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Introduction

On October 23–24, 2015, the University of St. Gallen hosted a two day workshop on “Finance, Capital Reallocation and Growth”. This first FGN-HSG international workshop was organized jointly with the Centre for Economic Policy Research, London, and featured twelve papers including three keynote addresses.¹ The workshop addressed a range of themes relating to the real effects of finance on growth and capital productivity. Topics included the effects of central bank interventions and capital regulations on credit supply and the role of banks in national and cross-border allocation of credit to different types of firms and uses of capital. This special issue of the *Swiss Journal of Economics and Statistics* (SJES) includes the three keynote papers of the workshop.

In his paper on “Reallocation of Capital and Labor within Firms”, Holger Müller, New York University, discusses the role of internal capital markets on (re-)allocation of capital and labor within large firms, which is ultimately related to the question of what defines the size and boundaries of firms. He starts with the question why and when it might be advantageous to replace arms’ length transactions in markets with an internal allocation of capital in large firms where different divisions compete for alternative uses of scarce capital. He then reviews the empirical evidence on internal capital markets, which tend to make investments in different units interrelated and dependent on each other. In channeling funds from less performing units to highly profitable and expanding divisions, large firms can boost capital productivity and thereby create value, although this process of capital reallocation is not free from frictions.

The paper on “Macroprudential Policy and Credit Supply” by José-Luis Peydró from the University of Pompeu Fabra explores the impact of bank regulation on the intertemporal allocation of credit over the business cycle, i. e., on macroeconomic stabilization and the incidence of financial crisis. When leverage builds up unrestrained during prolonged periods of boom and an economy enters the following recession with a large debt overhang, the ensuing output losses and the

1 See www.fgn.unisg.ch/en/fgn+conference+2015/home for the scientific program, downloadable papers and a video.

likelihood of financial crisis are much larger. He therefore argues for countercyclical capital regulation that forces banks to build up reserves in booms when it is much easier and less costly to do so, allowing them to avoid credit crunches by running down reserves during recessions. Since relaxing credit constraints facilitates productive investments with positive net present value, this mechanism also helps to improve capital allocation and capital productivity on average. He reviews empirical research on Spanish banks in support of this line of argument.

The paper by Viral V. Acharya, New York University, and Sascha Steffen, University of Mannheim, on “Capital Markets Union in Europe: Why other Unions must lead the way” points to a period of increasing home bias and capital market fragmentation in Europe, which stands in the way of risk-sharing and efficient capital allocation across countries. They argue that distortions in sovereign bond markets in a monetary union lead to spillovers into other capital markets and result in cross-country differences of interest rates on new business loans, thereby distorting regional capital allocation in the Eurozone. They emphasize important policy complementarities and argue that the success of the Capital Markets Union as proposed by the European Commission will importantly hinge on the proper implementation of the Banking Union, including a European deposit insurance system, and on fortifying the Fiscal Union. A stronger Fiscal Union requires strengthening the fiscal compact with more authority for common macroeconomic surveillance as well as the proper functioning and authority of the ESM (European Stability Mechanism), which gives credit to distressed nations subject to strict reform programs. Such a systemic approach ensures level playing fields in European capital markets and raises the chances for the Capital Markets Union to be successful.

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Reallocation of Capital and Labor within Firms

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SUMMARY

Understanding how internal capital and labor markets function sheds light on one of the most fundamental questions in economics: what determines the boundaries of the firm? This essay reviews the theoretical and empirical literature on internal capital markets and firm boundaries, focusing in particular on the close link between the two subjects. Emphasis is placed on the question of how firms reallocate capital and labor internally across individual firm units in response to plausibly exogenous shocks. The essay concludes with directions for future research.

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Introduction

Why study capital and labor reallocation within firms? As I argue in this essay, understanding how internal capital and labor markets function is closely related to one of the most fundamental questions in economics, namely, what determines the boundaries of the firm. This essay proceeds in reverse order. I begin with the literature on firm boundaries, arguing that internal capital allocation plays a central role for the boundaries of the firm. I subsequently discuss some empirical work on internal capital markets, focusing in particular on the reallocation of capital and labor within firms. I conclude with some directions for future research.

Internal Capital Markets and the Boundaries of the Firm

In his 1937 article, Ronald Coase raised one of the most fundamental questions in economics: why are there firms? In Coase's own words: "If production could be carried out without any organisation at all, well might we ask, why is there any organisation?" This question, as we understand it today, not only asks why firms exist but also what determines their optimal size and scope. Specifically, why are certain transactions carried out within firms while others are carried out through arms' lengths transactions in the market? If organizing production through firms has benefits, why is not all production carried out within a single firm? In other words, what determines the boundaries of the firm?

Coase's answer is that some transactions are carried out within firms because it is difficult to write fully contingent contracts that specify what should happen in all possible future situations. This notion of what is nowadays referred to as "contractual incompleteness" provides a role for the existence of firms if they are able to fill the void left by incomplete contracts. Specifically, Coase argues that firms can substitute for missing contractual contingencies with "authority." Simply put, when contracts are silent, the firm's owner can dictate its employees what to do. To define the boundaries of the firm, Coase invokes diminishing marginal returns from management as well as resources wasted within firms.

What Coase is somewhat less clear about is what exactly are the transaction costs arising from contractual incompleteness. Thirty years later, WILLIAMSON (1975) and KLEIN, CRAWFORD, and ALCHIAN (1978) provide an answer to this question by introducing an inefficiency that is commonly known as the "hold-up problem." Specifically, when there are relationship-specific investments, contractual incompleteness gives rise to ex-post opportunism in the sense that the

party making the investment is not properly rewarded once the investment is sunk. This fear of ex-post opportunism may discourage parties from making efficient investments ex ante.

While the contributions by WILLIAMSON (1975) and KLEIN, CRAWFORD, and ALCHIAN (1978) stress the importance of the hold-up problem, they are less clear about what precisely are the benefits from integration. That is, how exactly is the hold-up problem mitigated within firms? Ten years later, GROSSMAN and HART (1986) and HART and MOORE (1990) point to the crucial role of ex-post bargaining when the division of surplus cannot be fully specified in ex-ante incomplete contracts. In particular, they argue that asset ownership confers bargaining power in negotiations. This is because the asset's owner has residual control rights allowing him to exclude others from its use. Accordingly, agents can guard themselves against ex-post opportunism by owning the assets they invest in. If several agents make asset-specific investments, then the agent whose investment is more important should own the asset.

Although the Grossman-Hart-Moore "property rights approach" is widely hailed as a breakthrough in the theory of the firm, critics have questioned its usefulness in understanding real-world firms. The reason is that in reality firms, not managers, own the assets used in the production process. HOLMSTRÖM (1999) notes: "[T]his model, despite its express objective to explain the boundaries of the firm, fails to do so, at least if the model is interpreted literally. The model offers a theory of individual ownership of assets, that is, how control over assets should be distributed among individuals, but it does not explain why firms own assets." Likewise, BOLTON and SCHARFSTEIN (1998) argue: "[I]t is not so clear how one would use this model to understand, for example, the acquisition by a large multidivisional firm of one of its suppliers. Managers don't own their companies' assets, though they may control their use. How then might we think about the boundaries of the firm when managers control assets but don't own them?"

What features of real-world firms should a plausible model of firm boundaries be consistent with? For one, control over the firm's assets should reside with corporate headquarters (HQ), even though i) HQ itself is not the owner of the assets – it is merely given authority by the firm's owners (i. e., shareholders), and ii) HQ itself makes no relationship-specific investments. As BOLTON and SCHARFSTEIN (1998) point out, "The Grossman-Hart-Moore framework [...] predicts that control should be allocated to parties whose relationship-specific investments are most important to the relationship. Yet headquarters is given control, even though it does not really make such investments."

Hence, a realistic model of firm boundaries should feature centralized decision making under HQ. While not the owner, HQ has effective control over the

firm, including its assets. In particular, HQ can control divisions' investment by giving more funds to some divisions (or projects) and less to others. Notice the difference between HQ and an external lender, such as a bank. Lacking control rights, a bank cannot prevent a firm from going to another bank, nor can it redistribute funds from one borrower to another. STEIN (2003) summarizes this "capital-allocation-centric" view on the question of firm boundaries as follows: "Loosely speaking, a collection of assets should optimally reside under the roof of a single firm to the extent that the firm's internal capital market can do a more efficient job of allocating capital to these assets than would the external capital market, if the assets were located in distinct firms."

Why should HQ do a better (or worse) job of allocating capital to projects compared to the external capital market? First and foremost, HQ has authority. That is, unlike, e. g., a bank, HQ can simply dictate the efficient (re-)allocation of capital and labor within a firm. Second, because HQ has authority, it has strong monitoring incentives. That is, authority and monitoring are complements (ALCHIAN, 1969; WILLIAMSON, 1975; GERTNER, STEIN, and SCHARFSTEIN, 1994; STEIN, 1997). Third, because HQ can, by virtue of its authority, reallocate funds from "losers" to "winners," centralized firms under HQ control may be able to raise more external funds than comparable stand-alone firms (LEWELLEN, 1971; STEIN, 1997; INDERST and MUELLER, 2003). On the other hand, giving HQ authority may discourage managerial incentives (AGHION and TIROLE, 1997; BRUSCO and PANUNZI, 2005) or lead to intra-firm lobbying and rent-seeking, resulting in an inefficient capital allocation (MEYER, MILGROM, and ROBERTS, 1992; SCHARFSTEIN and STEIN, 2000; RAJAN, SERVAES, and ZINGALES, 2000).

Internal Capital Markets: Empirical Evidence

Direct empirical evidence on internal capital markets is relatively scant. The reason is that readily available data do not permit a look inside the firm, and if they do, the data are often subject to (self-) reporting and other biases. A commonly used data source, especially among earlier studies, are the business-segment data provided by Compustat. Based on these data, several studies in the mid- to late 1990s document that conglomerate firms trade at a discount relative to a portfolio of comparable stand-alone firms (LANG and STULZ, 1994; BERGER and OFEK, 1995; SERVAES, 1999; LINS and SERVAES, 1999). This empirical result, commonly referred to as "conglomerate discount" or "diversification discount," can potentially speak to the (dys-)functioning of internal capital markets. Indeed,

as some researchers argue, a possible explanation for the conglomerate discount is inferior capital allocation due to increased agency problems within conglomerate firms.

While the conglomerate discount literature has made quite a splash in the corporate finance profession, critics have argued that its methodology and the data used to obtain the discount are flawed. In a nutshell, the discount is the difference between a conglomerate firm's Tobin's q and the weighted average q associated with a portfolio of "comparable" stand-alone firms. The conglomerate firm's q is the market value of the firm divided by either the replacement value of its assets or the book value of its debt and equity ("market-to-book"). To obtain the qs of comparable stand-alone firms, researchers typically use the average q of single-segment firms operating in same industry as the conglomerate segment.

As for data quality, critics have pointed out that firms self-report segment data, and changes in number of segments may therefore reflect changes in reporting practices rather than changes in the degree of diversification. In particular, HYLAND (1997) argues that this issue arises in 25 % of all cases. Likewise, VILLALONGA (2004) argues that in 80 % of all cases, the segment's SIC code assigned by Compustat is not the SIC code of the segment's largest industry. Indeed, using Census (BITS) data, which provide correct SIC codes, VILLALONGA (2004) finds that the conglomerate discount turns into a conglomerate premium.

On the methodology side, the main issue is the endogeneity of the decision to join or form a conglomerate. Effectively, the question is whether a portfolio of "comparable" stand-alone firms constitutes a valid counterfactual. After all, there may be good reasons why some firms remain stand-alone firms. Simply put, estimates of the conglomerate discount may be biased due to unobserved heterogeneity. In this vein, CAMPA and KEDIA (2002), GRAHAM, LEMMON, and WOLF (2002), and VILLALONGA (2004) all conclude that "correcting" for the endogeneity makes the conglomerate discount disappear or turn into a premium. Arguably, "correcting" for the endogeneity is rather difficult in the absence of plausibly exogenous variation in the conglomeration decision.

Perhaps more useful – because more direct – evidence on the functioning of internal capital markets comes from the empirical literature studying investment within conglomerate firms. In this regard, SCHARFSTEIN (1998), SHIN and STULZ (1998), and RAJAN, SERVAES, and ZINGALES (2000) all find that conglomerate firms overinvest relative to comparable stand-alone firms in segments with low investment opportunities and underinvest in segments with good investment opportunities. Thus, conglomerates are plagued by inefficient cross-subsidization, often referred to as "corporate socialism." As in the conglomerate discount

literature, however, the question is whether “comparable” stand-alone firms constitute a valid counterfactual. Indeed, WHITED (2001) argues that conglomerate segments may not have the same investment opportunities as stand-alone firms. After correcting for potential measurement error bias, she finds no difference between the investment behavior of conglomerates and that of stand-alone firms. Perhaps more strikingly, CHEVALIER (2000) finds that conglomerate divisions exhibit the same (“inefficient”) cross-subsidization pattern already *before* they merge, implying that the cross-subsidization pattern found in other studies cannot possibly be due to “socialistic” internal capital markets within conglomerates.

An alternative approach to studying internal capital markets is to examine how firms respond to “shocks” to one of their divisions (or projects). To the extent that these shocks are plausibly exogenous, this could provide interesting insights into how internal capital markets operate. If internal capital markets are efficient, we would expect that HQ reallocates budgets (and thus “capital” and “labor”) within the firm so as to maximize overall firm value. STEIN (1997) succinctly summarizes the “efficient internal capital markets hypothesis” as follows: “Thus, for example, if a company owns two unrelated divisions A and B, and the appeal of investing in B suddenly increases, the argument would seem to imply that investment in A would decline – even if it is positive NPV at the margin – as corporate headquarters channels relatively more of its scarce resources toward B.” Along similar lines, SHIN and STULZ (1998) define an internal capital market to be efficient if “its allocation of funds to a segment falls when other segments have better investment opportunities.”

There are relatively few studies that look into how internal capital markets respond to exogenous shocks. One of the earliest studies is LAMONT (1997). He finds that in 1986, when oil prices declined by 50 %, integrated oil companies cut investment across the board, including investment in non-oil segments. While Lamont’s paper suggests an interdependence across otherwise unrelated divisions, the underlying experiment differs from STEIN’s (1997) thought experiment outlined above. In Stein’s experiment, some divisions experience a decrease in investment while others experience an increase. By contrast, in Lamont’s study, there is no shock to investment opportunities but rather a liquidity shock to one (namely, the oil) division which is then “shared” with other divisions. Hence, investment declines across the board. Another interesting industry study is KHANNA and TICE (2001), who examine Wal-Mart’s entry into local markets between 1975 and 1996. They find that conditional on staying in the market, investment by discount divisions of diversified firms becomes more sensitive to division profitability than does investment by stand-alone discount retailers. Moreover, diversified

firms transfer funds away from failing discount divisions. Both LAMONT (1997) and KHANNA and TICE (2001) feature reasonably well identified shocks. However, both studies are limited to small samples (26 integrated oil companies and 25 discount divisions of diversified retailers, respectively).

At the other end of the spectrum are studies using large samples but without exogenous shocks. Using Compustat segment data, SHIN and STULZ (1998) regress investment by a segment on the industry qs of the firm's other segments. They overwhelmingly reject the view that the qs of the other segments affect the segment's investment, concluding that "unless one believes that firms face no costs of external finance, this evidence suggests that the internal capital market does not allocate resources efficiently." MAKSIMOVIC and PHILLIPS (2002) do not use Compustat segment data but rather construct segment-level observations by aggregating Census plant-level data at the firm-industry level. The authors show that a segment's sales growth is negatively (positively) correlated with the other segments' productivity if the segment's sales growth at the industry level is lower (higher) than that of the firm's median segment. In both studies, identification comes from cross-sectional variation in segments' industry qs and sales growth, respectively.

Overall, the existing evidence on internal capital markets seems inconclusive. While some studies suggest that internal capital markets do not operate efficiently, others suggest the opposite. With few exceptions, existing studies rely on Compustat segment data, meaning their results must be interpreted with some caution. Studies that do not use Compustat segment data provide suggestive but not causal evidence of spillovers from one division to another. Finally, studies based on specific shocks are mostly industry studies using small samples.

Capital and Labor Reallocation within Firms

In GIROUD and MUELLER (2015a), we try to address many of the shortcomings listed in the previous paragraph. For one, we do not use Compustat segment data but rather confidential plant-level data provided by the U.S. Census Bureau's Census of Manufactures (CMF) and Annual Survey of Manufactures (ASM), respectively. Second, we use a large sample: almost 300 000 plant-year observations. Third, we study plausibly exogenous shocks to plant-level investment opportunities allowing a relatively tight identification, which includes plant fixed effects (to control for time-invariant plant characteristics) and MSA \times year fixed effects (to control for time-varying shocks in the plant's vicinity.)

The objective of our study is to shed light on the efficient internal capital markets hypothesis. As discussed previously, this hypothesis posits that HQ can create value by actively reallocating scarce resources within the firm:¹

Thus, for example, if a company owns two unrelated divisions A and B, and the *appeal of investing in B suddenly increases*, the argument would seem to imply that investment in A would decline – even if it is positive NPV at the margin – as corporate headquarters channels relatively more of its *scarce* resources toward B (STEIN, 1997, italics added).

To obtain exogenous variation in the “sudden increase in the appeal of investing in a plant,” we use the introduction of new airline routes that reduce the travel time between HQ and plants. GIROUD (2013) uses this source of variation to study whether proximity to HQ affects plant-level investment. The idea is that a reduction in travel time makes it easier for HQ to monitor a plant, give advice, share knowledge, etc., raising the plant’s marginal productivity and thus making investment in the (treated) plant more appealing. Consistent with this idea, Giroud finds that a reduction in travel time leads to an increase in plant-level productivity and investment.

The main benefit of using travel time instead of geographical proximity is that plant location is endogenous. By contrast, holding plant location fixed, variation in travel time is plausibly exogenous with respect to plant-level outcomes. A second benefit is that travel time constitutes a more direct proxy for the ease of monitoring. For example, a plant may be located far away from HQ, yet monitoring may be easy, because there exists a short direct flight. Conversely, a plant may be located in the same state as HQ, yet monitoring may be costly because it involves a long trip by car.

In our study, we use the “sudden increase in the appeal of investing in a plant” as a starting point and ask whether it leads to a reallocation of resources within the firm. Theory predicts that HQ should withdraw resources from existing plants only if the firm is financially constrained. (Note the emphasis on *scarce* resources in Stein’s quote.) Accordingly, we separately examine financially constrained and unconstrained firms. We also examine whether, to provide the treated plant with resources, HQ selectively “taxes” some plants more than others. We finally examine whether the reallocation is beneficial for the firm as a whole, as argued by the efficient internal capital markets hypothesis.

The main identification challenge comes from local shocks at the plant level. For instance, suppose a plant is located in a region that experiences an economic

1 In other words, HQ reallocates budgets or funds, which then translate into an allocation of resources (capital and labor) among the firm’s projects and divisions.

boom. As a result, HQ may find it more attractive to invest in the plant. By the same token, airlines may find it more attractive to introduce new routes to the plant's location. Thus, local shocks may be driving both plant-level investment and the introduction of new airline routes. Fortunately, we can control for such local shocks by including a full set of MSA \times year fixed effects. The fixed effects are identified because not all local plants have their HQ in the same region.

Controlling for local shocks also matters with regard to the firm's other (that is, non-treated) plants. In particular, it implies that a decline in resources at these plants is not simply due to an adverse local shock that might have affected the plants anyway, i. e., if they had been stand-alone entities. Thus, controlling for local shocks allows us to address a key premise of the theory of the firm, namely, that combining different projects under one roof creates an interdependence among otherwise unrelated projects.

Our plant-level results support the hypothesis that HQ reallocates scarce resources across plants. For financially constrained firms, we find that investment and employment both increase at the treated plant, while they both decline at other plants within the same firm. Indeed, the increase at the treated plant is of similar magnitude as the decline at the other plants: investment (employment) at the treated plant increases by \$ 186 000 (five employees), while it declines by \$ 179 000 (six employees) at all other plants combined. In contrast, we find no evidence of investment or employment spillovers among plants of financially unconstrained firms.

If HQ actively reallocates scarce resources across plants, then the increase in investment and employment at the treated plant and the decline at the other plants should occur around the same time. This is indeed the case: the increase at the treated plant and the decline at the other plants both begin about one year after the treatment. Moreover, we find no pre-existing differential trends, strengthening a key identifying assumption underlying our difference-in-differences analysis.

While the firm's other plants experience a decline in resources, the average spillover effect is relatively weak. There are several reasons for this. First, the amount of resources needed to "feed" the treated plant – and thus the amount HQ must take away from other plants – is relatively modest. Second, this amount is divided among many other plants, implying that the average amount that is taken away from any individual plant is small. Indeed, when we focus on firms that have relatively few other plants, the spillover effect becomes much stronger. Third, the average spillover effect is likely to be noisy. Presumably, HQ does not "tax" all of the firm's other plants equally: while some plants may experience a large drop in resources, others may experience none. To examine this hypothesis,

we look at various plant characteristics. We find that HQ is more likely to take resources away from plants that are relatively less productive, not part of the firm's core industries, and located far away from HQ. When we focus on these plants, we again find that the spillover effect becomes much stronger.

Our main measures of financing constraints are the KZ index (KAPLAN and ZINGALES, 1997) and the WW index (WHITED and WU, 2006). In robustness checks, we additionally use the SA index (HADLOCK and PIERCE, 2010), debt-to-cash flow ratio, investment in excess of cash flow, and whether firms have a credit rating. These measures have been designed to capture financing constraints, so we naturally interpret our results in this light. Still, it is conceivable that the resource reallocation occurs for reasons unrelated to financing constraints. To a certain extent, this issue can be addressed by looking at financially unconstrained firms. For instance, suppose the treated plant produces the same type of output as the firm's other plants, while the firm's total output volume is given by its market share, which is fixed in the short run. Then, if the firm produces more at the treated plant, it must produce less at the other plants. While this creates an interdependence among plants, the mechanism causing it is unrelated to financing constraints. However, in this case, we should also observe a decline in resources at other plants of financially *unconstrained* firms. (Essentially, such plants constitute a "placebo group".) We do not observe any such decline, however, suggesting that the likely reason why HQ withdraws resources from existing plants is precisely because the firm is financially constrained.

Looking at financially unconstrained firms does not help if our measures of financing constraints proxy for other variables that are (economically) unrelated to financing constraints but nevertheless affect the resource reallocation within the firm. While we cannot rule out this possibility completely, we can address specific alternative stories. For instance, our measures of financing constraints are uncorrelated with productivity measures. Thus, our results are unlikely to be driven by differences in productivity. Another possible candidate is firm size. While some of our measures of financing constraints are correlated with firm size, others are not, including the KZ index, debt-to-cash flow ratio, and investment in excess of cash flow. Thus, our results are also unlikely to be driven by differences in firm size.

In the final part of our study, we consider the aggregate (or net) effect at the firm level. For financially constrained firms, we find that the aggregate effect on investment and employment is essentially zero, consistent with our plant-level results showing that the increase at the treated plant is of similar magnitude as the decline at the other plants. By contrast, the aggregate effect on investment and employment at financially unconstrained firms is strictly positive. Given

that these firms exhibit no (negative) spillovers among their plants, this is not entirely surprising.

A key premise of the efficient internal capital markets hypothesis is that the resource reallocation is overall beneficial: while resources may be taken away from projects that have a positive NPV at the margin, they are channeled toward other projects whose investment prospects are even better. To investigate this issue, we consider the aggregate effect on productivity at the firm level. Doing so also helps us distinguish the efficient internal capital markets hypothesis from alternative stories. For example, the resource reallocation may be the outcome of lobbying by managers of the treated plant, who suddenly find it easier to lobby for a larger budget given that their travel time to HQ is reduced. While such lobbying efforts can explain why the treated plant gains at the expense of other plants – provided the firm is financially constrained – they are unlikely to yield an increase in overall firm-wide productivity. However, regardless of which productivity measure we use, we find that overall firm-wide productivity increases.

We finally consider other sources of funding. Our plant-level results suggest that financially constrained firms fund the expansion at the treated plant entirely by reallocating internal resources. Therefore, when looking at other sources of funding, we would expect to see no changes. By contrast, financially unconstrained firms do not reallocate internal resources. Accordingly, we would expect to see changes in other sources of funding at these firms. Indeed, we find that financially unconstrained firms fund the expansion at the treated plant by issuing debt and drawing down cash reserves, while financially constrained firms exhibit no significant changes in their cash, short-term debt, long-term debt, or equity positions.

Directions for Future Research

Our study (GIROUD and MUELLER, 2015a) shows that following a positive shock to investment opportunities at one plant, investment and employment increase at the treated plant while they both decline at other plants within the same firm. An interesting question our study cannot address is to what extent workers are physically transferred across plants. That is, HQ reallocates budgets or funds, which then translate into allocations of capital and labor. Hence, our results are consistent with either workers being physically moved across plants or some plants hiring new workers and others laying off workers. Presumably, workers are physically transferred only if the plants are close to one another, albeit that is ultimately an empirical question. To shed light on this issue, one would need to have access

to employer-employee matched data, such as those provided by the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) database.

Another question that remains unanswered by our study is whether internal capital markets create value *relative* to external capital markets. As I argued previously, this question lies at the heart of the broader issue of what determines the boundaries of the firm. While our study shows that internal capital markets operate fairly well – capital and labor are shifted toward plants whose investment opportunities have improved – it cannot say whether they operate “more efficiently” than external capital markets would have. To tackle this question, however, one needs to overcome the ubiquitous endogeneity problem that has plagued the internal capital markets literature ever since the first studies on the diversification discount have come out. That is, one would need to find plausibly exogenous variation in the decision to join a multi-unit firm, which is arguably challenging.

Finally, an interesting yet virgin research territory is the role of internal capital markets for the macro economy. If shocks are propagated from one establishment (region) to another, does this dampen or amplify macroeconomic volatility? Consider an adverse local shock, such as the drop in local consumer demand during the Great Recession studied by, e. g., MIAN and SUFI (2014) and GIROUD and MUELLER (2015b). For one, affected establishments or regions may suffer less, as their local shock is “shared” with other establishments or regions. On the other hand, previously unaffected establishments or regions may now be affected. Overall, the aggregate implications of such capital and labor reallocations are entirely unclear.

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Macroprudential Policy and Credit Supply

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SUMMARY

In this paper we analyze financial crises and the interactions of macroprudential policy and credit. Financial crises are recurrent systemic phenomena, often triggering deep and long-lasting recessions with large reductions in aggregate welfare, output and employment. Importantly for policy, systemic financial crises are typically not random events triggered by exogenous events, but they tend to occur after periods of rapid, strong credit growth. Moreover, a credit crunch tends to follow in a financial crisis with negative aggregate real effects. Macroprudential policy softens the credit supply cycles, with important positive effects on the aggregate real economy in crisis times.

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In 2007, the United States and Western Europe were overwhelmed by a financial (notably banking) systemic crisis, which was followed by a severe economic recession. This sequence of events was not unique: financial crises are recurrent systemic phenomena, often triggering deep and long-lasting recessions with large reductions in aggregate welfare and employment (REINHART and ROGOFF (2009)). In fact, systemic financial crises are typically not random events caused by exogenous events, but they tend to occur after periods of rapid credit growth in conjunction with other financial imbalances – notably real estate price bubbles (ALLEN and GALE, 2007; SCHULARICK and TAYLOR, 2012; GOURINCHAS and OBSTFELD, 2012).

Conditional on a financial crisis, these *ex-ante* debt booms are associated with higher *ex-post* systemic costs, both within the financial sector (e.g., bank failures) and in the economy at large (e.g., large unemployment or poverty, large fiscal costs, and even political extremism).¹ Their damaging real effects have generated a broad agreement among academics and policymakers that financial regulation needs to get a macroprudential dimension that aims to lessen the negative externalities from the financial to the macro real sector, as in a credit crunch in a financial crisis caused by the weakening in banks' balance-sheets (both bank capital and liquidity crunch).

Therefore, it is important for policy makers, academics and even citizens to understand the *ex-ante* determinants of credit booms and their *ex-post* consequences of credit crunches, and how public policy can ameliorate the likelihood and costs of financial crises. This paper offers a summary on some benefits and costs of some macroprudential policies from a book that I co-authored with Xavier Freixas and Luc Laeven on “Systemic Risk, Crises and Macroprudential Policy” (published last year by MIT Press) and a forthcoming paper at the *Journal of Political Economy* on “Macroprudential Policy, Countercyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments,” co-authored with Gabriel Jiménez, Steven Ongena and Jesús Saurina.

A key message that I want to convey here is that, in order to limit systemic risk effects, it is crucial to reduce excessive debt – leverage levels and acceleration – in times of growth, and to reduce the costs to the economy of excessive debt in times of crisis (mainly because debt is non-contingent, i. e., defaults and renegotiations are difficult).

1 See, for example, BERNANKE (1983) and REINHART and ROGOFF (2009).

What Is Macroprudential Policy?

Macroprudential policy limits systemic risk over the financial cycle, including a preventive, ex-ante role for the build-up of systemic risk, where systemic risk is the risk of threats to financial stability that impair the functioning of a large part of the financial system with significant adverse effects on the broader economy. Because systemic crises arise from the build-up of financial imbalances (mainly leverage booms) in the financial sector, the ex-ante prevention of excessive risk-taking (not just ex-post crisis management and resolution) should be a crucial objective of public policy, in particular of macroprudential and banking policies.

Moreover, systemic risk normally arises from ex-ante correlated risk choices by individual financial intermediaries and non-financial borrowers (i. e., endogenous systemic risk), not because of risks outside of the financial system (i. e., exogenous risk). Therefore, ex-post crisis interventions, such as central bank liquidity injections via expansive monetary policy or government recapitalizations (bailouts) fail to address the root causes of the systemic crisis, and can even cause higher ex-ante risk-taking via moral hazard, thereby increasing the likelihood of a systemic financial crisis. Nevertheless – while ex-post policies are important to support the liquidity and capital positions of financial institutions and non-financial borrowers (households and firms), the flow of credit to the real economy, and asset prices in crisis times – macroprudential policy applied in booms should be the crucial line of defense to combat systemic risk.

A key question for policy is therefore why excessive endogenous build-ups of debt occur in the first place, both in the financial sector and among non-financial borrowers. There are mainly two root causes. The first is excessive risk-taking in booms mainly by agents (households, banks and firms) being guided by behavioral finance, i. e., not fully rational thinking, such as being overoptimistic in good times, neglecting tail risks with limited memory of previous crises.² The second explanation for the credit and asset price bubbles is poor incentives for excessive risk-taking (moral hazard) of banks and other financial intermediaries which arise from very large leverage and strong explicit and implicit government guarantees (in the extreme case it is like going to a casino to play in order to

2 Yet some of the fluctuations in the preferences for risk-taking can be fully rational, as in habit-formation models, where good times make financial intermediaries and non-financial borrowers less risk-averse; they thus take excessive risks in their search for yield.

privatize the gains but, to a large extent, spreading out the losses among society, which leads to a clear and excessive gambling strategy for the player).³

It is important to stress that depending on which one is the most important view of the determinants of excessive risk-taking, optimal public policy will be different. For example, higher bank capital requirements would have positive effects, whether one subscribes to the root cause by increasing buffers in a crisis or not. However, it is mainly in the moral hazard view that higher capital requirements would also reduce ex-ante excessive risk-taking.

Credit (debt, leverage) booms have the strongest ex-ante correlation with the incidence of financial crises in the empirical literature analyzing large historical and cross-country episodes of systemic financial crises. Conditional on the occurrence of a crisis, they increase the negative effects of the crisis upon the real economy. Credit booms, however, can also result from (and promote) sound economic fundamentals and, therefore, be part of the equilibrium growth path, without contributing negatively to systemic risk. For example, research has shown that since the 1970s two-thirds of the credit booms did not produce financial crises. Therefore, it is essential on real time to identify the determinants of the bad (as opposed to good) credit booms that cause financial instability.

Financial crises can be highly damaging not only for the financial system but also for the real economy, as the impairment of the financial system reduces the intermediation of savings to the real economy and the deleveraging of financial institutions puts undue pressures on asset prices and credit flows. Additionally, financial crises tend to follow periods of high leverage for households and non-financial firms, and the ensuing debt overhang problems reduce aggregate consumption and investment. Moreover, a decline in aggregate demand feeds back into the financial system by depressing asset prices and collateral values, creating a vicious cycle in which weaknesses in the financial sector and real economy reinforce each other.

Financial crises not only have a strong immediate negative impact on aggregate output and employment, but their negative effects tend to persist over a prolonged period of time, with a recovery to pre-crisis levels of economic activity and wealth often taking several years. A crucial question is therefore what explains the persistency of these financial shocks. Why is it that several countries today have still not recovered to their pre-crisis levels of GDP per capita? Country experiences in handling financial crises have been met with mixed success, with government

3 Most banks have a capital structure with more than 95 % in debt (whereas the typical non-financial firm in US has less than 33 %), and also have deposit insurance, central bank liquidity and bailouts as guarantees from the taxpayers.

policies sometimes aggravating rather than alleviating problems. Some government policies only target the financial system, such as the creation of a bad bank or bank recapitalization, whereas other policies are more macro oriented, including expansive monetary and fiscal policies. Expansive policies may be beneficial to minimize the short-term impact of a crisis, but have important intergenerational consequences and may plant the seeds for the next bubble.⁴ Other policies, such as forcing banks to hold more capital, may be more effective in good times rather than in crisis times. Structural public policies can also play an important role in restoring financial and economic stability, for instance, policies that foster a more diversified financial system or that increase the flexibility of labor markets.

The real costs of financial crises can be measured in terms of output losses, increases in unemployment, asset prices, fiscal costs associated with bank support measures, and increases in public debt. In the book, and in here, we abstract from the social costs associated with loss of employment and debt overhang problems. Output losses and the increase in public debt capture the overall real and fiscal implications of the crisis.

The costs of financial crises are conditional on potential policy actions taken and are therefore not directly comparable in a strict sense. Also, realized costs do not include taxpayer money put at risk to contain the crisis (including from government guarantees on bank liabilities and subsidized deposit insurance), nor do they capture any wealth transfers associated with accommodative macroeconomic policies to save the banking system (e.g., from creditors to debtors via inflation or low interest rates, or from young to old via increases in public debt).⁵

What Are the Transmission Channels in a Financial Crisis?

The financial system performs several important functions for the real sector. Therefore, its overall impairment creates several substantial costs for firms and households – for example, ensuring the smooth functioning of the payment system, risk sharing, and saving products. The main transmission channel from financial sector distress is the impairment of the allocation of funds from savers to firms for investment and to households for consumption. This allocation of funds mainly takes the form of bank credit, though in some countries, such as

4 See, for example, BERNANKE and GERTLER (1995), BERNANKE and BLINDER (1992), ECB (2009), and ALLEN and ROGOFF (2011).

5 See the book and the references therein for a large and important literature on the costs of financial crises.

Germany and Japan, banks also take equity stakes in firms. Moreover, in some countries financial markets constitute important alternative sources of finance, which are very useful for firms in need of external finance when the banking sector is in distress.

A reduction in credit is an important negative spillover from financial crises (BERNANKE and LOWN, 1991). Credit is reduced in a crisis partly because of lack of credit demand as economic perspectives are worse and thus investment opportunities and consumption needs are reduced. However, as firm cash flows are lower in crisis times, the need for external finance in a bust can be higher. Moreover, as collateral and asset prices are lower, agency costs of borrowing are higher, and therefore credit is reduced despite a potential demand for credit. This is also known as the (firm or household) balance sheet channel effect.

Furthermore, systemic crises tend to follow periods of strong credit growth and increasing leverage. Debt overhang problems associated with the crisis and a collapse in asset prices may thus lead to a reduction of aggregate investment and consumption and also reduce access to external finance. Likewise, there may be a strong reduction in risk appetite by financial intermediaries and investors, thus decreasing access possibilities to external finance especially in the case of risky projects, including those needed for a strong recovery of economic growth. Finally, although firms and households may continue to have a positive demand for credit and to be solvent, they may not be able to obtain the necessary credit because bank illiquidity and insolvency may create a reduction of the supply of credit, namely a credit crunch. Contagion within the financial system can further aggravate bank capital shortages and liquidity problems, with funding and market liquidity problems reinforcing each other. In extremely severe systemic crises, the financial system can be so impaired that it is no longer able to perform its main function of attracting savings and channeling them to their most productive use to support investments and consumption, thus implying large real costs.

Banks collect private information from borrowers to make valuable relationship loans, thereby enhancing borrowers' welfare. This information would be lost if banks fail. For example, as we show in our book, there is evidence showing that firms with closer relationships to their banks benefited from easier access to credit from their banks during the Korean financial crisis of 1997. Bank failures therefore create negative externalities for the failed bank's clients through an increase in borrowing cost or credit rationing.

Moreover, firms that lose their main bank relationship during the crisis may suffer disproportionately because surviving banks are at an informational disadvantage and will therefore be reluctant to lend to such firms, especially when

these firms are small and opaque. Problems in the banking system thus change production decisions of borrowers and this has real effects.

A large empirical literature has shown that financial conditions have real consequences, as we show in our book. For example, there is evidence that the US banking crisis during the Great Depression reduced the efficiency with which credit was allocated, and that the resulting higher cost and reduced availability of credit acted to reduce domestic output by depressing aggregate demand. Though less studied, the real consequences of the European banking crisis in 1931 might have been equally worse, following the collapse in Vienna of Kreditanstalt, which was taken over by the Austrian government. This shook people's confidence not only in other Austrian but also in German banks and was followed by a number of bank failures and corporate bankruptcies which resulted in high unemployment in Germany.

There is also micro level evidence. For example, JIMÉNEZ et al. (2012) analyze the credit crunch in the 2008 crisis in Spain using a dataset consisting of loan applications. To establish a causal link between bank balance sheet strength and credit supply, they focus on the set of loan applications made in the same month by the same borrower to different banks of varying balance-sheet strengths. Within this set of loan applications, for which the quality of potential borrowers is constant, they study how economic conditions that affect the granting of loans vary with bank capital and liquidity conditions. Moreover, they analyze whether firms that get rejected in their initial loan application can undo the resultant reduction in credit availability by successfully applying to other banks. (If that was the case, then it would imply that the real effects associated with credit crunches are minimal.)

They find that lower GDP growth reduces the probability that a loan application is granted, particularly during crisis times. The negative effect on loan granting is statistically stronger for banks with low capital, implying that a bank capital crunch leads to a credit crunch. They also find that firms that get rejected in their initial loan application cannot undo the resultant reduction in credit availability by applying to other banks, especially in periods of tighter economic conditions.

All in all, both excessive credit booms and credit crunches in financial crises are damaging for systemic risk. Some key instruments (that I want to highlight) to reduce excessive leverage in booms and to reduce the costs in the real economy once the crisis arrives are respectively: (i) eliminating or reducing the debt tax shields in favor of debt over equity (debt interest payments over dividends), or in buying versus renting houses (as it happened in Spain during the crisis); (ii) increasing bank capital as in Basel III; (iii) loans without full recourse as in most states in US; (iv) expansive monetary policy via conventional reduction

in monetary short-term interest rates and some unconventional policies such as quantitative easing and reducing long-term interest rates (these expansive policies favor debtors over creditors); (v) allowing more loan defaults (including household, bank and country bankruptcy procedures, which are slowly progressing); (vi) countercyclical capital requirements (even the dynamic provisioning from the Bank of Spain); and (vii) maybe potential bailouts of borrowers and lenders, though this should be the last line of policy. It is important to stress that these policies are fiscal via changes in taxes or bailouts and that some unconventional monetary policies increase the risk of losses for the central bank more indirectly, or require less taxpayer funds in the case of higher bank capital (and thus higher bank buffers to withstand a crisis or a potential reduction in crises as bank shareholders lose much more in case of excessive risk).

Finally, some public policies on the European level are advancing, notably the Banking Union, where we have progress on reducing the risk of bailouts of banks by taxpayers by increasing bail-in principles, as we saw in the resolution of the Cyprus crisis. This will reduce the diabolic loop of banks-sovereign problems. There are still limitations in the current banking union, notably on deposit insurance, whereas there has been strong progress on the ECB being the common supervisor. Moreover, there are other interesting policies in Europe. For example, the Macroeconomic Imbalance Procedure is a surveillance mechanism that aims to identify potential risks early on, prevent the emergence of harmful macroeconomic imbalances and correct the imbalances that are already in place, notably external, such as current account deficits and strong capital inflows, as well as internal, such as excessive credit booms and real estate price acceleration.

All in all, at both the local and international level, we need better public policy – a combination of banking, macroprudential, monetary and fiscal policies – to reduce the likelihood and negative consequences of financial crises. In the rest of this paper, I want to concentrate on countercyclical capital requirements, with some evidence from Spain, to analyze in detail how macroprudential policy can affect credit supply and in turn the real economy.

Macprudential Policy in Action

As credit cycles are key for systemic risk, time-varying macroprudential policy tools can be used to address these cyclical vulnerabilities in systemic risk.⁶ Under the new international regulatory framework for banks – Basel III – regulators agreed to vary minimum capital requirements over the cycle, by instituting countercyclical bank capital buffers (i. e., pro-cyclical capital requirements), which aim to achieve two macroprudential objectives at once. First, boosting equity or provisioning requirements in booms provides additional (countercyclical) buffers in downturns that can help mitigate credit crunches. Second, higher requirements on bank own funds can cool credit-led booms, either due to the higher cost of bank capital or because banks internalize more of the potential social costs of credit defaults (via lower moral hazard by having more “skin in the game”).

Countercyclical buffers could hence lessen the excessive pro-cyclicality of credit, i. e., those credit cycles that find their root causes in banks’ agency frictions. Smoothing credit supply cycles will cause positive firm-level real effects if bank-firm relationships are valuable and credit substitution for firms is difficult in bad times.

Despite the attention now given by academics and policymakers alike to the global development of macroprudential policies, no empirical study so far has estimated the impact of a time-varying macroprudential policy tool on the supply of credit and the associated spillovers on real activity in both good and bad times. JIMENEZ et al. (2015) attempts to fill this void by analyzing a series of pioneering policy experiments with dynamic provisioning in Spain: From its introduction in 2000:Q3, and change in 2005:Q1 during good times, to its later performance when a severe (mostly unforeseen) crisis shock struck, thus allowing a test of the countercyclical nature of the policy, and also the changes in bad times (the two reductions in 2008:Q4 and in 2009:Q4, and an ad hoc increase in provisions in 2012:Q1 and Q2). These shocks coupled with unique bank-, firm-, and loan-level (and loan application) data allow for identification.

Dynamic provisions – called “dynamic” as they vary over the cycle and “statistical” or “generic” as a formula is mandating their calculation – are forward-looking: Before any credit loss is recognized on an individual loan, a buffer (i. e.,

6 This last section summarizes JIMÉNEZ, ONGENA, PEYDRÓ and SAURINA (2015). Macroprudential policy, countercyclical bank capital buffers and credit supply: Evidence from the Spanish dynamic provisioning experiments. Mimeo. UPF. Forthcoming at the Journal of Political Economy.

the dynamic provision fund) is built up from retained profits in good times to cover the realized losses in bad times (i. e., when specific provisions surpass its formula-based average over a credit cycle). The dynamic provision fund has a regulatory ceiling and floor. The required provisioning in good times is over and above the specific loan loss provisions and there is a regulatory reduction of this provisioning in bad times, when bank profits are low and new shareholders' funds are costly to obtain. Dynamic provision funds are now Tier-2 regulatory capital. Hence, dynamic provisions are pro-cyclical, thus constituting countercyclical capital buffers to be used in crisis times.

The policy experiment in good times that JIMENEZ et al. (2015) focus on is the introduction of dynamic provisioning in 2000:Q3, which by construction entailed an additional non-zero provision requirement for most banks, but – and this is crucial for the estimation purposes – with a widely different formula-based provision requirement across banks. Next, the authors analyze the countercyclical workings of the dynamic provision funds built up by the banks as of 2007:Q4 following the crisis shock in 2008:Q3. The authors also follow a series of policy experiments in bad times, i. e., the sudden lowering of the floor of the dynamic provision funds from 33 to 10 % in 2008:Q4 and to 0 % in 2009:Q4 (that allowed for a greater release of buffers for many banks). Given that the overall pre-crisis level of provisions was relatively low (1.25 % of total credit) and basically depleted in 2011, the 2012 increase in provisioning that banks needed to make was based on their exposure to construction and real-estate firms to clean up their balance sheets.

To identify the availability of credit and the associated real effects, JIMENEZ et al. (2015) employ a comprehensive credit register that comprises bank-firm level data on all outstanding business loan contracts and balance sheets of all banks collected by the supervisor, in conjunction with firm-level data from the Spanish Mercantile Register. The authors calculate the total credit exposures by each bank to each firm in each quarter, from 1999:Q1 to 2013:Q3, a time period which allows us to study the impact of dynamic provisions along a full cycle, with an unexpected crisis in the middle. The paper analyzes changes in committed credit volume, on both the intensive and extensive margins, and also credit drawn, maturity, collateral and cost, and also uses the granting of loan applications made by firms to new banks to analyze substitution effects. Depending on their credit portfolio, banks were differentially affected by the various policy experiments. Therefore, the authors perform a difference-in-differences analysis where they compare before and after each shock differently affected banks' lending at the same time to the same firm. Though the authors analyze the same bank (-firm) before and after the shock, in robustness they further control for

up to 32 bank variables and key bank-firm and loan characteristics. They also exploit differences across various subsamples, components of the risk formula, and regulation (i. e., foreign branches in Spain were not regulated with respect to dynamic provisioning). Finally, by matching credit with firm balance sheets and the register on firm deaths, they also assess the effects on firm-level total assets, employment and survival.

In good times JIMENEZ et al. (2015) find that banks that have to provision more cut committed credit more to the same firm after the shock – and not before – than other banks. These findings also hold for the extensive margin of credit and for credit drawn, maturity, collateral, and credit drawn over committed (an indirect measure of the cost of credit). Hence, pro-cyclical bank capital regulation in good times contracts credit supply.

These findings are robust. For example, first, the authors apply the new provision formula to each bank's credit portfolio in 1998:Q4, well before any discussion on the policy had taken place, rather than in 2000:Q3, when dynamic provisioning became compulsory. Second, they exclude banks of direct interest to policy-makers, i. e., the savings or the very large banks, as policy-makers capable of accurately predicting the heterogeneous changes in bank credit could have devised the formula to maximize its impact. Third, to allay any remaining endogeneity concerns, they exploit the opposite implications of the formula related to bank risk and also assess how unregulated foreign branches react as compared to what regulated foreign subsidiaries or domestic banks do. Fourth, to understand the economic channel, they analyze how credit responds to realized overall provisions instrumented with the formula-based provisioning. Fifth, by using firm observables, firm fixed effects or no firm controls, they assess the degree to which the credit supply shock is orthogonal to observed and unobserved demand fundamentals.

But are firms really affected in good times? JIMENEZ et al. (2015) find mostly not. Though total committed credit availability by firms drops immediately following the introduction of dynamic provisioning, three quarters afterwards there is no discernible contraction of credit available to firms, as firms easily substitute credit from less affected banks (from both new banks and banks with an existing relationship). Consistently, the authors find no impact on firm total assets, employment, or survival.

Yet, while average firms are not significantly affected, there are important changes in the allocation of credit supply. After the policy shock, banks with higher requirements focus their credit supply more to firms with a higher ex-ante interest paid and leverage, and with higher ex-post default, thus suggesting that higher capital requirements may increase bank risk-taking and searching-for-yield.

This may be an unexpected but likely unintended consequence of this regulatory intervention. Moreover, the negative impact of higher requirements on credit is stronger for smaller firms and banks, which struggle more to absorb the shock.

In bad times things look very different. Banks with higher pre-crisis dynamic provision funds, stemming from policy, increase their supply of committed credit to the same firm permanently over the whole period 2009–10 (i. e., capital buffers mitigate the credit crunch). Similar findings hold for credit continuation, drawn and drawn over committed (i. e., implying a lower cost of credit), and again for numerous alterations in specification and instrumentation (as for example instrumenting pre-crisis buffers with initial policy provisioning from 2000). Results, moreover, suggest that the mechanism at work is through saving capital in crisis times, when profits and shareholder funds are scarce and costly. In addition, banks with dynamic provision funds below ceiling (and hence that benefited most from the lowering of the floor in 2008:Q4 and in 2009:Q4 as they can immediately release capital funds) increase their credit supply only in the quarters around the policy changes. These banks also tighten maturity and collateral, possibly to compensate for the higher risk taken by easing volume.

Strikingly different in bad times (from good times) is that the changes in bank-firm level credit are binding at the firm-level; credit availability permanently contracts more for those firms that borrowed more from banks that, when the crisis hit, had lower dynamic provision funds stemming from policy. Results with granting of loan applications show that firms cannot substitute for lost bank financing. Consistent with this, the authors find that firm total employment and survival are negatively affected as well. The estimates also imply economical relevancy. Firms dealing with banks holding 1 percentage point (pp) more in dynamic provisioning funds (over loans) receive 9 pp more in committed credit than when dealing with other banks, have a 6 pp higher growth in the number of employees and a 1 pp higher likelihood of survival. In sum, banks with higher capital buffers, stemming from the stricter regulatory requirements in good times that can be drawn down in bad times, partly mitigate the deleterious impact of the financial crisis on the supply of credit and the associated real effects.

Compositional changes in credit supply are again important. Bank risk-taking also differs between higher pre-crisis capital buffers versus softer requirements on lowly capitalized banks. In the latter case, more credit is supplied to more levered firms and firms with long-term (client) relationships, consistent with risk-shifting strategies related to zombie lending or gambling for resurrection. Hence, real and risk-taking effects are not the same when the regulator increases requirements in good times to have higher buffers in bad times, than when she simply reduces them in bad times. Also the positive effects on credit from countercyclical buffers

are lower when bank non-performing loans and leverage ratios are higher, thus suggesting a binding market constraint for weaker banks.

Finally, JIMENEZ et al. (2015) analyze the increase in provisions in 2012 that banks had to make based on their lending exposure in 2011 to construction and real-estate firms. The impact on credit supplied to firms not in construction or real-estate is immediate and binding (again, the granting of loan applications shows that credit substitution is difficult). These firms are subsequently negatively affected in their survival. Firms that dealt with banks that, on average, face 1 pp more tightening in requirements suffer a contraction of at least 4 pp in committed credit availability and a 1 pp of survival. Significant effects occur only after the policy change and not before. Moreover, the credit crunch is softer by lowly capitalized banks with high NPLs ratios and for firms with worse credit history and profits, consistent with risk-shifting by the banks more affected by the policy.

Conclusions

All in all, responding to the urgent interest among policymakers and academics, JIMENEZ et al. (2015) is the first empirical paper to actually estimate the impact of a macroprudential policy on credit supply cycles and their associated real effects. The robust evidence shows that countercyclical bank capital buffers mitigate cycles in credit supply and have a positive effect on firm-level aggregate financing and performance. In bad times switching between banks is difficult, thus firms will be more affected by capital shocks. Hence, the aggregate level of capital and its distribution across banks matters. Tightening capital requirements in bad times is much more contractive for credit and real output than it is in good times. Building up capital buffers before the crisis is superior in terms of maintaining real activity and avoiding risk-shifting than changing requirements (for lowly capitalized banks) during the crisis, as the evidence from the floor reductions in 2008–09 and the increase in 2012 suggests. However, a capital tightening in good times can induce both risk-taking by regulated banks (that supply more credit to firms with higher both ex-ante yield and leverage and ex-post defaults) and regulatory arbitrage by non-regulated and regulated-but-less-affected banks.

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Capital Markets Union in Europe: Why Other Unions Must Lead the Way

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JEL-Classification: G01, G15, F34

Keywords: Capital Markets Union, financial market integration, sovereign risk

SUMMARY

Government bond markets in the Euro Area are highly fragmented causing further fragmentation in bond and equity markets. Capital Markets Union with fully integrated capital markets across member countries can only work when the status of member country sovereign bonds as risk-free assets is restored. Banking Union and fiscal union are both required for this outcome. However, the Banking Union remains an unfinished project without an European deposit insurance framework and there is little consensus at the moment for a fiscal union in the Euro Area. It appears thus that the fate of the Capital Markets Union solely rests with the European Central Bank in the near to medium term.

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Market Segmentation in Sovereign Bond Markets

Starting with the financial crisis in 2008–2009, European capital markets became increasingly fragmented. This process accelerated with the deepening of the sovereign debt crisis in Europe in 2011. A notable example is the government bond market, which is not only the largest capital market in Europe but is also critical for the functioning of other capital markets: Government bonds used to be the safe assets needed to facilitate transactions and price securities.

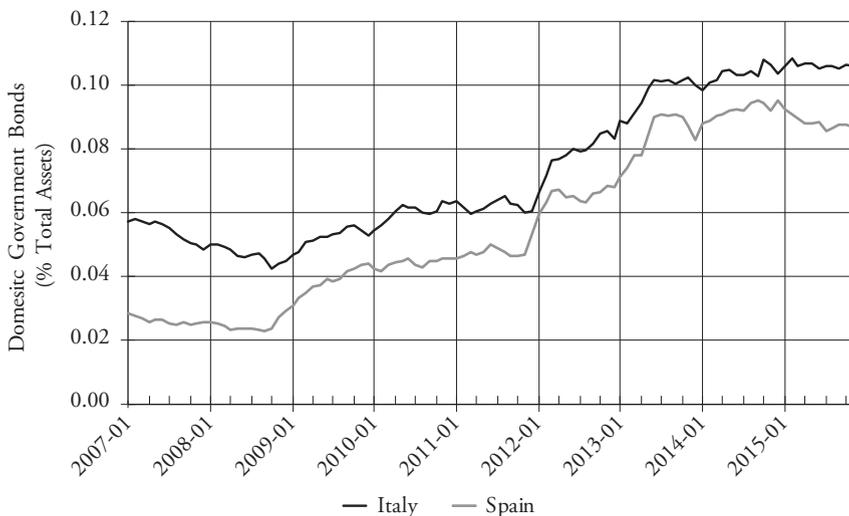
However, the massive public sector debt overhang – that was to some extent caused by financial sector bailouts and recovery programs – sparked doubts about the ability of some countries to repay their debt. Yield spreads of peripheral countries (Greece, Italy, Ireland, Portugal and Spain, GIIPS henceforward) to German federal bonds (bunds) widened and investors retrenched to their home market. The empirical literature has documented different reasons for this “home bias”: (1) moral hazard of weak GIIPS banks to buy domestic government bonds (ACHARYA and STEFFEN, 2015), (2) financial repression, where governments pressure domestic banks to buy their debt during turbulent economic times (BECKER and IVASHINA, 2014); and (3) banks as buyer of last resorts during crises, where weak banks buy domestic sovereign debt positively correlated with other sources of revenue (CROSIGNANI, 2015).¹ Sovereign debt became entrenched to banks’ balance sheets causing large losses when sovereign debt deteriorated in 2011 and the first half of 2012.²

Figure 1 strikingly shows the increase in home bias over time. We plot Italian and Spanish banks’ domestic government bond holdings relative to banks’ total assets using data obtained from the European Central Bank (ECB) that include all monetary financial institutions in both countries. At the same time, yields on Italian and Spanish sovereign bonds were substantially increasing (Figure 2). They diverged further from, e. g., German bunds, whose yields were even decreasing due to elevated demand when investors were scrambling for high-quality assets in a “flight-to-quality”.

1 In a German setting, BUCH et al. (2014) show that weakly capitalized German banks also hold more domestic sovereign bonds.

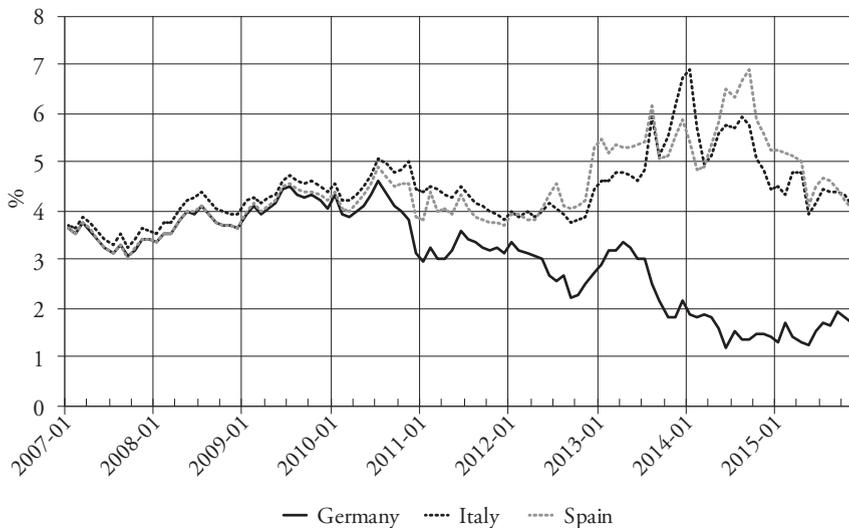
2 Short-term investors also ran on banks with large exposures to sovereign debt (ACHARYA, PIERRET and STEFFEN, 2016).

Figure 1: Home Bias



Source: European Central Bank

Figure 2: Sovereign Bond Yields



Source: Datastream

Spillovers into Other Capital Markets

The problems in the government bond market eventually spilled over into other capital markets. Sovereign default risk as well as concerns regarding the stability of the Euro Area increased home bias in other capital markets in that there emerged substantial country factors in the pricing of equity and corporate bond markets. The elevated sovereign risk increased the cost of capital of peripheral country firms that continued to diverge from the cost of capital of similar core European companies.

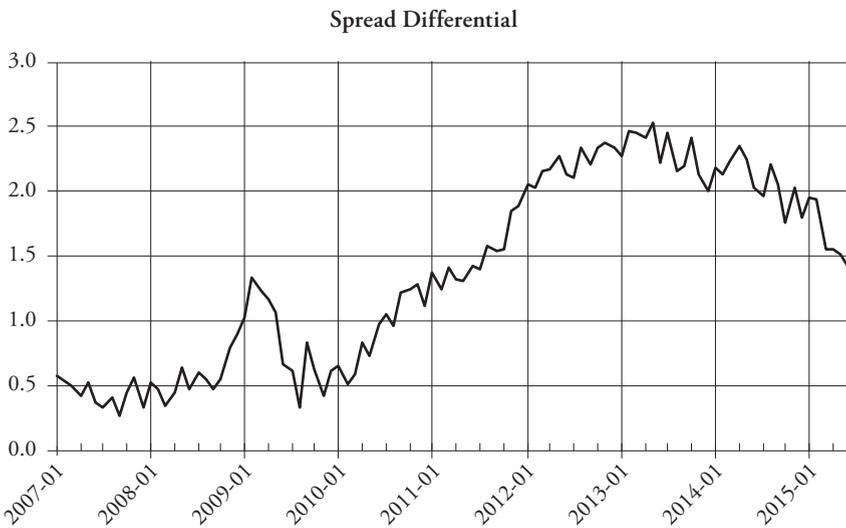
To illustrate this, we show the emergence of the spread differences on newly issued loans in Europe (Figure 3). We obtain data from the ECB and plot the spreads on new loans issued to non-financial firms in GIIPS countries and Cyprus (GIIPS+C) relative to spreads paid by German firms since January 2007 in the first graph. The second graph shows the loan spread differential as the difference of spreads paid by firms in GIIPS countries and Cyprus and Germany. Both figures suggest that loan spreads in peripheral countries started to increase relative to Germany at the end of 2009 and diverged even further in the fall of 2011 and the first half of 2012 when the Euro crisis deepened.³

ALMEIDA et al. (2016) also provide evidence how sovereign impairments affect corporate bond markets. In particular, they show that highly rated firms (those that are better rated compared with their sovereigns) are more affected by a sovereign rating downgrade compared to firms that are already lower rated than their domestic sovereign. That is, they experience a larger increase in cost of debt capital compared to lower rated firms. Moreover, and given the elevated risk of being downgraded themselves, highly rated firms reduce debt issuances and leverage and increase issuing equity. However, given adverse market conditions around sovereign downgrades, an increase in equity issuance cannot offset the reduction in debt financing resulting in a reduction in investment activity.

A functioning Capital Markets Union (CMU) should not feature such spillovers and to ensure that, it needs a level-playing field in the holding and transacting of debt and equity securities by market participants in different countries. That is, a CMU with fully integrated capital markets can only work when the

3 The increase in loan spreads is directly linked to the increase in funding costs of the banking sector in the peripheral countries. In its quarterly report about the Euro Area, the European Commission showed that funding costs of peripheral banks were two to four times as high compared to funding costs of German banks in 2011 and the first half of 2012 (EC, 2015). ACHARYA et al. (2015) also show that low-risk banks reduced loan spreads of customers relative to high-risk banks after the ECB implemented the full allotment principle in October 2008.

Figure 3: Loan Spread Difference



Source: European Central Bank

status of sovereign bonds as a risk-free asset is restored and the risk-free rate across Euro Area countries is equalized.

The Importance of Other Unions to Capital Markets

a. The Banking Union

European leaders have started a series of reforms that will reshape the financial architecture of the Eurozone and that are crucial for the CMU to work. The “Banking Union” (BU) that has been agreed on in June 2012 and started with the introduction of the Single Supervisory Mechanism (SSM) in November 2014 was an important step in this direction. BU consists of three pillars: (1) the SSM, (2) the Single Resolution Mechanism (SRM) and (3) a European Deposit Insurance Scheme.

The “traditional view of banking” is that banks’ liabilities are effectively risk-free (and this, in fact, was our understanding until the global financial crisis started in August 2007). The reason is three-fold. First, government bonds are risk-free and banks are the largest owner of domestic sovereign debt. Second, depositors are insured preventing bank runs. Third, banking regulation ensures that banks are adequately capitalized. These factors contributed to the development of a European interbank market, in which banks lend to each other, short-term, without any collateral. That allowed the ECB to conduct its monetary policy at a single interbank market rate.⁴

The financial crisis revealed the shortcomings of this concept in the context of an (incomplete) monetary union. Government bonds are not risk-free across the Eurozone. As banks’ balance sheets were bloated with government bonds, the increase in sovereign risk also further increased solvency risk of Eurozone banks (ACHARYA, DRECHSLER and SCHNABL, 2014). Moreover, regulation was not harmonized across Euro Area countries. There were differences in deposit insurance frameworks causing deposit flights from peripheral to core European banks. Similarly, there were differences in accounting standards and banking regulation across countries. Bank insolvency was a national problem and regulators were inclined to exercise leniency to avoid a collapse of its banking system facilitating the rise of zombie banks and firms in the peripheral countries.

4 The ECB only needs to make sure that banks have sufficient liquidity to meet their reserve requirements on aggregate, and the interbank market ensures that banks that need liquidity can borrow from banks that have abundant liquidity.

The BU is supposed to address these shortcomings. All banks are directly or indirectly under the same supervision using the same set of rules and regulation (SSM). A banking collapse should not become a national (i. e. sovereign) problem that increases sovereign risk because of national government bail-outs (SRM). The BU should also reduce sovereign-bank linkages and forbearance by national regulators. In particular, BU can help ensure that banks in different countries are all adequately capitalized and do not have incentives to entrench balance-sheets with risky domestic government debt, in turn imposing discipline on domestic fiscal authorities. In other words, BU is crucial for CMU to work.

b. The Fiscal Union

CMU also needs a fiscal union that completes the European monetary union. While one aspect of fiscal union is budgetary discipline and eventually ceding some sovereignty to a European authority, another important aspect is the ex-post risk-sharing arrangement across Euro Area countries when a member country is in distress.⁵

The problems without having risk-sharing arrangements in place became obvious in 2011 and 2012, when yields on GIIPS sovereign bonds increased because investors were concerned with the solvency of the governments and whether countries remain part of the monetary union. The private sector involvement (PSI) in the attempt to solve the Greek debt crisis and the eventual haircut of private investors by 53.5% intensified concerns that investors on Eurozone sovereign bonds would not be repaid in full even when other countries supported these bonds, which segmented sovereign bond markets even further. The increase in sovereign bond yields amplified solvency concerns of the sovereigns, and, in absence of a BU, also the solvency risk of the banking system, which reinforced the solvency risk of the sovereign.

In turn, country specific factors began to have a substantial impact on both equity and bond markets and, consequently, on real economic activity in these

5 An analysis different from ours suggests an alternative that, according to the authors, does not require a fiscal union. BRUNNERMEIER et al. (2011) propose the use of "European Safe Bonds" (ESBies). ESBies pool existing sovereign bonds and create a risk-free security that can be used as collateral in private repo transactions as well as by the ECB. However, such as securitization structure requires a risky junior tranche and might even additionally require a credit enhancement (i. e. a guarantee) that is provided by paid-in capital from the different sovereigns. The junior tranche has to be purchased by investors outside the banking system. It is unclear, however, how many investors are willing to buy the junior tranche. That is, ESBies will likely depend on further public sharing as well.

countries. A fiscal union is therefore crucial to ensure that capital markets are not adversely affected by individual country-level risks. Moreover, a fiscal union may not suffice by itself as banks in different countries also need to play on a level-playing field in capital markets. Taken together, the BU and fiscal union are both necessary to build a functioning CMU.

The Role of the ECB: Making-up for a Lack of Political Union

The ECB is at the center stage of the Eurozone crisis, particularly because of the lack of commitment of national governments with respect to further integration and to address the above mentioned shortcomings of the financial architecture of the monetary union.

Currently, the BU also remains an unfinished project. Several core-European countries have refused to implement the common deposit insurance framework. Limited committed funding to deal with bank insolvencies also compromises the requirement that national governments and taxpayers are insulated (ex post) from banking collapse in the future. In other words, the BU has not been able to fully address the sovereign-bank “doom loop” (see Figure 1).⁶ However, the new role of the ECB as single regulator of the European banking system is an important first step into this direction.

The ECB had to step in as “lender of last resort” (LOLR) on different occasions, notably, for the first time, implementing the full allotment of liquidity in October 2008, and with the 3-year Long-Term-Refinancing-Operations (LTRO) in December 2011 and February 2012. The ECB was able to reduce funding liquidity risk as LOLR (ACHARYA et al., 2015; ACHARYA, PIERRET and STEFFEN, 2015). However, the LTROs further distorted government bond markets by giving banks’ liquidity to increase their domestic sovereign bond holdings that further segmented the government bond market. At the same time, the ECB reduced the collateral requirement for central bank repo transaction including also low-rated government bonds.

6 Moreover, the BU was implemented to deal with future crises, not to mutualize the bad (legacy) assets that banks have accumulated during the pre-crisis period. The ECB has performed a comprehensive assessment ahead of the start of the SSM, in which it analyzed banks’ portfolios using a harmonized set of rules such that any capital shortfall can be addressed by each country individually and all banks are adequately capitalized at the start of the ECB. Whether the ECB has been successful in recapitalizing the Euro Area banking system can be questioned (compare, e. g. ACHARYA and STEFFEN (2014a, b)).

After European leaders agreed to the BU, ECB President Mario Draghi declared on July 26, 2012, during a conference in London that he will do “whatever it takes” to preserve the euro. The ECB announced outright purchases of sovereign debt in secondary bond markets and the parameters of the OMT program in the following months. A key provision requires countries to participate in a financial support program from the European Stability Mechanism (ESM) and to comply with the required reform efforts. Instead of providing liquidity to the banking system, the ECB announced to purchase assets directly acting as a “Buyer of Last Resort” (BOLR). Sovereign bond yields of peripheral countries compressed substantially following the announcement because of a reduction in sovereign default risk (e.g., because of the conditionality and required reform efforts) as well as a reduction in segmentation and redenomination risk (KRISHNAMURTHY, NAGEL and VISSING-JORGENSEN, 2015).

Lower sovereign bond yields also reduced the risk of the banking system. In fact, it implicitly recapitalized the banks holding massive amounts of sovereign bonds and reduced banks’ incentives to hold sovereign debt potentially reducing the sovereign-bank loop (ACHARYA, PIERRET and STEFFEN, 2016). Figure 1 suggests that the OMT program did decelerate the increase in home-bias but did not reverse it. However, foreign investors appear to have started purchasing peripheral sovereign bonds suggesting that markets have become more integrated.

While the national governments were hesitant to push for further integration, the ECB “artificially” created two aspects important in a fiscal union with the OMT program. First, distressed countries cede some sovereignty when applying for ESM financial assistance. Second, when purchasing the bonds, the ECB effectively introduces risk-sharing among Euro Area countries since in the event of the ECB making losses on these bonds, it will likely be recapitalized by stronger countries in the Eurozone. The convergence of sovereign yields in the Eurozone suggests that the ECB effectively moved closer to making government bonds a “safe” asset. In turn, this has helped restore conditions for a CMU in the Eurozone.

Conclusion

A functioning Capital Markets Union needs a Banking Union and a fiscal union to work. First steps have been made with the start of the Banking Union, the implementation of the Single Supervisory Mechanism and the Single Resolution Mechanism. European leaders, however, do not seem to have the political will to enforce more integration both with respect to completing the deposit insurance

part of the Banking Union and to pursuing fiscal union. In fact, arrangements such as the Private Sector Involvement created further segmentation.

The European Central Bank (arguably within the mandate to pursue its monetary policy objective) introduced the Outright Monetary Transactions program which increased integration among Eurozone member countries. Sovereign yields in the Euro Area started to converge, an important step for Capital Markets Union. It is uncertain, however, whether this arrangement can be a viable, long-term solution, so that in the long run only completion of the Banking Union process and a movement towards fiscal union are likely to create a sustainable Capital Markets Union.⁷

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7 The ECB is not an elected government and OMT has already been challenged in open court.

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