to the test during financial crises. During the global and euro area crises, and again recently in the pandemic, major central banks undertook unprecedented large-scale interventions to restore financial stability, reestablish intermediation, and support the transmission of

[7] In this context bank capital refers to its economic (i.e., its stream of future risk-adjusted net profits) rather than to its regulatory or accounting dimensions (see Dell'Ariccia, Laeven and Suarez, 2017; Dell'Ariccia, Laeven and Marquez, 2014).

[8] From a global game perspective WIT can be seen as solving a multiple equilibrium problem reducing the likelihood of runs on banks and thereby supporting financial stability (see Goldstein and Pauzner, 2005; Corsetti, Guimarães and Roubini, 2006).

monetary policy. Actions involved unconventional measures, such as the easing of refinancing operations and outright asset purchases of government and private securities. These interventions helped stabilize financial systems and restart the real economy (see e.g., Financial Crisis Inquiry Report, 2011; Goodhart, 2014; Altavilla, Barbiero, Boucinha and Burlon, 2023). At the same time, the interventions came with distortions (BIS, 2014; Acharya and Steffen, 2015; Drechsler, Drechsel, Marques-Ibanez and Schnabl, 2016; Rajan, 2017).

Evidence on the trade-offs involved in systemic interventions is still limited due to the empirical challenges, mentioned earlier, in quantifying their effects on banks' behavior. Many studies use aggregate data, and their conclusions remain largely qualitative. A few recent exceptions use more detailed data from national credit registries. Some of these studies show that central bank liquidity injections are effective in restoring bank credit supply, particularly for financially constrained banks (Carpinelli and Crosignani, 2021; Andrade, Cahn, Fraisse and Mésonnier, 2018; Alves, Bonfim, and Soares, 2021). Other studies show some unintended consequences of large operations (for the United States, see for instance Acharya, Fleming, Hrung and Sarkar, 2017; and for the euro area, see for instance Drechsler et al., 2016), with weaker banks (those with higher leverage) more likely to borrow aggressively and in larger amounts from the central bank, suggesting risk-shifting. Closely related to our work is Acharya, Eisert, Eufinger, and Hirsch (2019). Using euro area syndicated loan market data, they find that WIT contributed to lending to unprofitable ("zombie") firms at the expense of viable borrowers, indicating unintended side effects. These micro-based studies highlight the two challenges mentioned above of analyzing the impact of large liquidity interventions. First, that interventions typically happen amid many confounding factors, which makes analysis more difficult, especially when trying to isolate effects within the same economic region as the intervention. Second, most studies must resort to public data which generally means having to rely on a very small sample that makes tests difficult. Our study tackles both issues.

The international setting in our paper also relates it to the literature on international banking. That literature shows that global banks transmit liquidity shocks as well as monetary policy and actions internationally (Cetorelli and Goldberg, 2011; Morais, Peydro and Ruiz Ortega, 2019; Buch, Bussière, Goldberg and Hills, 2019;

Correa, Du and Liao, 2025; Correa, Paligorova, Sapriza and Zlate, 2020). Yet, a major difference with our work is that these papers tend to focus and analyze the international component of banks, and in particular their cross-border activities. In contrast, our analysis uses an international setting for identification purposes but does not study cross-border banking activities themselves.

3. Setting, data and hypotheses

In this section, we review the key macroeconomic developments and institutional features of the Mexican banking system around the time of WIT that are relevant for our study, we describe the data, and we develop the hypotheses.

3.1. Setting

The above review makes clear that assessing the impact of unconventional monetary policy measures on the lending standards of banks poses a series of challenges. Foremost, the analysis requires an unexpected and large-scale intervention in order to observe a meaningful impact. Such interventions tend not only to be rare, but they typically occur under exceptional circumstances. This raises many empirical issues, the major ones being endogeneity and omitted variables, i.e., what caused the intervention in the first place and what other factors were at play. Adverse financial conditions and a poor macroeconomic outlook can, for example, trigger the intervention which can both be caused by banks having risky loans and lead to more risky loans. Addressing this endogeneity involves disentangling the effects of demand factors, i.e., the need for funds and the quality and riskiness of borrowers, from those of supply factors, including the capitalization and liquidity positions of banks. A related important and very common constraint is the access to granular data to identify the precise channel through which interventions affect the behavior of banks. Very detailed data about the conditions of banks and their matched borrowers are needed to help identify causal effects, but these data are often unavailable or confidential.

To overcome these difficulties, we exploit a unique combination of events, data and methods. First, we use the July 2012 “whatever it takes” (WIT) speech which was an unconventional monetary policy response to a severe deterioration in financial and

economic conditions in the euro area. As the euro area faced a sovereign debt crisis and a deep recession, banking institutions and sovereign yields came under unprecedented stress, especially in peripheral countries. The speech was an announcement of a credible commitment to intervene to relieve this stress. Specifically, through WIT, the ECB promised to provide enough support to financial institutions, markets, and countries to "save the euro". This made it the largest central bank interventions ever undertaken, and sufficiently important to have a material and long-lasting impact. Apart from its large scale, the announcement was unexpected, meaning that investors, banks, and borrowers including sovereigns, could not have adjusted their actions in advance. The WIT speech dramatically changed the markets' perception of the capitalization of the banks going forward so banks saw their stock prices increase sharply and funding costs for countries and banks in the euro area periphery narrowed abruptly (Figures 1 to 3).[9]

Second, as WIT responded to adverse financial and macroeconomic developments that influenced both the supply and demand for credit in the euro area, we avoid such confounding concerns by studying lending conditions in Mexico, which is a good "laboratory setup" to analyze a large central bank intervention on lending conditions. A relevant advantage is that Mexico has an important presence of euro area as well as other foreign and domestic banks, which helps us to isolate the impact of the foreign shock—the WIT announcement—through banks. In Mexico, foreign banks held more than 70% of total banking assets (Table 1). Of the foreign banks, two were from Spain, representing around one third of the Mexican banking assets, and the rest were from countries outside the euro area. In terms of credit to non-financial corporations, large domestic and foreign banks lent to this sector in similar proportions relative to their total balance sheets which helps to reduce any biases related to lending specialization, and to ensure comparability across banks.[10]

While WIT did have a strong effect on the capitalization of the euro area banks, Mexico's economy and banking system were to a large extent unaffected by the crisis in Europe other than through the euro area banks operating in Mexico. During the period

[9] While WIT led to large, significant, and long-lasting effects in financial markets (particularly in the euro area periphery), other euro area regulatory and macroeconomic events elicited much weaker responses (Krishnamurthy, Nagel and Vissing-Jorgensen, 2018; Fiordelisi and Ricci, 2016; Szczerbowicz, 2015).

[10] In contrast, banks vary significantly in their presence in mortgage and consumer lending, with foreign banks much more focused on these markets.

around WIT, Mexico's business cycle was weakly connected to that of the euro area, and in particular that of Spain, the headquarter country of the two euro area banks with major subsidiaries in Mexico. For instance, in 2012 the Mexican economy was growing at 3.6% annually while the Spanish economy experienced a negative growth of -3% during that period.[11] At the same time, while there was stress in the European banking system, the Mexican banking system was stable and its central bank did not conduct any major interventions (Bank of Mexico, 2012).

With the various foreign and domestic banks differentially exposed to shocks, we can identify the effects of WIT by comparing the behavior of euro area banks to all other banks or domestic banks only. Therefore, our identification—akin to that of Peek and Rosengren (1997, 2005)—avoids other factors contaminating the analysis.

Third, another benefit of Mexico is that we can exploit very granular data that allow us to use robust econometric techniques. Mexican authorities collect detailed information on the lending relationships between banks and individual borrowers so that we can control for all other factors and cleanly measure the effects of any shock on *individual* borrowers. Specifically, we use the Mexican Central Credit Bureau, which stores comprehensive and detailed data on the universe of bank loans. We then build on the methodology of Khwaja and Mian (2008) to isolate supply shocks by studying the differences in lending conditions to the same borrower between WIT-affected (euro area) and non-WIT-affected (non-euro area) banks before and after WIT. That is, by using multibank firms borrowing from more than one bank including *at least* one bank from the euro area *and* another from outside it, we can identify the impact of WIT on lending conditions in terms of prices, quantities, and risk ratings, controlling for any other shocks, including changes in borrowers' loan demand and riskiness. In additional tests, we study the lending to all firms, including single-bank firms, i.e., those borrowing from one bank only.

[11] In terms of direct economic exposures, Mexico's main trade partner is the United States. It accounted for around 80% of Mexican exports in 2012 while the euro area and Spain totaled 4.9% and 1.1% of Mexican exports, respectively.

3.2. Data

We combine several datasets. The main one consists of loan-level information on credit granted by banks operating in Mexico to Mexican corporate borrowers from July 2009 to December 2014. This database, managed by the banking supervisor in Mexico (Comisión Nacional Bancaria y de Valores, CNBV), is available monthly. We rely on the so-called Form R04-C, which all banks operating in Mexico are legally required to file and contains detailed information on loans granted (CNBV, 2017). Unlike many other national credit registries, the Mexican data base provides extensive information on lending rates.[12] In terms of credit quality, we know whether a loan is non-performing and its so-called "qualification" (i.e., credit risk rating). Table 2 includes a general description of the main variables used in this study.

The database covers loans to non-financial firms using a very low cut-off of 5,000 Mexican pesos (about 373 US dollars at the time), thus including more than 99% of loans outstanding. The database also includes firm-specific information such as location (state and municipality), main sector of activity, age, gross income, and a number of financial variables.

Our main dependent variables are the outstanding balance of each firm's credit with a given bank at the end of each period, the loan interest rate and the riskiness of the loan. If a firm has more than one outstanding loan with a bank, the interest rate is calculated as the weighted average using the outstanding loan amounts as weights. This loan-level information is matched with another database containing the financial statements of the banks. For comparability purposes, we restrict our sample to commercial banks, omitting other institutions such as development banks and insurance companies. We focus on the largest banks (which represent almost 80% of the Mexican banking assets in the 2011-2013 period) to ensure a significant overlap of borrowers across banks, both geographical and sectoral.

Table 3 shows the distribution of amounts outstanding by types of loan for the largest banks operating in Mexico. We include in our analysis the so-called "single disposition", which account for about 55%, as well as "straight" and "contingent" loans.

[12] Including, inter alia, the reference rate, the spread over the reference rate, and the frequency of repricing.

Lending rates are largely similar across loan types, except for syndicated loans, which are much larger and often denominated in US dollars. As our identification partly relies on the cross section of banking shocks, we omit syndicated loans from our sample, since they are not solely provided by a single bank, as well as revolving or multiple non-revolving loans, as they both allow the borrower to access to multiple loans on pre-arranged conditions.

We obtain data on banks credit default swap (CDS) spreads and equity prices from Datastream. Section 4 also employs comprehensive information on liquidity borrowing from the central by euro area banks, as well as security-by-security data on government bond holdings obtained from the ECB, and data on loans to real estate developers, obtained from the Bank of Spain.

3.3. Hypotheses

First, we consider a "moral hazard" hypothesis. Banks can use the greater provision of liquidity by central banks to lend *even more* to insolvent borrowers or take on new risks. This would imply that, as Draghi's WIT speech meant banks could expect additional liquidity, it would allow them to increase lending and at (more) favorable conditions, including possibly to insolvent and risky firms. According to this moral hazard hypothesis, WIT encouraged banks, especially those with low economic capital, to take on even more risks by lending more and at lower spreads to riskier borrowers.

Second, we consider a "risk containment" hypothesis, which goes the other way. It poses that during periods of systemic stress, a large and credible enough unconventional monetary policy could increase the franchise value and economic capital of banks. This implicit recapitalization would in turn reduce banks' incentives to engage in excessive risk-taking and bring the underlying risk-shifting incentives in lending back to the "normal" relationship between bank capital and risk-return. According to this risk containment hypothesis, as WIT led to a sharp increase in euro banks' economic capitalization, it curtailed banks' underlying risk-shifting incentives across the various

parts of their organizations, including Mexican subsidiaries, and led to lower volume and less-risky lending.[13]

Third, we consider a "lending expansion" hypothesis in the robustness test section, whereby WIT boosted the economic prospects of euro area banks, enhancing their economic capital and supporting more lending. In our setting, this hypothesis would also imply a positive correlation between economic bank capital and lending in Mexico. But it would not involve a correction of the risk-taking behavior seen before WIT. Broadly, the lending expansion implications would be, in line with the main tenet of the bank capital channel literature, that better capitalized banks lend more along a normal risk-return trade-off.

4. The build-up period and empirical design

An important consideration of our setting is that we assess whether a monetary intervention could reverse an underlying trend as a response to already shocked economic conditions. This is different to the more common setting of the literature that analyzes the effects of sudden shock on a stable system (see Section 2). In that sense, our approach, akin to Peek and Rosengren (1997), starts by documenting a prolonged banking crisis in which undercapitalized foreign banks lend to riskier borrowers in host countries. In our setting, the European banking crisis shaped banks' incentives in the years running up to the intervention. During the crisis, euro area banks suffered large losses, particularly in peripheral countries, but even weakly capitalized banks could at the time obtain central bank liquidity and use the proceeds to engage in excessively risky behavior. Before introducing our main setting, we assess whether in the years preceding the WIT there was more risk-taking by euro area banks in Mexico compared to domestic institutions, and we show how the financial tensions that occurred during the European crisis corresponding to the run-up period to the WIT were reflected in financial asset market prices and whether the WIT was sufficiently large to alter financial market dynamics.

[13] By providing liquidity and at the same time temporarily curtailing excessive risk-taking, WIT and other unconventional interventions would give banks the time and incentives to restructure their balance sheets and raise new capital.

4.1. The build-up period

In the quarters before the WIT announcement, Mexican, and US sovereign yields were largely stable while yields from peripheral euro area countries increased markedly, as shown for the case of Spain (shaded area in Figure 1). Following WIT, yields on Spanish bonds declined substantially as the intervention lowered concerns about credit risk which also reduced the CDS spreads of euro area banks (see Figure 2). In short, WIT was sufficiently large to alter financial market dynamics in the euro area, switching from a period of extreme financial strain towards a more stable and positive outlook.

Figure 3 shows the monthly evolution of stock prices of the two largest euro area banks operating in Mexico. The figure starkly illustrates a downward trajectory for the valuation of euro area banks and how the WIT announcement was a turning point that led stock prices to improve their valuation. One reason for these improvements was the rise in prices of sovereign bonds from of periphery countries as many of these bonds were held on these banks' balance sheets (Figure 4).

Simple comparisons of aggregate lending by euro area and other banks operating in Mexico show significant differences. Figure 5 presents the logarithmic differences in average lending between euro and non-euro area banks for the period of study. These data suggest a more aggressive lending stance in Mexico by euro area banks before the WIT compared to other banks. This behavior is consistent with evidence supporting risk-shifting behavior by euro area banks *prior* to WIT aided by unconventional monetary policies (Drechsler et al., 2016; Acharya and Steffen, 2015; Fecht, Nyborg, Rocholl and Woschitz, 2016). As shown in Figure 5, after WIT, this more expansive lending stance by euro area banks saw a strong reversal, again providing preliminary evidence of the WIT's impact on banks' behavior.

To delve deeper into composition effects on the aggregate difference shown in Figure 5, we also test whether euro area banks targeted riskier loans in Mexico (in the run-up to the WIT). To measure borrower risk, we use a categorical variable that ranges from 1 to 9, where 9 corresponds to the riskiest borrowers. In very intuitive terms, this variable is constructed to be the equivalent of rating scores for firms as calculated by major rating agencies (see Table A.1 in the appendix). This risk variable is managed by

the banking supervisor in Mexico (the Comisión Nacional Bancaria y de Valores, CNBV), and is available monthly.[14] It uses a credit scoring econometric model constructed for the purpose of assessing banks' credit risk from their exposure to individual borrowers and aims to provide a standardized proxy for credit risk across banks and industries. It considers (whenever available) firms' accounting information as well as other loan and borrowers' information such as collateral, guarantees, derivatives exposures, previous incidents of arrears, industry, products and operational risk (the latter includes financing of illegal economic activity or the informal economy).

Using this measure, we consider a panel regression specification for the period before the WIT, with its most basic specification defined as follows:

$$Credit_Score_{ijt} = \beta_0 + \beta_1 treatedbank_j \times pre + bank_j + period_t + location_l + firm_i + firm_i \times period + \varepsilon_{ijt} \quad (1)$$

Where *Credit_Score*$_{ijt}$ is the risk score attributed to firm *i*, by bank *j* at time *t*; *treatedbank*$_j$ is a dummy variable that equals 1 if the bank is "treated" (1 for euro area banks, and 0 otherwise); *pre* is a dummy variable that equals 1 in the 5 months before the WIT announcement (in the base case, February to June 2012); Period, location, and industry fixed effects are again added sequentially to the base estimation. Additional specifications include also $bank_j$, $period_t$, $location_k$, $firm_i$, and $firm_i \times period$ fixed effects to account for bank specific, time, location, firm and firm location conditions.[15] We are primarily interested in the coefficient β_1, which captures the (differential) effect of euro area banks on risk composition.

We first estimate a linear model in which bank, firm, period, location, and firm*time fixed effects are progressively incorporated to account for demand effects (see Table 4, also Section 4.2 below). A big limitation is that the ordinal dependent variable (i.e., credit scores) would suggest using an ordered probit model. However, this approach would not allow us to include firm fixed effects. For this reason, we deploy a Bucologit,

[14] More detailed information is under the "Reglas para la Calificación de la Cartera Crediticia de las Sociedades Nacionales de Crédito, de la Ley de Instituciones de Crédito" Diario Oficial de la Federación 24 October 2000.
[15] As in the estimation of Equation 1, if a firm does not change location during the period of study, the effect of different domestic conditions is absorbed by the firm fixed effect. However, we did include the location fixed effect because some firms did change location during the period of study.

an alternative non-linear model (Baetschmann, Staub and Winkelmann, 2015) to estimate this equation.[16]

Table 4 shows the results for multibank firms (i.e., firms borrowing already from a euro area and at least a non-euro area bank). Our main independent variable, $euro* pre$, is always positive and strongly statistically significant.[17] This suggests that during the period leading up to WIT the risk of credit granted by euro banks was higher relative to the other banks operating in Mexico. Our results are robust, as shown by the similar marginal effects of the linear and Bucologit models. Overall, these results suggest that during the buildup period to the WIT, euro area banks ramped up their risk taking and were more likely to lend to a riskier pool of borrowers than other banks.

4.2. Empirical design

Having analyzed the pre-WIT period, to accurately identify the effects of the WIT loan supply shock, we build on the estimation technique of Khwaja and Mian (2008). This involves constructing a sample of only those borrowers with multiple lending relationships, and within that sample, to further restrict the analysis to those with at least one euro area bank and at least one non-euro bank as lender.[18] We apply this methodology using a panel structure as follows:

$$\%\Delta loan_{(ijt)} = \beta_0 + \beta_1 treatedbank_j \times treatmentperiod_t + bank_j + location_k + post \times firm_i + firm_i \times period_t + \varepsilon_{(ijt)} \quad (2)$$

Where $\%\Delta loan_{ijt}$ is the monthly % change in credit to nonfinancial firm *i* by bank *j* at time *t*; $treatedbank_j$ is a dummy variable that equals 1 if the bank is "treated" (1 for euro area banks, and 0 otherwise); $treatmentperiod_t$ is a dummy variable that equals 1 after the WIT announcement (in the base case, August to December 2012); $bank_j$ is a bank fixed effect; and $location_k$ is the geographic location of the firm measured by

[16] The model is implemented using the approach of Dickerson, Hole and Munford (2014). The Bucologit (BUC) estimator is a consistent and unbiased estimator of the Fixed Effects Ordered Logit Model essentially and involves estimating the model using all possible cut-offs (K-1) simultaneously, where K is the number of alternatives. In practice, this is done by duplicating each individual K-1 times, with each time a different cut-off considered to collapse the dependent variable. Estimates are then obtained from a standard conditional logit approach using the entire sample.
[17] Regressions that include all firms show similar results; these are available upon request.
[18] This identification has been subsequently used among others by Jimenez et al. (2012), Albertazzi and Bottero (2014), Cetorelli and Goldberg (2011), and Schnabl (2012). Note that, for identification, since time and firm fixed effects are employed, a firm would need to borrow from at least one treated bank and at least one non-treated bank.

administrative districts.[19] Crucially, the $firm_i \times period_t$ dummy controls for loan demand for *each* firm *i* in *each* month *t*. We are primarily interested in the coefficient β_1, which captures the (differential) effect of WIT on lending by the affected euro area banks.

Our base period of study runs from February to December 2012. Since Draghi made his speech in late July, we exclude July from the sample. Hence, the pre-WIT period runs from February to June 2012, while the treatment spans the period from August to December 2012. Thus, the treatment period covers five months after the event, a period during which banks had sufficient time to change their lending conditions. In our base specification, the non-euro area banks are the non-treated group banks.

5. Results

Results for the impact of WIT on bank lending to multibank firms are presented in Table 5, where again "*euro*" applies to euro area banks, and the variable "*post*" refers to the period following the WIT speech. Column (1) shows the specification without any fixed effects, (2) adds location to consider domestic economic conditions, (3) has fixed effects accounting for firm characteristics, (4) adds firm*treatment fixed effects, (5) includes bank fixed effects (instead of a euro bank dummy variable). Finally, Column (6) shows our preferred estimation with firm*period fixed effects to better account for loan demand.

The negative and statistically significant coefficient for the *euro area*post* variable across all specifications shows that, compared to other institutions, euro area banks altered their trend of credit expansion and decreased their lending following WIT. In terms of magnitude, the reduction in the monthly growth rate from 1.4 to 1.6 % points is large; the average for all banks during the period of study was 1.95%. Our estimations imply that, absent WIT, lending by euro area banks would have grown by 15% more over these 6 months. Given the market share of euro area banks in Mexico, this implies a cut in overall credit growth in Mexico by some 10%.

Since our findings remain robust to the inclusion of various sets of fixed effects, we can be assured that they are not due to demand and other shocks affecting firms

[19] As in the estimation of Equation (1), if a firm does not change location during the period of study, the effect of different domestic conditions is absorbed by the firm fixed effect. Hence, we do not combine, location and firm fixed effects.

differently. These findings provide first evidence that WIT substantially reduced incentives for euro area banks to continue engaging in aggressive lending.

5.1. Lending rates

The lending rate is a crucial variable in understanding changes in credit conditions and fortunately, Mexico's credit registry is one of the few providing comprehensive information on lending rates to borrowers. Hence, we run a set of regressions on the interest rates charged using a similar regression specification as for the volume of loans. Table 6 documents that euro area banks adjusted their lending rates upwards following WIT, as indicated by the *euro*post* dummy interaction. Results show a relative increase in lending rates be euro area banks ranging from 22 to 32 basis points.

A very relevant result from Tables 5 and 6 is that the results barely change in terms of magnitude or statistical significance when firm*period fixed effects are included (Column 6) to account for loan demand, following Khwaja and Mian. The estimated coefficient of the Euro*Post regressor is basically the same, which suggests that there is no bias in results of Columns (1) to (5) due to demand factors, and that the WIT shock was indeed uncorrelated with drivers of credit demand in Mexico.

5.2. All firms: credit and rates

The analysis so far focuses on the intensive margin, as it includes existing borrowing relationships from both treated and non-treated banks.[20] This leaves out a considerable fraction of borrowers such as firms already borrowing only from one bank only, or any new borrowers. This exclusion of other borrowers could alter our results: For instance, there are economic reasons for which a bank may change lending conditions only to firms that borrow exclusively from them.[21] To account for this possibility, we next consider changes in credit conditions to *all* firms using an estimation similar to Equation 2 that

[20] Firms that borrow from, at least, one euro area bank and at least one non euro area bank.
[21] See Degryse and Ongena (2015), Cerqueiro, Degryse and Ongena (2011), and Jakovljevi, Degryse, and Ongena (2015). For instance, as switching costs are higher for single-bank firms, hold-up costs can arise so one could expect banks to find it easier to adjust their lending rates for such borrowers.

uses firm fixed effects to account for firm-specific characteristics.[22] The results are reported in Tables 7 (lending volumes) and 8 (interest rates).

Table 7 shows that, after the WIT, the monthly loan growth of euro area banks declined by about 1.5 % points relative to other banks. Table 8 shows that, for all firms, euro area banks increased their lending rates between 16 and 30 basis points relative to other banks. These results are consistent with our previous analysis for multibank firms and suggest a significant tightening also for single-bank firms and new borrowers.

5.3. Credit risk

A key aspect of the risk-shifting hypothesis involves a change in the composition of credit towards riskier lending. The decline in credit growth and increase in lending rates following WIT are consistent with less risk-taking after the announcement, but do not speak directly as to whether banks are lending to riskier or safer borrowers. That is, it does not tell us about the composition of credit. To assess a change in the composition of credit, we analyze the changes in the risk profile of borrowers of euro area banks relative to other banks. As a measure of the risk profile, we use the same credit risk score variable used in Equation 1, i.e., a categorical variable that ranges from 1 to 9, where a higher score indicates higher risk.

To capture the impact of WIT on the riskiness of granted loans, we adopt a similar specification as we did for lending growth but now include the variable *High Risk* as an additional interaction. The objective is to assess if lending is directed to riskier borrowers after the WIT. We use the sample for all firms, limited to those firms for which there is information on the credit score variable over time.

Table 9 presents the results and shows that after WIT there was a relative decline in lending concentrated on the riskier firms. In further estimations available upon request, we confirm the consistency of this finding for the risk of new lending relationships only.

[22] Often, data limitations do not allow for adding *borrower*time* fixed effects and the literature resorts to pooling of firms to account for common shocks (see for instance Degryse, Laeven and Ongena, 2009; Popov and Udell, 2012; De Haas and Van Horen, 2013).

5.4. WIT and local firms

We have argued that the Mexican real economy is relatively isolated from Spain, where the headquarters of the two euro area banks are located. However, as there is still meaningful trade between Mexico and Spain, the euro area economic turmoil could have had some impact on Mexican firms and their demand for credit. Such links could confound our results. If firms that had a relationship with a euro area bank were also more likely to be commercially connected to the euro area, then the economic slowdown in 2012 would directly and significantly hurt their activity and bias our results.

To address this concern, we conduct additional tests that use the industry and size variation among borrowers as an alternative to within-borrower-cross-bank variation. Specifically, we hypothesize that smaller firms and those in the service industry in Mexico are far less likely to trade, including with the euro area. As a result, these firms would be far less directly affected by the economic developments in the euro area, but they would still be affected by their banks' conditions. As such, lending to these firms provides another good control group to analyze how banks are impacted by the speech.

In Tables 10 and 11 we present the results of the impact of WIT on credit to all firms for three different subsamples of firms: small firms (less than 20 workers), service sector, and both criteria combined.[23] As reference, we also include the earlier results for the full sample (Table 7, Column 5). The results hold and corroborate our main findings. Tables 10 and 11 shows that the main result also holds for firms in the service sector, small firms, and the intersection of the two, i.e., small firms in the service sector. Results for multibank firms are similarly consistent.[24]

6. Additional tests, robustness, and alternative explanations

In this last section we first elaborate further on our econometric setting and then conduct several robustness tests: alternative groupings of treated and control banks, different time

[23] This specification includes fixed effects accounting for firm-specific characteristics, firm*treatment fixed effects, and bank fixed effects.
[24] Not reported but available upon request.

windows, a placebo test, and tests for other confounding factors. For regressions, we use our most stringent specification of Equation 2 with *firm*time* fixed effects.

6.1. Econometric setting: reversing trends

The identifying assumption underlying differences-in-differences models (DD) is that the changes in the control group outcomes serve as valid proxy for any change in the treatment group outcomes not caused by the treatment. We graphically compare the evolution of the relevant variable for treated and control groups, as shown in Figure 5, and then conduct statistical tests, discussed below.

In our setting, as indicated in Section 4, our aim is to tests for differences in trends of growth rates. For this reason, we follow Jacobson, et.al. (1993) and McCrary (2007), to adopt a more flexible approach than a traditional DD specification, so instead of estimating one dummy representing the complete post treatment period, we estimate T $\boldsymbol{\delta}_t$ coefficients, where T is the total number of periods in the sample. If $\boldsymbol{\delta}_t$ is not statistically different from 0, loan growth rates for the treated banks (euro area) in that period are similar to those of the non-treated banks (rest), which is evidence of parallel trends:

$$\%\Delta\, loan_{ijt} = \beta_0 + \sum_{\boldsymbol{t}} \boldsymbol{\delta}_t treatedbank * period_t + bank_j + firm_i + period_t + \varepsilon_{ijt} \quad (3)$$

Where $\%\Delta loan_{ijt}$ is the monthly % change in credit to nonfinancial firm i by bank j at time t; $treatedbank_j$ is a dummy variable that equals 1 if the bank is "treated" (1 for euro area banks, and 0 otherwise); $bank_j$ is a bank fixed effect (to account for bank-specific characteristics); and $firm_i$ is a firm fixed effect.

We run regression (3) for the period running from August 2011 to 2014. All the δ_t coefficients with their respective confidence intervals are shown in Figure 6, which shows that in the period leading up to WIT, credit granted by euro area banks during the year before the WIT was growing consistently (at about 16 % points) more than credit by other banks in Mexico. After WIT, there is a distinct change in the coefficients: the gap in the growth rate of euro area banks and that of other banks in Mexico declines markedly and eventually becomes no longer statistically different from zero. The differential in credit growth in the period leading up to WIT followed by a sharp change after WIT,

where the growth rates no longer differed between the two types of banks supports our identification strategy in differences in growth trend. This suggests that the situation of euro area banks before WIT was very different from that of the other banks, which we further document in the "The Build-Up Period" section (see Section 4.1), and following WIT the euro area banks altered dramatically their credit behavior and converged to that of other banks.

6.2. Alternative control groups

We have compared euro area (treated group) to all other banks (control), with the latter including both non-euro area foreign banks operating in Mexico and Mexican domestic banks. However, as the non-euro area foreign banks group includes global institutions that might be indirectly affected by WIT, it could be argued that the optimal control group should just include Mexican domestic banks. We therefore replicate our baseline regression, with two additional control groups: non-euro area foreign banks and Mexican domestic banks. We run these tests with the most stringent specification of Equation (2).[25]

Table 12 shows the main coefficients of interest (*treatment*period*) for the different combinations of the control groups. Panels A and B report the results for loan amounts and interest rates, respectively. For comparison, the first column in Table 12 (Non-euro) provides the regression results for all firms on loan growth and lending rates (Tables 5 and 6, Column 6). The second column (Mexican) shows that, after WIT, euro area banks lent substantially less and at considerably higher rates to the same borrower than Mexican domestic banks did, as the statistically significant coefficients of -1.4 and 0.2 show, respectively. The results of the effect of WIT when including non-euro area banks as the control (non-euro) are consistent with our previous findings. In the case of the control group that includes only non-euro foreign banks operating in Mexico (non-euro foreign), the last column of panel A, the coefficient of -1.6 is even larger than with the full control group, -1.52. Importantly, the coefficient gains statistical significance for longer time windows, i.e., the results for the baseline time window are the most

[25] We also re-run these regressions including other sets of fixed effects. The results (available upon request) do not change materially.

conservative, with other windows exhibiting stronger statistical significance and support for the risk-containment hypothesis.

6.3. Changing time window and treatment group

In this subsection, we consider alternative time windows and treatment groups. We do not have strong priors about the optimal time span to capture the lag over which banks adjust their lending standards to WITs, so our baseline time window of 5 months after the WIT is based on the literature (de Bondt, 2005) and conversations with supervisors. To test the robustness of our results to different time windows, we run our baseline estimations for different start and end dates. In the same tests, we also change the composition of the treated group. The objective of the latter exercise is to determine whether our euro area bank WIT results might be due to a general "foreign bank" effect impacting all foreign banks operating in Mexico rather than to the WIT effect.

Table 13 reports the results with different time windows and add a column using non-euro foreign banks as the alternative treated group.[26] The specifications are the same as for the baseline for multibank (Panel A) and all firms (Panel B). The results are consistent with our earlier findings. When the treated group are euro area banks, the size of the loan growth coefficients is only marginally affected by the specific time window, both for multibank and all firms. Our main conclusion that euro area banks adjusted their interest rates upward after WIT is also robust to shifts in the time window.

When we use non-euro foreign banks as the treated group, the results change dramatically. The loan growth coefficients are no longer statistically significant. None of the interest rate coefficients are significant either. As such, our findings consistently suggest that there was a major shift in lending behavior around the time of the WIT speech, with effects driven by euro area banks rather than by other foreign banks.

[26] The results are robust to running the regressions using other winsorizing criteria (not reported here, available upon request).

6.4. Placebo

Next, we rerun our baseline equations for a period 6 months earlier in the dataset, i.e., as if the treatment period occurred in the period before WIT using our baseline specification for multibank firms (Table 14). We do not find any significant impact prior to WIT, which reaffirms the consistency of our results. The results for all firms (not reported but available upon request) are similar.

6.5. Discussion: Other explanations and further evidence

An alternative hypothesis, which we call "opportunistic diversification", would attribute our findings to Spanish banks shifting their lending and risks across borders in response to shifts in business opportunities, regardless of their capitalization. According to this hypothesis, in the run-up to the WIT, as the economic situation of the euro area deteriorated, Spanish banks stepped up their lending and risk-taking in Mexico and lowered those in Spain. Conversely, the relative improvement in economic conditions in Spain compared to Mexico following the WIT, led to a tightening (loosening) in lending and risk-taking by these banks in Mexico (Spain). The main differences between the opportunistic diversification and the risk containment hypotheses are, first, the differentiated risk-taking across countries and, second, the role of bank capital. While the risk containment hypothesis poses that risk-taking incentives for banks operate at the consolidated level, the opportunistic diversification hypothesis argues that lending incentives operate fully independently in each country. At the same time, according to the opportunistic diversification hypothesis, the changes in bank capital were not what motivated euro area banks to expand and then retrench in Mexico. According to the risk containment hypothesis, however, it was changes in banks' global capital positions that affected how their risk-taking in Mexico varied.

While we cannot fully exclude that the opportunistic diversification hypothesis was also at work**,** we provide evidence from several angles that helps us differentiate this hypothesis from the risk containment hypothesis and, more importantly, determine whether the risk containment hypothesis underlies our finding to a large extent. We do this in several steps: First we analyze aggregate evidence in the *home* market (i.e., Spain)

of euro area banks operating in Mexico. Second, we study the cross-border flows between home and host markets. Third, we undertake extensive micro-econometric analysis with euro area data. [27] These additional analyses all vouch for the risk containment hypothesis.

First, aggregate data for Spain support the risk containment hypothesis as WIT also altered lending in risky credit segments in Spain. Loans to real estate developers, typically highly leveraged, are much more cyclical and riskier in a downturn. Indeed, during the European crisis that took place before WIT, nonperforming loans in the real estate sector reached 35% of outstanding loans in Spain, three times the average in other sectors. But, as in other real estate-related crises, banks often refinanced delinquent loans (evergreening) to avoid loss recognition and declines in capitalization. Indeed, despite the large drop in commercial property prices, the outstanding amount of loans to real estate developers only gradually declined, suggestive of such lending (Figure 7). In contrast, following WIT, there was a sharp (the largest to date) decline in real estate loans. This decline is consistent with the notion that WIT incentivized banks to recognize losses (i.e., tighten their lending as predicated by the risk containment hypothesis) rather than adding to risks by refinancing nonperforming loans to insolvent borrowers.

Second, in the run-up to WIT, Spanish banks increased their borrowing from the ECB and increased their purchases of bonds from distressed countries. Following WIT, this trend reverted and there was a large decline in both central bank borrowing and net acquisitions of distressed bonds. This reversal is consistent with the notion that WIT reduced euro area banks' risk-taking incentives not only in Mexico but in their home country as well (Figure 8).

Third, also in this direction, we turn to data on central bank liquidity to assess risk-taking in the euro area around the WIT period. To do this, we build on Drechsler et al. (2016) who show that *prior to WIT*, weakly capitalized euro area banks used central bank liquidity to buy risky assets in the form of distressed sovereign debt, supportive of the risk-shifting hypothesis.[28]

[27] We just present a summary of the various analyses and some supporting figures. Additional detailed results are available upon request.

[28] See Drechsler et al. (2016) for a detailed definition of all variables. When interpreting Figure 9, note that estimates closer to the WIT date would suffer from endogeneity as the WIT was partly a response to underlying problems in the euro area banking sector. We are grateful to Stefano Corradin, for sharing the final dataset used to run this analysis (see

In line with our findings from Mexico, the hypothesis here is whether the WIT attenuated this risk-taking behavior particularly by the riskier banks. Specifically, we update the dataset of Drechsler et al. (2016) to include the post-WIT period, and we re-estimate their analysis for euro area periphery banks (including Spanish banks operating in Mexico), to obtain the coefficients for the time interactions with pre-crisis credit risk ratings of the banks:

$$y_{it} = \alpha_i + \delta_t + \beta_t * treatment\ period_t * Bank\ Risk_{i,07} + \varepsilon_{ijt}, \quad (4)$$

where y_{it} is the amount of central bank liquidity drawn by bank *i* at time *t*, as a % of total assets, and *Bank Risk*$_{i,07}$ is the pre-crisis bank risk, defined as the median credit ratings provided by the three main rating agencies (Moody's, S&P, and Fitch) as of August 2007.[29] We assign a numerical value to each bank rating: 1 for AAA, 2 for AA+ and so on, e.g., a higher rating means a riskier bank. The variables α_i and δ_t are bank and time fixed effects, respectively.[30] The coefficient β_t represents the interaction between time (month) and the pre-crisis credit rating in period *t*. Figure 9 plots the coefficients β_t over time. The figure shows that beginning in early 2010, riskier banks increased their borrowing from the central bank relative to stronger banks, and that this movement reversed in the months following WIT. These results are consistent across different econometric specifications and robustness tests.[31] As both Spanish banks in our sample were among those with the highest level of risk, this supports the view that, like in Mexico, WIT led Spanish banks to reduce their risk taking in general.

Fourth, we find that the euro area bank that tightened lending the most in Mexico following WIT was the most undercapitalized euro area bank in our sample prior to WIT and the one that experienced the largest increase in stock market capitalization after

Corradin and Sundaresan, 2022). For confidentiality reasons, this part of the analysis is not replicable externally, but all researchers working for the ECB with access to the ECB liquidity dataset can re-run our analysis. All Stata .do files are available also to external researchers. To this effect interested researchers can contact david.marques@ecb.europa.eu.

[29] We use pre-crisis long-term unsecured credit ratings (August 2007) to avoid capturing the direct impact of the crisis on ratings.

[30] We double-cluster standard errors at the bank and time levels to allow for correlation of error terms.

[31] A one standard deviation decreases in a bank's credit rating lead to a broadly 15% increase in central bank borrowing. Following Drechsler et al. (2016), we also re-run a specification using bank holdings of distressed bonds as the dependent variable. It shows that weakly capitalized banks increased their holdings of riskier securities before WIT and reduced it following WIT, again buttressing the view that the intervention lowered risk-taking by banks.

WIT.[32] This result also speaks strongly to the role of capital in explaining the differential effect of WIT.

Finally, the opportunistic diversification hypothesis would predict significant net transfers of liquidity from euro area banks' headquarters to their subsidiaries in Mexico prior to WIT, and from the Mexican subsidiaries to the headquarters afterwards. Yet, during the full period of study, intra-bank liquidity transfers remained very limited, below 1% of the total assets of euro area subsidiaries in Mexico (Figure 10). This evidence also makes our paper complement the literature on cross-border banking, notably the seminal paper of Peek and Rosengren (1997). That paper finds that during the banking crisis in the early 1990s, Japanese banks reduced their lending in the U.S. In contrast, we find that during the global financial and euro area sovereign crises, i.e., before WIT, euro area banks expanded aggressively in Mexico. The difference in findings likely reflects, in part, the very different responses of the Bank of Japan (BoJ) and the ECB to their crises. While the ECB swiftly provided considerable amounts of liquidity to banks, as reflected in the sharp expansion of its balance sheet, the BoJ kept its balance sheet fairly constant until late into crisis (Figure 11). As a result, short on funds, Japanese commercial banks had little choice but to deleverage, including via cross-border activities, and to repatriate as much liquidity as possible. In contrast, euro area banks before WIT were also weakly capitalized, but with more liquidity they had the ability and incentives to take more risks.[33]

7. Conclusions

This paper analyzes the impact of a major unconventional central bank intervention, the WIT speech from 2012, on euro area banks' lending conditions. As domestic demand shocks and macroeconomic risks are very difficult to insulate from the effects of the intervention and to avoid endogeneity issues, we use loan-level data for Mexico, and assess how banks from the euro area, which are directly affected by WIT, changed their lending conditions in Mexico—a country with diverse banking ownership—relative to the other banks. The intervention boosted the economic capital of banks in the euro area.

[32] The regression results are available upon request.
[33] Institutional features are also likely to matter. Euro area subsidiaries in Mexico were subject to ring-fencing and could not transfer large amounts of foreign liquidity to their home country.

This paper shows that the intervention significantly reduced risk taking of the subsidiaries of euro area banks relative to other banks by reversing underlying risk shifting—in volume, price, and borrowers risk ratings.

These findings add a new dimension to the bank lending channel literature, showing that during banking stress, undercapitalized banks can take risks abroad without a transfer of capital or liquidity and that the announcement of a large and credible central bank intervention can reverse such risk-shifting behavior. A clear policy implication of our work is that if credible and large enough, an unconventional policy action, such as the WIT, can augment bank capital, incentivizing safer lending, and thus give the authorities time to restructure their banking system to reduce systemic risk domestically and abroad.

TABLE 1. Mexican banking system

Commercial Banks	2011		2012		2013	
	Number	(%) Assets	Number	(%) Assets	Number	(%) Assets
I. Subsidiaries of foreign financial institutions	**17**	**72.4**	**17**	**70.9**	**16**	**70.9**
a. United States	5	20.1	5	20.3	5	20.0
b. Euro area	2	33.7	2	33.5	2	33.3
c. Other foreign	10	18.6	10	17.1	9	17.1
II. Domestic banks	**25**	**27.6**	**26**	**29.1**	**30**	**29.6**
Total	**42**	**100**	**43**	**100**	**46**	**100**

Note: This table provides summary statistics on the ownership of the Mexican banking system from 2011 to 2013. It includes the number and total assets (in %) of commercial banks by nationality of the owner. The original data is monthly. Given that the number of banks may vary during the year we consider only the data of December of each year. Source: Comisión Nacional Bancaria y de Valores.

TABLE 2. Data description

Variable	Variable definition	Source
Outstanding amount	Outstanding balance (in Mexican pesos) of the commercial credit at the end of the period. It includes receivable accrued interest, capitalized or refinanced interest, commissions or any other concept.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Interest rate	Is the annual lending rate. When there is more than one credit per firm from the same bank in a particular period, it is the weighted average of the interest rates using outstanding amounts as weights.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Type of credit	Single disposition. Credits granted with only one purpose and borrowers.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Credit risk	Credit score for each large loan is a categorical variable that takes values from 1 to 9, where 9 correspond to the riskier firms.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database
Euro	Dummy variable that takes the value 1 if the loan was granted by a euro area bank.	Created by the authors with R04C database.
Post "Whatever it takes"	Dummy variable that takes the value 1 for the period August-December 2012, i.e., the period post "Whatever it takes"	Created by the authors with R04C database.
Bank	Dummy variable that includes a category for each of the banks included in our sample.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Firm	Dummy variable for each firm.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Location	Dummy for each state in Mexico.	Adapted by authors from R04C database.

Note: This table describes the main variables used in the main empirical analyses and their sources.

TABLE 3. Summary statistics by type of credit

		Outstanding amount *(thousands of pesos)*			**Lending rate** *(%)*	
Type	Obs.	Mean	Std. Dev.	Total Outstanding Amount	Mean	Std. Dev.
Revolving	3,059,387	4,124	40,100	12,616,897,848	13.3	3.5
Single disposition	4,004,575	5,313	58,122	21,277,067,519	14.1	4.3
Non-revolving	756,287	9,244	76,938	6,991,414,711	14.4	5.9
Syndicated	2,374	485,024	588,717	1,151,446,761	7.2	1.4

Note: This table shows summary statistics by type of bank loans and lending rates in Mexico during the period of July 2009 to December 2014 by type of credit.

TABLE 4. Before WIT: risk-taking by euro area banks (multibank firms)

	OLS					Bucologit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Euro* pre	**0.390*** **	**0.198*** **	**0.378*** **	**0.108*** **	**0.098*** **	**0.592*** **	**0.406*** **
	(0.022)	(0.012)	(0.022)	(0.016)	(0.025)	(0.049)	(0.068)
Mg Effect at mean						**0.145*** **	**0.101*** **
						(0.012)	(0.017)
Fixed effects							
Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period	Yes	No	Yes	Yes	No	No	Yes
Location	No	No	Yes	No	No	No	No
Firm	No	Yes	No	Yes	No	Yes	Yes
Firm*period	No	No	No	No	Yes	No	No
Observations	136,903	136, 903	136, 903	136, 903	136, 903	136, 903	136, 903
Adjusted R-squared	0.148	0.612	0.158	0.615	0.467		

Note: This table shows the regression results regarding the risk of loans granted by euro area banks compared to other banks during the period that preceded WIT for multibank firms. The outcome variable is a categorical variable that takes values ranging from 1 to 9, where 9 correspond to riskiest firms. This score is reported by the banks at the request of the Mexican regulator (CNBV). The period of analysis ranges from February 2010 to June 2012 (leading to WIT). The Euro dummy is equal to one for euro area banks; *pre* is a dummy variable that equals 1 if the period is just before WIT (between February and June of 2012). The first five columns correspond to an OLS estimation with different specifications of fixed effects and in the last two we present a nonlinear Bucologit model. The nonlinear regressions include marginal effect at the mean. Standard errors in parentheses are clustered at bank level. The number of observations in equations 6 and 7 correspond to the marginal effects. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 5. Impact of WIT on loan growth (multibank firms)

	(1)	(2)	(3)	(4)	(5)	(6)
Euro	-0.667	-0.646	-1.352	-1.317		-1.314
	(2.451)	(2.454)	(1.731)	(1.674)		(2.101)
Post	0.632	0.629	-1.039**			
	(0.423)	(0.423)	(0.343)			
Euro*Post	**-1.588***	**-1.587***	**-1.416****	**-1.520*****	**-1.571*****	**-1.534****
	(0.739)	(0.734)	(0.611)	(0.439)	(0.459)	(0.603)
Fixed effects						
Location	No	Yes	No	No	No	No
Firm	No	No	Yes	No	No	No
Post*firm	No	No	No	Yes	Yes	No
Firm*period	No	No	No	No	No	Yes
Bank	No	No	No	No	Yes	No
Adjusted R^2	0.001	0.001	0.024	0.029	0.032	0.017
N	437,574	437,574	437,574	437,574	437,574	437,574

Note: This table shows the regression results regarding the effect of WIT on bank lending for multibank firms. The outcome variable is the monthly % change in credit to nonfinancial firms. The period of analysis spans from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks, and zero otherwise. Column (1) shows the specification without any fixed effects. Column (2) adds location fixed effects to account for domestic economic conditions which might impact loan demand. Column (3) includes firm fixed effects, Column (4) adds firm*treatment fixed effects, Column (5) includes bank fixed effects instead of a euro bank dummy variable. Finally, Column (6) shows the results with firm*period fixed effects. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 6. Impact of WIT on lending rates (multibank firms)

	(1)	(2)	(3)	(4)	(5)	(6)
Euro	-2.000	-2.117*	-1.761**	-1.776**		-1.776**
	(1.096)	(1.081)	(0.597)	(0.597)		(0.740)
Post	-0.248**	-0.247**	-0.185**			
	(0.106)	(0.105)	(0.070)			
Euro*Post	**0.320****	**0.320****	**0.222****	**0.253*****	**0.264*****	**0.253*****
	(0.107)	(0.107)	(0.073)	(0.054)	(0.059)	(0.067)
Fixed effects						
Location	No	Yes	No	No	No	No
Firm	No	No	Yes	No	No	No
Post*firm	No	No	No	Yes	Yes	No
Firm*period	No	No	No	No	No	Yes
Bank	No	No	No	No	Yes	No
Adjusted R^2	0.057	0.080	0.676	0.669	0.800	0.492
N	437,574	437,574	437,574	437,574	437,574	437,574

Note: This table shows the regression results regarding the effect of WIT on interest rates for multibank firms. The outcome variable is the annual lending rate. When there is more than one credit per firm from the same bank the lending rate is the weighted average using outstanding amounts as weights. The period of analysis spans from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks and zero otherwise. Column (1) shows the specification without any fixed effects. Column (2) adds location fixed effects to account for domestic economic conditions which might impact loan demand. Column (3) includes firm fixed effects, Column (4) adds firm*treatment fixed effects, Column (5) includes bank fixed effects instead of a euro bank dummy variable. Finally, Column (6) shows the results with firm*period fixed effects. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 7. Impact of WIT on loan growth (all firms)

	(1)	(2)	(3)	(4)	(5)
Euro	-1.530	-1.392	-1.511	-1.459	
	(2.563)	(2.545)	(1.568)	(1.763)	
Post	0.560	0.556	-1.076**		
	(0.475)	(0.476)	(0.349)		
Euro*Post	**-1.531***	**-1.552****	**-1.339****	**-1.460****	**-1.515****
	(0.668)	(0.659)	(0.419)	(0.483)	(0.503)
Fixed effects					
Location	No	Yes	No	No	No
Firm	No	No	Yes	No	No
Post*firm	No	No	No	Yes	Yes
Bank	No	No	No	No	Yes
Adjusted R^2	0.001	0.001	0.035	0.039	0.041
N	1,045,466	1,045,466	1,045,466	1,045,466	1,045,466

Note: This table shows the regression results regarding the effect of WIT on bank lending to all firms. The outcome variable is the monthly % change in credit to nonfinancial firms. The period of analysis ranges from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks. Column (1) shows the specification without any fixed effects. Column (2) adds location-specific fixed effects to account for domestic economic conditions which might impact loan demand. Column (3) includes firm fixed effects (dropping the location fixed effects), Column (4) adds firm*treatment fixed effects. Column (5) includes bank fixed effects instead of a euro bank dummy variable. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 8. Impact of WIT on lending rates (all firms)

	(1)	(2)	(3)	(4)	(5)
Euro	-1.866	-2.131*	-1.733**	-1.774**	
	(1.079)	(1.038)	(0.603)	(0.619)	
Post	-0.188*	-0.194*	-0.149**		
	(0.085)	(0.088)	(0.065)		
Euro*Post	**0.276****	**0.301*****	**0.156****	**0.247*****	**0.264*****
	(0.091)	(0.087)	(0.067)	(0.050)	(0.061)
Fixed effects					
Location	No	Yes	No	No	No
Firm	No	No	Yes	No	No
Post*firm	No	No	No	Yes	Yes
Bank	No	No	No	No	Yes
Adjusted R^2	0.053	0.085	0.826	0.827	0.892
N	1,045,466	1,045,466	1,045,466	1,045,466	1,045,466

Note: This table shows the regression results regarding the effect of WIT on lending rates to all firms. The outcome variable is the annual interest rate. When there is more than one credit per firm from the same bank the lending rate is the weighted average of the interest rates using outstanding amounts as weights. The Euro dummy is equal to one for euro area banks. The period of analysis ranges from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. Column (1) shows the specification without any fixed effects. Column (2) adds location-specific fixed effects to account for domestic economic conditions which might impact loan demand. Column (3) has firm fixed effects (dropping the location fixed effects) while Column (4) adds firm*treatment fixed effects. Column (5) includes bank fixed effects instead of a euro bank dummy variable. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 9. Impact of WIT on loan growth risk composition (all firms)

Loan Growth	(1)	(2)	(3)	(4)	(5)
Euro	0.573	0.669	2.397	1.991	1.920
	(2.370)	(2.463)	(1.617)	(1.777)	(2.872)
Post	-0.201	-0.293	-1.267***		
	(0.857)	(0.834)	(0.376)		
Euro*Post	6.962**	7.012**	-0.237	0.466	-0.190
	(2.776)	(2.752)	(0.616)	(1.173)	(1.448)
Euro*Post*high risk	**-14.084*** **	**-13.859*** **	**-1.190** **	**-5.313*** **	**-7.095*** **
	(0.970)	(0.979)	(0.512)	(0.835)	(1.460)
Location	No	Yes	No	No	No
Firm	No	No	Yes	No	No
Post*firm	No	No	No	Yes	No
Firm*period	No	No	No	No	Yes
Adjusted R2	0.005	0.006	0.091	0.099	-0.083
N	112,364	112, 364	112, 364	112, 364	112, 364

Note: This table shows the regression results regarding the effect of WIT on bank lending to all firms. High risk is a dummy identifying loans in the highest quintile of CNVB score (top 20%) pre-WIT, CNVB score takes values from 1 to 9, 9 indicates higher risk. The outcome variable is the monthly % change in credit to nonfinancial firms. The period of analysis ranges from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks. Column (1) shows the specification without any fixed effects. Column (2) adds location-specific fixed effects to account for domestic economic conditions which might impact loan demand. Column (3) includes firm fixed effects (dropping the location fixed effects), Column (4) adds firm*treatment fixed effects. Column (5) includes bank fixed effects instead of a euro bank dummy variable. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 10. WIT on credit: service sector and small firms (All firms)

	All Firms	Services	Small	Small and Services
Euro*Post	**-1.515****	**-1.428****	**-1.715***	**-1.863****
	(0.503)	(0.513)	(0.752)	(0.710)
Adjusted R^2	0.041	0.042	0.045	0.045
N	1,045,466	710,672	732,231	523,430

Note: This table shows the regression results regarding the effect of WIT on bank lending to all firms. The outcome variable is the monthly % change in credit to nonfinancial firms. Small firms are those with less than 20 workers. The period of analysis ranges from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks. All columns include firm and bank fixed effects. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 11. WIT on lending rates: service sector and small firms (All firms)

	All Firms	Services	Small	Small and Services
Euro*Post	**0.264*****	**0.268*****	**0.328*****	**0.326*****
	(0.061)	(0.060)	(0.080)	(0.077)
Adjusted R^2	0.892	0.894	0.902	0.900
N	1,045,466	710,672	732,231	523,430

Note: This table shows the regression results regarding the effect of WIT on bank lending to all firms. The outcome variable is the annual interest rate. Small firms are those with less than 20 workers. The period of analysis ranges from February to December 2012. The treatment period spans from August to December 2012 (post=1). July 2012 is excluded. The Euro dummy is equal to one for euro area banks. All columns include firm fixed effects (dropping the location fixed effects). and bank fixed effects. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 12. Changing control group: impact of WIT on credit and interest rates (multibank firms)

Panel A: Loan growth			
Treatment (row) / Control (column)	**Non-euro**	**Mexican**	**Non-euro foreign**
Euro	-1.534***	-1.418***	-1.619
Panel B: Lending rates			
Treatment (row) / Control (column)	**Non-euro**	**Mexican**	**Non-euro foreign**
Euro	0.253***	0.203***	0.331*

Note: This table shows the regression results regarding the effects of WIT changing treatment and control groups of Table 5 (loan amounts) and Table 6 (interest rates) on our preferred, more stringent identification (Column 6). It reports the coefficient of the variable of interest euro*post effects. Panel A corresponds to loan amounts and panel B corresponds to interest rates. The columns represent three alternative control groups: non-euro area, Mexican-only and non-euro foreign. In all regressions the treatment group is the same: Euro area banks. The study period ranges from February to December 2012. July 2012 is excluded. The treatment period spans from August 2012 to December 2012 (post=1). Clustered standard errors at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 13. Changing time horizon and treatment group

	Loan growth		Lending rates	
Treatment group:	Euro area	Other foreign	Euro area	Other foreign
Study period		**Panel A: Multibank firms**		
Dec. 2011–Feb. 2013	-1.750***	-0.248	0.382***	-0.215
Jan. 2012–Dec. 2012	-1.258**	-0.649	0.291***	-0.219
Feb. 2012–Jan. 2013	-1.672***	-0.159	0.271***	-0.178
Treatment group:	Euro area	Other foreign	Euro area	Other foreign
Study period		**Panel B: All firms**		
Dec. 2011–Feb. 2013	-1.748***	-0.384	0.377***	-0.187
Jan. 2012–Dec. 2012	-1.144**	-0.728	0.285***	-0.203
Feb. 2012–Jan. 2013	-1.637**	-0.187	0.267***	-0.161

Note: This table shows the regression results of the effects of WIT on loan amounts and interest rates for different treatment groups and time horizon using our most stringent identification. This table reports the Euro*Post and Other foreign*Post estimated coefficients of the treatment groups, where the control groups are non-euro banks and all banks ex-other foreign banks, respectively. Rows present different time spans of the regressions (study period). The first two columns present results for loan amounts, Columns 3 and 4 present results for interest rates for the two treatment groups (euro area and other foreign banks). In all regressions, July 2012 is excluded and the treatment period starts in August 2012 (post=1). Clustered standard errors at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

TABLE 14. Placebo: Impact of WIT on loan growth (multibank firms)

Monthly growth rates	(1)	(2)	(3)	(4)	(5)	(6)
Euro	-1.121	-1.115	-1.885	-1.837		-1.798
	(1.868)	(1.906)	(1.069)	(1.173)		(1.447)
Post	0.137	0.129	-1.454***			
	(0.382)	(0.380)	(0.271)			
Euro*Post	**0.456**	**0.459**	**0.748**	**0.525**	**0.691**	**0.489**
	(1.023)	**(1.024)**	**(1.094)**	**(0.684)**	**(0.691)**	**(0.898)**
Fixed effects						
Location	No	Yes	No	No	No	No
Firm	No	No	Yes	No	No	No
Post*firm	No	No	No	Yes	Yes	No
Firm*period	No	No	No	No	No	Yes
Bank	No	No	No	No	Yes	No
Adjusted R^2	0.000	0.000	0.024	0.027	0.030	0.021
N	714,723	714,723	714,723	714,723	714,723	714,723

Note: This table shows the regression results regarding the effect of an artificially constructed treatment period on bank lending for multibank firms. We rerun our baseline equations assuming that the treatment period occurs in the period before WIT. The outcome variable is the monthly % change in credit to nonfinancial firms. The period of analysis ranges from August 2011 to June 2012. The treatment period ranges from February to June 2012. The Euro dummy is equal to one for euro area banks. Column (1) shows the specification without any fixed effects. Column (2) adds location-specific fixed effects to account for domestic economic conditions. Column (3) includes firm fixed effects and Column (4) adds firm*treatment fixed effects. Column (5) includes bank fixed effects instead of a euro bank dummy variable. Finally, Column (6) shows the results with firm*period fixed effects. Growth rates are winsorized at the 2nd and 98th percentiles. Standard errors in parentheses are clustered at bank level. ***Significant at the 1% level, **significant at the 5% level, and *significant at the 10% level.

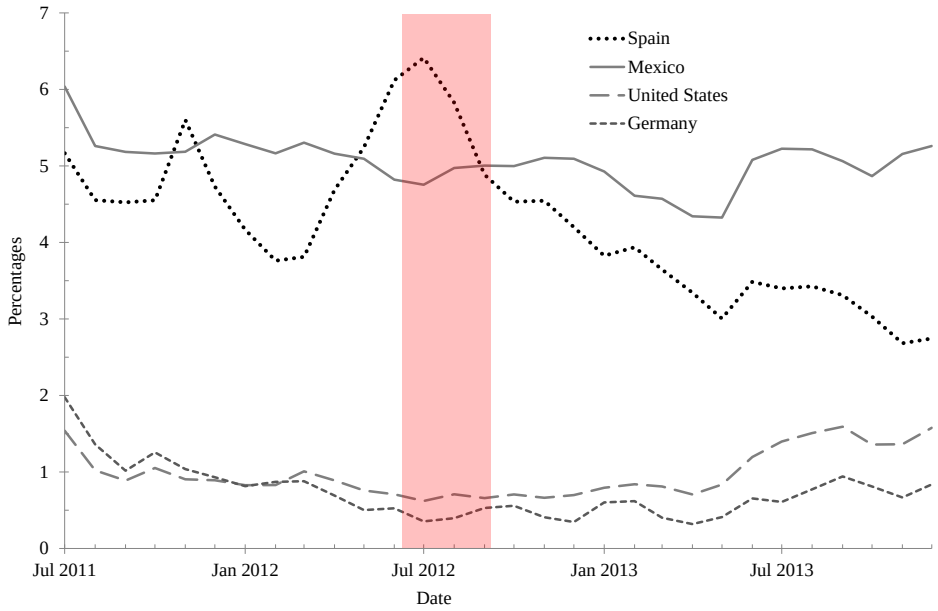

FIGURE 1. Sovereign bond yields (%). *Note:* This figure plots sovereign bond yields for Germany, Mexico, Spain and the United States. Yields are monthly %s for 5-year government bonds. The shaded area represents about ±1.5 months around the WIT event (July 26, 2020). The figure shows that Spanish sovereign bond yields narrowed sharply after the WIT event, implying a dramatic change in market perception, while remaining constant for the other countries. Source: Datastream.

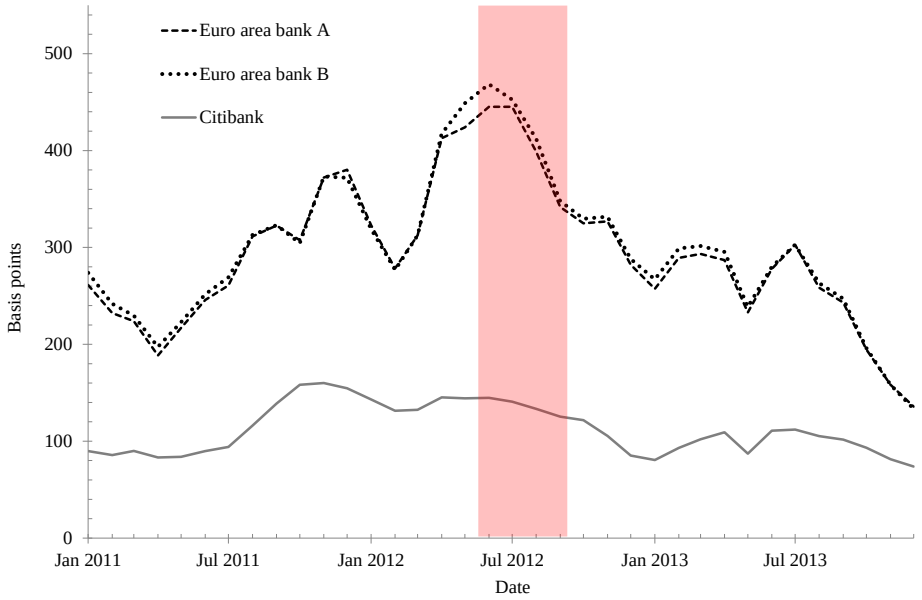

FIGURE 2. Bank credit default swap spreads (Basis points). *Note*: This figure plots credit default swap spreads for two large euro area banks operating in Mexico and Citibank large US bank also operating in Mexico in monthly frequencies. Spreads are expressed in basis points above LIBOR. The shaded area represents about ±1.5 months around the WIT event (July 26, 2012). The figure shows that spreads narrowed significantly for both euro area banks after the WIT event, implying an improvement in bank funding conditions, while remaining broadly constant for Citibank. Source: Datastream.

FIGURE 3. Stock prices of euro area banks (Indexed, July 26, 2012=100). *Note*: This figure plots stock market prices of some major euro area banks. Market prices have been indexed at 100 at the date of the WIT speech (July 26, 2012). It shows that the WIT event had a strong effect on euro area banks' capitalization, resulting in a sustained double-digit increase in banks' stock market prices. Source: Datastream.

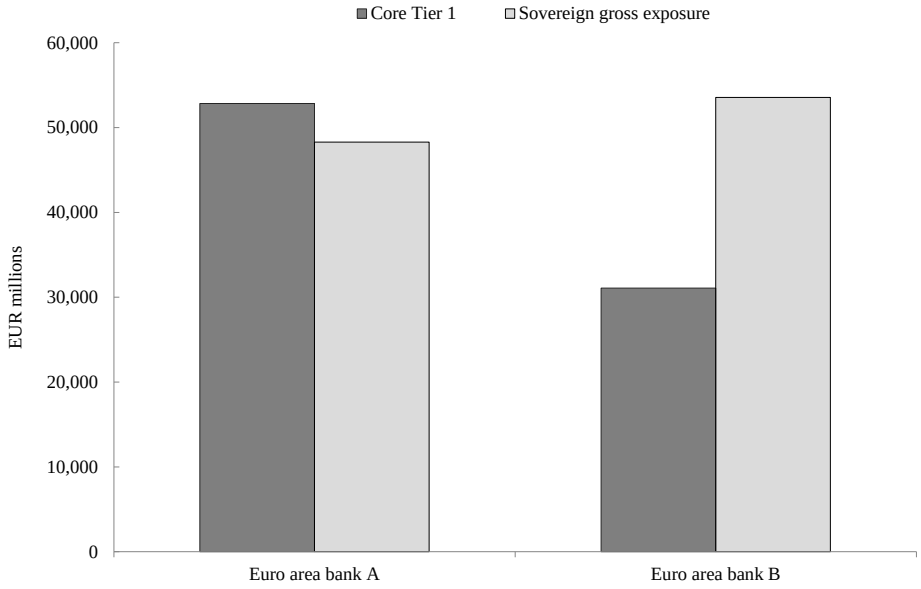

FIGURE 4. Bank core capital and direct exposure to periphery sovereign bonds. *Note*: This figure plots the two euro area banks' core capital in comparison to their direct holdings of sovereign peripheral country bonds, all in millions of euros. It shows that the two banks held a large amount of sovereign debt of these countries relative to capital, implying that the decline in bond yields following WIT boosted banks' economic capital. Source: EBA.

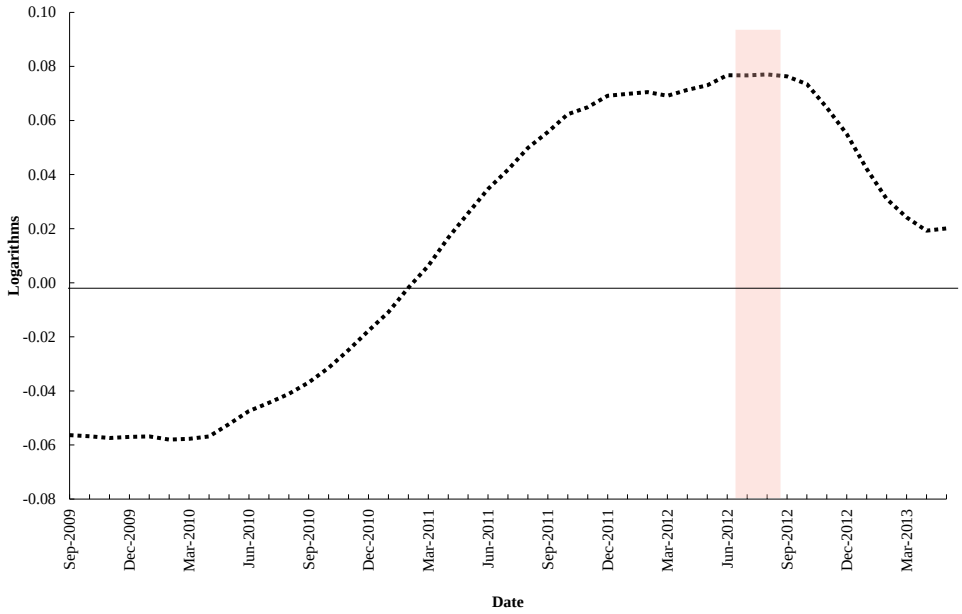

FIGURE 5. Difference in average lending volumes in Mexico between euro and non-euro area banks. *Note*: This figure plots the difference in total lending in logarithms between euro and non-euro area banks in Mexico as a 6-month moving average. The shaded area represents ±1.5 months around WIT (July 26, 2012). The figure shows that, around 2011, in the context of the crisis in Europe, euro area banks initiated an expansion of credit relative to the rest of the banks operating in Mexico. This expansionary trend abroad reverted after WIT. Source: ECB and Central Bank of Mexico.

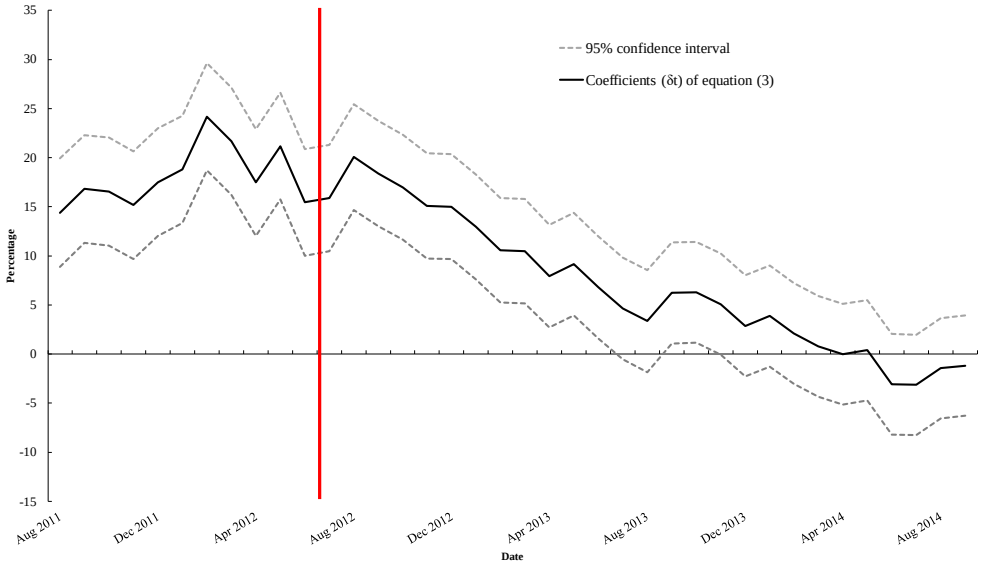

FIGURE 6. Trend reversal. *Note:* This figure plots the coefficients (δ_t) of the Equation 3, in %. δ_t represent the interactions between the treated group (i.e. euro banks) and the time variable (monthly). The dotted grey lines represent the 95 % confidence intervals around these coefficients. It shows that credit growth differences between euro area non-euro area banks were large and statistically significant before WIT and declined after it to become statistically insignificant from zero. The shaded area represents ±1.5 months around WIT (July 26, 2012). Source: Own calculations.

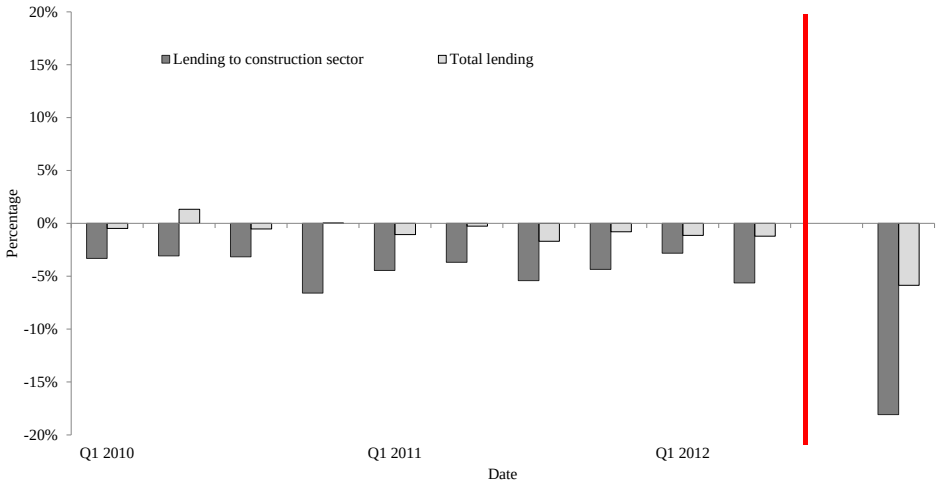

FIGURE 7. Lending to construction in Spain *(quarterly changes)*. *Note*: This figure plots quarterly changes in Spanish bank lending to the domestic construction and total corporate sectors. The figure shows that there was only a gradual decline in the outstanding amount of loans to real estate developers over the course of the European crisis. However, following WIT, Spanish banks registered a sharp (i.e., the largest to date) decline in real estate loans. Source: Bank of Spain.

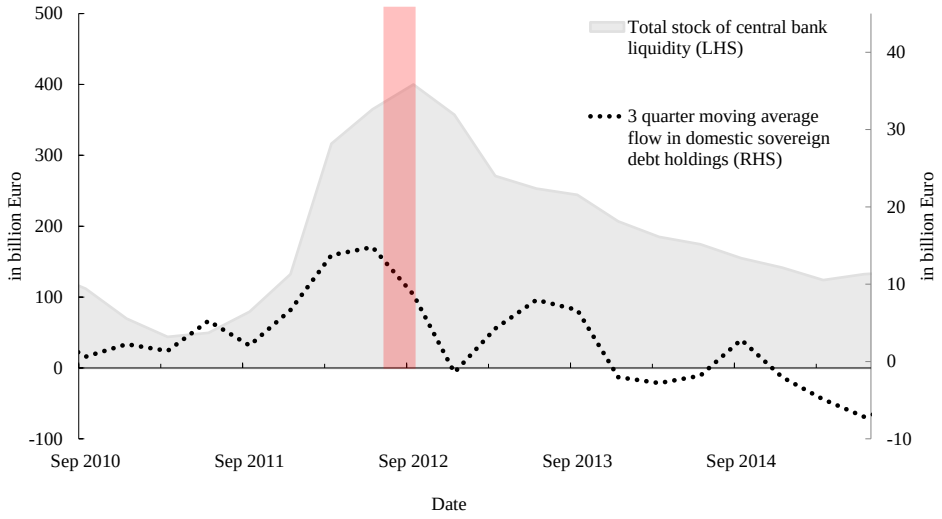

FIGURE 8. Spanish banks' funding from ECB and domestic sovereign bonds holdings *(EUR billions)*. *Note*: This figure plots Spanish banks' funding from all the ECB lending operations combined (left-hand side) and changes in domestic sovereign bonds holdings in billions of euros (RHS). Central bank liquidity refers to the combined volume of main refinancing operations (MRO) and long-term refinancing operations (LTRO). Sovereign bond holdings are presented as the three-quarter moving average change in holdings. The shaded area represents the period of ±1.5 months around the WIT event (July 26, 2012). The figure shows that, in the run-up to WIT, Spanish banks increased their borrowing from the ECB, which facilitated an increase in their purchases of domestic sovereign bonds. Following WIT, this trend reverted and there was a large decline in both central bank borrowing and of net acquisitions of bonds. Source: Own calculations using central bank data.

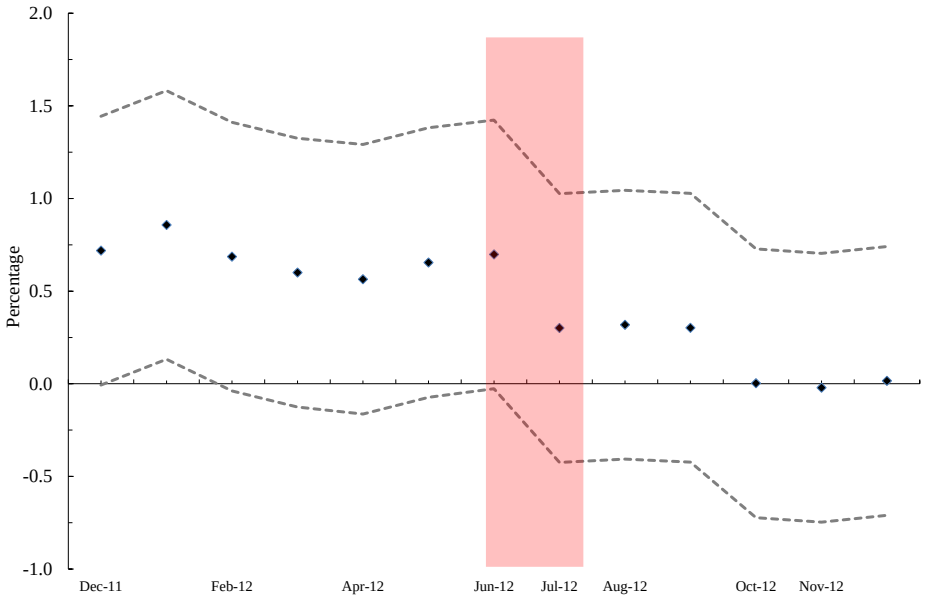

FIGURE 9. Bank capitalization and risk-taking. *Note*: This figure plots the coefficients (βt) of Equation 4, in %, that represent the interactions between time (month) and pre-crisis credit rating. The dotted grey lines represent the 95% confidence intervals around these coefficients. The shaded area represents ±1.5 months around WIT (July 26, 2012). It shows, that beginning in early 2010, weakly capitalized banks increased borrowing relative to strongly capitalized banks. This movement reversed in the months following WIT. Source: Authors' calculations.

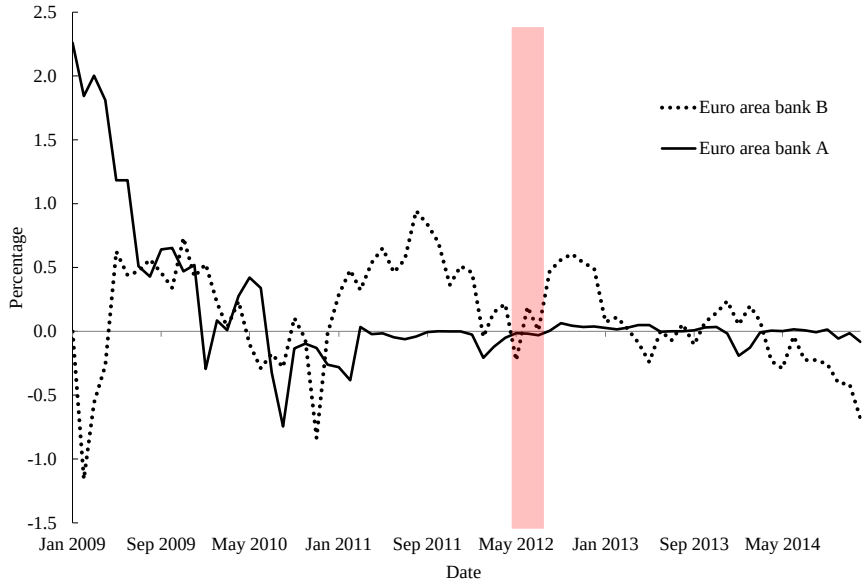

FIGURE 10. Intra bank liquidity transfers from headquarters to (from) subsidiaries *(% of total assets).* *Note:* This figure plots intra bank liquidity transfers between the respective euro area bank's subsidiary (in Mexico) and its parent company (in Spain). Liquidity transfers are represented as net exposure from the subsidiary to the parent company as a % of total assets. The shaded area represents ±1.5 months around WIT (July 26, 2012). The figure shows that intra bank liquidity transfers between banks' subsidiaries and headquarters remained very limited during our period of study, below 1% of total assets of euro area subsidiaries.

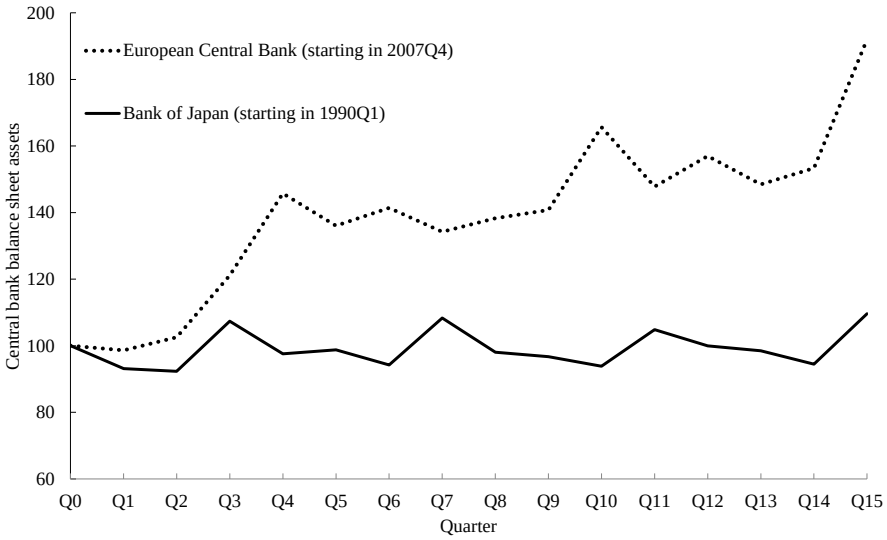

FIGURE 11. Central bank balance sheets. *Note*: The figure plots total balance sheet assets of Bank of Japan (BoJ) and ECB during crisis times. Both lines are indexed at 100 starting at the beginning of the respective crisis (1990Q1 for BoJ and 2007Q4 for ECB). It shows that, ECB more swiftly provided large amounts liquidity to the banking sector following the default of Lehman Brothers in 2008, while the Bank of Japan kept its balance sheet fairly constant. Only much later, after the Asian crisis erupted in 1997, did BoJ's balance sheet start to increase. Source: Bank of Japan and ECB.

Appendix:

TABLE A1: Mapping of ratings of agencies and CNBV to categorical scores

Moody's	**S&P**	**Score CNBV**	**Categorical variable**
Aaa	AAA	A1	1
Aa1	AA+		
Aa2	AA		
Aa3	AA-	A2	2
A1	A+		
A2	A	B1	3
A3	A-		
Baa1	BBB+	B2	4
Baa2	BBB		
Baa3	BBB-	B3	5
Ba1	BB+		
Ba2	BB	C1	6
Ba3	BB-		
B1	B+	C2	7
B2	B		
B3	B-		
Ca (1,2,3)	CCC	D	8
Ca	CC		
C	C	E	9
	D		

Source: CNBV

TABLE A2. Descriptive statistics scores and interest rate, 2009-2014- All firms

	Summary of interest rates charged			
Credit bucket	*Mean*	*Std. Dev.*	*Median*	*Freq.*
1	11.9	4.0	12.3	883,597
2	11.7	4.1	11.4	303,627
3	10.7	4.1	9.5	181,430
4	11.5	4.5	10.8	76,601
5	13.0	4.5	12.8	129,068
6	13.6	4.7	13.0	44,081
7	12.5	4.2	12.3	26,623
8	14.2	4.5	13.7	61,136
9	10.7	5.9	11.4	24,122
Total	11.9	4.2	12.0	1,730,285

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