



Credit, Labor Formality and Firm Size:

**Analytical Framework and
Regional Evidence in the
Context of the IDB's Country
Strategy Dialogue**

Alejandro Támara

**Inter-American
Development Bank**

Department of Research
and Chief Economist

TECHNICAL NOTE

No. IDB-TN-627

March 2014

Credit, Labor Formality and Firm Size:

**Analytical Framework and Regional Evidence in
the Context of the IDB's Country Strategy
Dialogue**

Alejandro Támara



Inter-American Development Bank

2014

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Támola, Alejandro.

Credit, labor formality and firm size : analytical framework and regional evidence in the context of the IDB's country strategy dialogue / Alejandro Támola.

p. cm. — (IDB Technical Note ; 627)

Includes bibliographic references.

1. Credit. 2. Informal sector (Economics)—Employees. 3. Business enterprises—Size. I. Inter-American Development Bank. Department of Research and Chief Economist. II. Title. III. Series.
IDB-TN-627

<http://www.iadb.org>

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.

The unauthorized commercial use of Bank documents is prohibited and may be punishable under the Bank's policies and/or applicable laws.

Copyright © 2014 Inter-American Development Bank. All rights reserved; may be freely reproduced for any non-commercial purpose.

Abstract¹

This work summarizes the results from a series of papers prepared within the framework of the project “Credit, Formalization, and Firm Growth.” Those papers were prepared to help inform the overall policy dialogue and the IDB’s technical assistance work with its borrowing members, particularly in regard to financing the lending programs of small and medium enterprises (SMEs). The main results can be summarized as follows: i) a positive association between formality and credit conditions in the region appears to be empirically relevant but dependent on idiosyncratic conditions and unevenly distributed conditional on firm size; ii) the positive associations between credit conditions and other measures of firm performance (such as size, growth, and investment) appear to be heterogeneous conditional on firm size; and iii) the empirical assessment of the links between formal credit and the various measures of firm performance may benefit from considering alternative sources of funding such as internal funds.

JEL classifications: E2, J2, O4

Keywords: Credit, SMEs, Labor formality, Firm growth, Latin America

¹ This technical note was undertaken as part of the IDB project “Credit, Formalization, and Firm Growth.”

1. Introduction

The relationship between domestic credit market imperfections, formal employment, and firm growth are key issues in Inter-American Development Bank (IDB) lending programs as well as in the Bank's policy dialogue with its borrowing members. For instance, the goal of many policy-based loans (PBLs) underpinning financial market reforms is to mitigate financial market imperfections in the borrowing country in order to promote financial deepening and, hence, boost the growth of domestic firms and formal employment. Likewise, many loans geared towards micro, small and medium enterprise financing programs also have the implicit goal of helping those firms expand by mitigating the effects of domestic financial market imperfections on their growth. Good knowledge of how these variables are interconnected in practice is key for the effectiveness of these lending operations, the Bank's policy dialogue with country authorities, and the design of sound country strategies.

As widely documented in the 2010 edition of the Bank's Development in the Americas Report (DIA), slow productivity has been at the heart of Latin America's lagging growth performance relative to other emerging markets, notably in Asia. Two key factors lie behind this weak productivity performance. One is widespread informality of firm ownership and labor relations (broadly defined as evasion of labor and tax laws). The other is limited financial deepening and its flip-side, costly financial intermediation. Both factors have been shown to curb technological innovation and product diversification, thereby limiting the scope for economies of scale and leading to a misallocation of capital and labor towards less-productive informal firms. These effects, in turn, put domestic firms at a competitive disadvantage vis-à-vis their foreign peers and tend to lower potential output growth in these economies, thus limiting the room for non-inflationary growth once demand pressures strengthen. Moreover, as informality reduces national tax bases, governments try to compensate by levying higher tax rates on formal business, which further undermines the competitive edge of formal firms and creates disincentives to formalize. This tends to engender a vicious circle revolving around higher tax rates, corrupted tax collection systems, and informality.

Currently, credit growth in most of emerging Latin America is recovering rapidly from the trough of the recent crisis. In some cases, this recovery has been very rapid, raising questions about its sustainability and inflationary spin-offs. As a result, the issue of how this new wave of credit is being allocated and what its effects are is a timely one.

Against this background, the present work aims to summarize the results from the series of papers from the project “Credit, Formalization, and Firm Growth” in order to achieve a better understanding of the impact of credit growth on the nature of employment (formal/informal) and on firm size, and assist in the policy dialogue and technical assistance work of the IDB with its borrowing members, particularly with respect to financing the lending programs of small and medium enterprises (SMEs).

In this line, the present work is structured as follows. In the next section we discuss the related literature providing a general framework for the papers from the project “Credit, Formalization, and Firm Growth.” Sections 3 and 4 summarize the project's results on labor informality and firm size, respectively. Section 5 presents a summary of the results by country. Finally, Section 6 presents the main conclusions of the project.

2. Related Literature

2.1 Formality and Financial Conditions

In a setting of imperfect observability and enforcement, a firm’s level of compliance with regulations and taxes can be seen as the outcome of an optimization process. In this framework, firms choose a level of compliance with taxes and regulations after considering the associated costs and potential benefits—a process analogous to the selection of the appropriate combinations of alternative factors of production such as labor, land, and machinery. The benefits of operating within the realm of formality are given by the access to public goods (protection of property rights, use of the judiciary system, and better enforcement of contractual obligations), potential access to larger and more profitable markets, and access to external financing from formal institutions. On the other hand, the costs of operating within formality relate to higher entry and operating costs associated with taxes and regulations (including labor regulations).

In turn, informal firms face the opposite situation as considered by La Porta and Shleifer and (2008), Loayza (1996), Friedman et al. (2000), Almeida and Carneiro (2009), and Dabla-Norris, Gradstein and Inchauste (2008), among others. The costs of informality involve limited access to public goods (protection by the legal system) and markets, diseconomies of scale, and limited access to external financing from formal institutions—usually at relatively high costs. Moreover, informal firms face some specific costs, such as fines and relatively higher and/or

more frequent bribes. Conversely, the main benefits from operating within informality relate to unpaid taxes, avoidance of regulations, and the use of more flexible labor relationships.

Early models of informality paid marginal attention to financial market imperfections. Within this models are Loayza (1996), and Yamada (1996). Loayza (1996) develops a model of endogenous growth with formal and informal sectors where government spending contributes to increasing firms' productivity by providing public goods, to which informal firms have only partial access. In that model, the relative size of the informal sector depends negatively on the levels of government effectiveness and the benefits of having access to public goods. Yamada (1996) explores a model with three sectors, two tradable sectors and one urban informal sector (non-tradable), where workers self-select themselves into the informal sector based on their entrepreneurial abilities. A more recent model dealing with informality—still with no explicit modeling of financial frictions—is in Dabla-Norris, Gradstein and Inchauste (2008), where the quality of the legal system, the effectiveness of legal enforcement, and the regulatory burden (all elements affecting the affecting the efficiency of a financial system) have an impact on the size of the informal sector.

The explicit modeling of the links between informality and financial conditions is less frequent. In this line, Straub (2005) uses a CGE model to deal with the problem of the distribution of firms between formal and informal sectors in a context of explicit restrictions in financial markets.² In this model firms have to pay a fixed cost to enter the formal financial sector—which allows for ex-post income verifiability as opposed to the situation in informal segments where true income remains unverifiable. This setup of asymmetric information, limited enforcement, and entry costs leads to differential access to formal and informal credit markets, with firms being forced into informality due to insufficient initial assets and high entry cost.³ Low initial assets, high entry costs, and relatively inefficient formal credit markets push more firms into forced informality or make it more profitable to remain in the informal sector. Another model in this line is in Gordon and Li (2009), who introduce a different approach with a model where the government needs to rely on the information available from bank records in order to identify taxable entities and to measure the amount of their taxable activity. In this setup, more

² The model is an extension of Holmstrom and Tirole (1997).

³ Initial assets affect the amount the firm borrows and enters the lender's break-even constraint.

efficient financial markets lead to more firms using formal financial services in spite of the associated fiscal costs.⁴

At the empirical level, there are few works exploring these concepts. Two empirical papers conceptually close are Dabla-Norris and Koeda (2008) and D’Erasmus and Moscoso Boedo (2012). Dabla-Norris and Koeda (2008) use data on 41 countries (mostly developing and transition countries in America, Europe, and Asia) and 4,000 companies taken from the World Bank’s World Business Environment Survey (WBES). The authors construct a measure of informality based on responses to an indirect question about hidden output, and a measure of credit rationing based on a question regarding the level of difficulty in obtaining financing.⁵ The authors use an ordered probit to estimate the share of informal sales in a particular industry. The estimates indicate that for every category of the ordered probit, the probability of having a given percentage of informal sales is increasing in the reported level of perceived financing constraints. In particular, firms that report that financing is a major obstacle have a 16 percent probability of having informal sales of over 51 percent sales, while for firms reporting that financing is not an obstacle the predicted probability of having informal sales of over 50 percent is 7.6 percent. Dabla-Norris and Koeda (2008) also compute the marginal effects and find that for firms with a relatively low (high) predicted share of informal shares—in the 11-20 percent (51 percent and over) range—a discrete increase in the perceived financial constraint can change the fraction of informal sales by 0.2 percent (0.7 percent). The two main weak points in Dabla-Norris and Koeda (2008) are noted by the authors. First, all the firms in the survey are registered firms, which ignores firms that are completely unregistered (particularly small firms) and therefore creates a problem of sample selection. Second, the way the questions in the survey are phrased may introduce a bias towards the perceived average behavior of other firms in that environment.^{6,7}

⁴ Gordon and Li (2009) introduce the efficiency gains as a parameter expanding output for firm using the services of the financial sector (a_j in their notation, where j represents a given sector).

⁵ The survey avoids asking firms to reveal their evasion. Instead, it uses the following question: “Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical firm in your area of activity keeps “off the books”? The optional answers range from zero (“none at all”) to “more than 50%” in 10-point increments. In turn, the measure of financing constraint is based on the answers to the question “How problematic is financing for the operation and growth of your business?”, with the optional answers no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4).

⁶ Therefore, the data may not provide a good approximation to the distribution of informal sales across registered firms.

Conceptually much closer to the papers dealing with informality within the framework of the project “Credit, Formalization, and Firm Growth” is D’Erasmus and Moscoso Boedo (2012). This work departs from the standard econometric approach and calibrates a general equilibrium model for the US economy, which considers in particular a measure of efficiency in the financial sector (bankruptcy costs, comprising the costs of bankruptcy procedures and the average recovery rates as reported by the World Bank’s Doing Business survey). The resulting calibrated model matches the estimated distribution of formal and informal establishments for size and age, and approximates the distribution of small firms. Furthermore, the authors simulate the effects on informality (and other relevant variables) from changing the bankruptcy costs to those observed for Lower Middle Income Countries. The calibration indicates that this change would reduce output per worker by 13 percent and increase informality from 7.8 percent to 27.1 percent of the labor force.

Thus, the theoretical literature suggests that firms have greater incentives to formalize their operations as financial conditions improve (lower transaction costs, higher efficiency, less credit rationing). However, in addition to the arguments linking formality to credit conditions, it is also important to pay attention to the factors that may dampen the empirical relevance of such links. One aspect to consider is that formalization costs can typically begin to be incurred long before a firm may gain access to external funding, and these costs will continue to be present whether or not the firm gains access to them; this opens two elements affecting the cost-benefit analysis driving the response to a given change in credit conditions. First, the further away in the future are the benefits, the lower is the present discounted value of formalizing—and therefore the more unlikely that the firm would benefit from formalizing.⁸ Second, the firm is uncertain about the moment at which it will start capturing the benefits from formalization, and also the uncertainty about the size of the benefits increases the further away these benefits are in the future—thus, risk-averse decision-makers would tend to formalize less in the presence of this

⁷ An additional problem is that the authors assume that the questions regarding credit problems offer a meaningful measure of credit rationing

⁸ The present discounted net benefit from formalizing can be written as

$$PDVF = (t = t_f, T) = \sum_{t=t_f}^T \left[\frac{1_{\tau}(t) \cdot BF_t(t_f) - CF_t(t_f)}{\prod_{t=t_f}^T (1+r_t)} \right] \text{ where } t_f \text{ indicates the period at which the firm formalizes, } T \text{ is}$$

the period at which it ceases its operations, r_t is the relevant discount factor at each period in time, $BF_t(t_f)$ indicates the benefit in period t from formalizing at t_f , $CF_t(t_f)$ is the cost in period t from formalizing at t_f , and $1_{\tau}(t)$ is the indicator function (taking the value of 1 whenever $t \in \tau$, and 0 otherwise), and τ indicates the periods over which the benefits will take place.

type of uncertainty. Another related factor is that formality may be a necessary but not sufficient condition for accessing external financing; more precisely, informality can be a factor precluding firms from accessing adequate external financing, but formality may not be such a relevant factor in the decision to grant a loan (private information, collateral, and reputation are likely to be far more important factors than formality for that decision).⁹ Also important is the fact that the relative importance of the associated costs and benefits change over time with economic policies and conditions.¹⁰ In sum, more research is needed both at the theoretical and empirical level in relation to the links between credit and formality, and in particular on how it can be affected by idiosyncratic conditions.

Box 1. Labor Formality and Domestic Credit in Latin America: Preliminary Evidence

Section 3 of this work presents the results of the country studies carried out within the project “Credit, Formalization, and Firm Growth.” This box presents preliminary evidence of a relationship between domestic credit and (labor) formality in Latin America. Using data for 14 countries over the period 2004-2011, the table below shows the results of the estimation of the specification $f_{i,t} = \beta_0 + \beta_1 Credit_{i,t} + \beta_3 X_{i,t} + \varepsilon_{i,t}$, where f indicates the proportion of formal employment (defined as workers with rights to pensions when retired) in country i at year t ; $Credit$ is domestic credit to private firms relative to GDP, and X stands for a set of varying controls: per capita growth (proxy for internal funds), registration costs (proxy for the incentives to maintain informal workers), legal rights (proxy for the benefits of formalizing), and finally for a set of country dummies. All controls are lagged one period, and standard errors are clustered at the country level.

Columns (1) to (5) show the alternative specifications. In all cases, domestic credit to private firms turns out to be statistically significant. The coefficients indicate that improved financial conditions are associated with higher levels of labor formality. The size of the coefficient remains relatively stable after controlling for internal funds, benefits of formalization, incentives to remain informal, and idiosyncratic country characteristics (the relatively small number of observations restricts the simultaneous use of all the regressors). Table 1 thus provides a preview of the results presented in Sections 3 and 5.

⁹ Moreover, the legal requirements firms must meet to have access to formal credit markets are not uniform across countries.

¹⁰ This is, the present discounted net benefit from formalizing can be alternatively written as $PVDF = \left(t = t_f, T, \{\Omega\}_{t=t_f}^T \right) = \sum_{t=t_f}^T \left[\frac{1_{\tau(t).BF_t(t_f, \Omega_t)} - CF_t(t_f, \Omega_t)}{\prod_{t=t_f}^T (1+r_t)} \right]$, where notation is as in the previous footnote and Ω_t indicates overall economic conditions (economic conditions are likely to affect the wage gap between formal and informal workers, the value at which the firm can sell its products, and other relevant variables).

Table 1. Labor Formality and Credit in Latin America: Preliminary Evidence

	(1)	(2)	(3)	(4)	(5)
Domestic cred. priv. sector.	0.506***	0.514***	0.427**	0.471***	0.579***
Per capita growth		-0.13302			
Registration costs			-0.03605		
Legal rights				1.475***	
Country fixed effects					yes
obs.	77	77	77	77	77

Source: author's calculations. Data sources: SEDLAC (UNLP) and World Development Indicators (World Bank). Dependent variable is the proportion of formal employment at the country level (formality defined as salaried workers with right to pensions when retired, SEDLAC). "Registration costs" is the cost of business start-up procedures (% of GNI per capita); "legal rights" is Strength of legal rights index (0=weak to 10=strong). RHS variables are lagged one year. Countries covered are Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Mexico, Peru, Paraguay, El Salvador, Uruguay, Venezuela. Period covered is 2004-2011. Panel regressions, clustered standard errors (country level). *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% respectively.

2.2 Firm Size and Financial Conditions

The initial exploration in the literature of the determinants of firm size was relatively more focused on technological and institutional factors, and has gradually paid more attention to financial factors. Technological arguments cover various aspects, including market size and the distribution of productive factors. Market size probably ranks among the most cited technological factors affecting firm size (tracing back to David Ricardo and Adam Smith, and more recently in Campbell and Hopenhayn, 2005, and Campbell, 2011), and it is a common argument often raised when discussing the merits of trade agreements. Also within the technological arguments, some theories point to the distribution of productive factors, in particular those related to human capital, as is the case of Lucas (1978), which pins down the link between capital-labor ratios and firm size to a pre-existing distribution of managerial talents among workers. Other arguments point to institutional and contractual factors. Within these are those theories resting on informational asymmetries, transaction costs, and limited enforcement as elements determining the size of a firm (Klein, Crawford and Alchian, 1978; Williamson, 1985; Grossman and Hart, 1986). Among additional institutional factors, regulations and taxes can influence optimal firm size.

Another set of explanations is that establishing a relation between firm size and financial conditions. These explanations—present in La Porta et al. (1997), Rajan and Zingales (1998), and Kumar, Rajan and Zingales (1999)—posit that the availability of external funds can be a relevant factor affecting firm size distribution, including the rates at which firms entry and exit the market. This last point is what makes the theoretical prediction ambiguous, since improved financial conditions would foster the emergence of new (and arguably smaller) firms, while at the same time would allow existing firms to expand and stay active for longer periods.

Turning specifically to the empirical results regarding firm size and financial conditions, Kumar, Rajan and Zingales (1999) find that the size of industrial firms tends to be larger in countries with more developed financial systems.¹¹ Coluzzi, Ferrando and Martínez-Carrascal (2009) attempt to deal with the problem of credit rationing and firm growth; they first estimate the probability of experiencing credit rationing using WBES data and then apply the estimated parameters to data from Amadeus—a much larger dataset.¹² The authors interpret their results as showing that the predicted probability of facing financing constraints has a negative effect on the growth rate of firms in five European countries. Angelini and Generale (2008) follow a similar strategy to that of Coluzzi, Ferrando and Martínez-Carrascal (2009) to estimate the effects of financial constraints on firm size (number of employees) using private data collected by a financial institution (Mediocredito).¹³ They use the responses in the survey to create a dummy variable identifying financially constrained firms, and they incorporate this variable into the regression analysis as a determinant of the growth rate in the number of employees (by firm). They find that, on average, the presence of financial constraints reduces firm growth by 0.8 percent. Beck et al. (2008) try to estimate causal effects of financial development on growth

¹¹ The work uses data on industrial firms from 15 European countries. The quantitative results indicate that an increase in a country's financial development from the 25th percentile to the 75th percentile results in the difference in log average size (measured as the weighted number of employees per firm in each industrial sector under consideration) between firms in industries at the 75th percentile amount-financed-externally and firms in industries at the 25th percentile of amount-financed-externally to increase by approximately 9 percent of the inter-quartile range of size.

¹² As per the official descriptions: "The World Business Environment Survey (WBES) is a survey of over 10,000 firms in 80 countries and one territory conducted in 1999-2000 that examines a wide range of interactions between firms and the state. Based on face-to-face interviews with firm managers and owners, WBES is designed to generate comparative measurements in such areas as corruption, judiciary, lobbying, and the quality of the business environment, which can then be related to specific firm characteristics and firm performance."

¹³ The survey covers 1,100-1,800 Italian manufacturing firms with less than 50 employees, for 1992-1995 and 1998-2001, who are asked to report difficulties in financing their last investment project.

relying on instrumental variable and GMM regressions;¹⁴ the results indicate that an exogenous 10 percent increase in the ratio of private credit to GDP can induce an acceleration of the per capita growth rate on the order of 0.24-0.32 percentage-point (0.9-1.0 pp from a 10 percent increase in the ratio of commercial banks' assets to the combined assets of commercial banks plus the central bank, and 0.16-0.26 pp from liquid liabilities to GDP). Beck, Demirgüç-Kunt and Maksimovic (2008) consider the effect of financial development on the relative growth of small-firms industries and adapt the methodology of Rajan and Zingales (1998); they conclude that the estimates support the hypothesis that small-firm industries grow relatively faster in economies with deeper financial markets.

Overall, both the theoretical and empirical literatures have paid relatively more attention to the possible impact of financial conditions on the various dimensions of firm size distribution than to links with formality.¹⁵ The theory in this area points to the presence of opposing effects regarding the average size of firms in the economy. On the one hand, improved financial conditions would allow firms to expand, and also to better withstand negative shocks, thus establishing a positive relationship between financial conditions and firm size. On the other hand, a more efficient and developed financial system would make easier for new firms to enter the market—therefore dampening the size of the initial positive relationship between financial conditions and firm size. The previous empirical evidence suggests that, on average, the positive effects are likely to outweigh the negative ones and improved financial conditions would be linked to an increase in the average firm size (see Table 2). However, the bulk of the research has been focused on economies with relatively well-functioning financial systems, where large and frequent shocks are the exception rather than the norm. Therefore, further research focused on less developed and more unstable economies can provide valuable information.

¹⁴ The GMM dynamic panel estimators are specifically designed to address the econometric problems induced by unobserved country-specific effects and joint endogeneity of the explanatory variables in lagged-dependent-variable models.

¹⁵ Table 2 presents a quick summary of theoretical predictions and empirical results.

Table 2. Summary of Theoretical Predictions and Empirical Results

	Labor formality and credit	Firm size and credit
Theoretical prediction	Positive association: improved financial conditions are linked to higher levels of labor formality	Ambiguous prediction: opposing forces
Empirical evidence	Scant, but supporting the theoretical prediction	Most results indicate a positive association: factors increasing firm size appear to outweigh those reducing it

Box 2. Firm Size and Domestic Credit: Cross-Country Results for New Firms and Self-Employment

As noted above, the theory linking firm size to credit conditions points to the presence of opposing effects, which in part come from the entrance of new firms into the marketplace, and the relocation of workers. This box shows the results of using cross-country data for 101 countries during 2005-2009 to explore the links between credit conditions, entry of new firms, and self-employment.

Table 3 below shows the results of estimating the following equation $y_{i,t} = \alpha_0 + \alpha_1 Credit_{i,t} + \alpha_2 percapita\ growth_{i,t} + \alpha_3 inflation_{i,t} + \eta_{i,t}$ where $Credit_{t,i}$ represents domestic credit to private firms relative to GDP for a country i at year t ; $percapita\ growth$ is a proxy for internal funds, and $inflation$ is used as a proxy for overall macroeconomic conditions. The LHS panel of Table 3 show the results of the estimation when the dependent variable is the proportion of new firms relative to the population aged 15-64, while the RHS panel shows the results of using the rate of self-employment as dependent variable.

The results show that domestic credit has a positive and statistically significant association with the emergence of new firms. This association remains after controlling for the effects of internal funds and macroeconomic conditions. In turn, the RHS panel of Table 3 shows that the rate of self-employment is negatively linked to the evolution of domestic credit to private firms (even after controlling for internal funds and overall macro conditions). These results suggest that increased credit availability may: i) induce higher firm entry rates and ii) move workers out of

self-employment. These results are consistent with the theories discussed above, and they provide a first empirical reference for the results described in Sections 4 and 5.

Table 3. Firm Size and Credit: Cross-Country Results for New Firms and Self-Employment

	New firms / pop. 15-64				Self-employment			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Domestic cred. priv. sector.	0.017***	0.017***	0.017***	0.018***	-0.063***	-0.071***	-0.062***	-0.072***
Per capita growth		0.035		0.034	-0.322			-0.334
Inflation			-0.032**	-0.027***			0.113	0.037
obs.	476	476	471	471	437	437	382	382

Source: author's calculations based on World Development Indicators data (World Bank).

First four columns show the results using the proportion (new firms / population aged 15-64); the second set of columns use proportion of self-employed workers as the dependent variable. "Domestic cred. priv. sector." is domestic credit to the private sector, "inflation" refers to consumer inflation (RHS variables are lagged 1 period). Data includes 101 countries over 2005-2009. Panel regressions, clustered standard errors (country level). *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% respectively.

3. Informality and Financial Conditions in Latin America

The series of papers on formality within the project “Credit, Formalization, and Firm Growth” have made a significant contribution to the empirical literature on informality and credit. The systematic, consistent, and independent replication of the methodology proposed by Rajan and Zingales (1998) to explore the problem of labor formality in Latin American countries has delivered a valuable set of methodological, quantitative, and qualitative results on which both future research and policy discussions can refer to and build upon.

This research has expanded the evidence regarding the empirical relevance of the relationship between formality and credit conditions adding results for six countries. More importantly, these cases represent relatively volatile and unstable economies, where labor informality is a significant problem and there is ample room to improve the efficiency of the financial system. The results from the series are in line with the theoretical view that the relevance of the relationship is likely to be affected by varying institutional and economic conditions. Finally, but no less important, the methodological similarities of the different papers in the series improve the comparability of the results—although the importance of the inevitable differences in coverage and definitions should not be understated. In short, the research on formality and financial conditions has provided a valuable set of quantitative references which can inform policy discussions and guide future research in the area.

3.1 The Challenge of Finding a Statistically Significant Relationship

The notion of a relationship between firm formality and credit conditions rests on a simple application of basic microeconomic principles and observed empirical regularities. The key empirical regularity is that firms use alternative funding sources to varying degrees. In particular, some firms make use of credit from formal financial institutions relatively more than others. There are multiple reasons behind this regularity, but for the present case the interest lies in the fact that—often—firms’ requests for credit are denied. In particular, sometimes such rejection is due to a lack of compliance with government regulations. Provided that this lack of compliance is (up to a point) the result of an internal decision, the effects of restricted credit access are likely to have entered in the decision process leading to such level of compliance with regulations. In other words, the (opportunity) cost of credit can be a relevant factor affecting compliance with government regulations.

These arguments need to be completed making reference to factors that may weaken the empirical relevance of the link between formality and financial conditions. Some of these potentially relevant factors are the following:

1. *Institutional conditions.* Institutional conditions affect a firm’s set of optimal decisions. Taxes, regulations, and access to public goods all affect a firm’s cost-benefit analysis and therefore have an effect on diverse outcomes such as firm size, input ratios, and investment in R&D (to name just a few). Since the mix between formal and informal workers and the selection of alternative funding sources is also part of a firm’s optimization process, it follows that institutional conditions would play a significant role in the observed distribution of formality across firms and its relationship with financial conditions. Institutional conditions can also affect the formality in a more direct ways, dictating the relative importance of complying with alternative sets of regulations; this case is clearly made by McKenszie and Sakho (2010), who point out that banks in Bolivia pay relatively little importance to the tax status of a firm, and if anything, are just concerned with whether or not firms have a municipal license.
2. *Sunk costs, forward-looking optimization, and expectations.* The decision to (partially or fully) formalize a firm’s activity is somewhat similar to the

decision to make an irreversible investment. Thus, the nature of this decision coupled with the forward-looking nature of the profit maximization process and the formation of expectations, may result in a low elasticity of formality with respect to current financial conditions.

3. *Information, observability, and reputation.* Firms are just one part of the equation. Informational asymmetries, observability problems, and reputation are significant factors affecting the allocation of credit which may swamp the marginal importance of better compliance with government regulations from a financial institution's point of view. Moreover, credit from formal institutions account for a fraction of the overall credit relationships in the economy. Failing to account for the role of self-financing (internal funds), inter-firm commercial credit and informal lending may compromise the results from the various models and estimations.

In short, these additional considerations highlight the fact that finding a stable and statistically significant relationship in the data can prove to be a challenging task, irrespective of the validity of the theoretical foundations of the hypothesis—particularly in a reduced-form framework.

3.2 Overview of Concepts and Measurements

The research on formality surveyed in this work covers Argentina, Brazil, Colombia, Mexico, Peru, and Uruguay. Each of these countries gathers data following somewhat different methodologies, making it difficult to have an exact replication of a given empirical strategy. Nevertheless, the variables involved are similar enough as to warrant reasonably valid comparison among specific country results. There are three central concepts in these analyses: firm formality, prevailing credit conditions, and the measure of “financial dependence.”

The main approach taken to measure formality in this series—given the availability of relevant data and the social and economic relevance of the concept—is to measure labor formality. There is no universal measure of labor formality, as the precise meaning from a policy perspective varies from one country to the other. The papers in the series rely mostly on two concepts to identify a given labor relationship as formal or informal. The first is by the presence

of a formal labor contract, while the second is the declaration of contributions to the social security system.

In turn, the approach taken in the series to measure prevailing credit conditions or the degree of financial development has been to rely on commonly used measures, readily available from reputable statistical sources, representing similar concepts in the various countries covered by the series. Thus, the typical measures used are commercial bank credit to the private sector, and commercial bank credit to the private sector excluding credit to families. Other credit measures used are M2/GDP, bank credit at the sector level, and the number of financial institutions in a given region (Section 5 and Annex 1 provide further detail on the measures actually used). Finally, in an effort to establish a potentially causal relationship between credit conditions and formality, the estimations include the “financial dependence” index proposed by Rajan and Zingales (1998), which—as becomes clear in the next section—occupies a central role in the empirical strategy (Box 3 gives additional details on this methodology).

3.3 The Main Empirical Specification

The central specification in the papers exploring the effects of credit conditions on formality is described by the following equation:

$$f_{jt} = \beta + \delta_t + \delta_j + \gamma [(Credit/GDP)_t \times FD_j] + \varepsilon_{jt} \quad (1)$$

where j , and t indicate sector and year; f_{jt} is the rate of formalization for sector j in year t ; δ_t and δ_j are year and sector dummies; $(Credit/GDP)_t$ is the ratio of (a particular measure of) credit to GDP and FD_j is the measure of financial dependence developed by Rajan and Zingales (1998). In order to account for potential heterogeneous effects for firms of different size, equation (1) is estimated separately for different size categories resulting in $f_{jt}^c = \beta^c + \delta_t^c + \delta_j^c + \gamma^c [(Credit/GDP)_t \times FD_j] + \varepsilon_{jt}^c$, where c identifies a particular firm size category (usually small, medium, and large). Equation (1) is essentially the main specification in Rajan and Zingales (1998), where f_{jt} (f_{jt}^c) represents formality rates rather than sector output growth rates. The central claim derived from the adoption of this specification is that γ (γ^c) would be capturing the causal effect running from the term $[(Credit/GDP)_t \times FD_j]$ to the dependent variable.

Some particulars about the validity of the “financial dependence” measure FD_j are discussed in Box 3; the use of different levels of aggregation, however, should be noted.¹⁶ More precisely, the idea behind equation (1) is that since formality is computed at the sector level and the credit ratio at the economy-wide level, then the former can be considered exogenous with respect to the latter. The point to stress here is that this is an assumption: if informality in a given sector depends on the level of aggregate informality in the economy then this assumption of exogeneity would not hold.¹⁷

Box 3. Rajan and Zingales’ (1998) Identification Approach

Rajan and Zingales (1998) suggested a methodology to gauge the causal effect of financial conditions on growth which has been later adapted to study similar relationships. The essence of the approach is the ordering of economic sectors according to their level of “financial dependence”—a measure of the reliance of a sector’s reliance of external funding to finance their investment plans. The underlying assumption is that this “financial dependence” ratio would be a deep technological parameter, and the different response of growth rates in industries with different levels of financial dependence to a given change in credit availability would be a reflection of the causal effect of credit on growth. To implement this approach, the authors combine data at different levels of aggregation (growth at sector level, credit at the country level) and compute the financial dependence ratios with data from firms operating in the United States.* Then, the authors run a regression of sector output growth ($\Delta \log y_{it}$) on the interacted term $[(Credit/GDP)_t \times FD_j]$ where $(Credit/GDP)_t$ would be a particular aggregate—such as commercial bank credit—in period t and FD_j would be the computed financial dependence ratio for industry j . The idea behind the term $[(Credit/GDP)_t \times FD_j]$ is that the effect on sector growth from changes in aggregate credit would depend on a sector’s level of dependence on external financing.

Although at first this strategy may result appealing, a closer inspection of its implementation calls for caution for various reasons:

1. There is neither a complete argument nor a proper empirical investigation behind the assumption that the estimated gap between investments and internal funds is a reflection of deep technological factors.

¹⁶ Note that f_{jt} is measured at the sector level, while $(Credit/GDP)_t$ is measured at the country level.

¹⁷ On an additional note, there are no strong a priori reasons to believe that equation (1) is the most adequate specification to capture the potential empirical relationship between credit conditions and formality.

2. It assumes that estimations with data from US industries are valid for industries in other countries—irrespective of regulations, market size, institutional and political conditions, and resource availability
3. It assumes that estimated “financial dependence” is persistent over time.
4. The “financial dependence” ratio is computed from a non-representative sample of firms in each industry.
5. The equilibrium “financial dependence” ratio is a simple average covering a few years, which is unlikely to provide valid approximations of a steady state or equilibrium value due to: i) the presence of economic and credit cycles of varying size and length, ii) the dependence of the dynamics of capital expenditures and cash flows on the characteristics of alternative cycles and iii) differences in the distribution of rates of expansion and contractions across industries in each business cycle.
6. It assumes that US financial markets are almost “frictionless” and;
7. All-in-all, these considerations call for caution at the inference stage, particularly in the quantitative aspects.

* The financial dependence measure would be given by $\frac{(\text{capital expenditures} - \text{cash flow})}{\text{capital expenditures}}$ computed at the industry level over various years (in this particular case the 1980s).

Box 4. Financial Conditions and Formality

Financial conditions. Usually in this type of research the interest lies in identifying the effect of exogenous changes in financial conditions or financial development on a particular variable. Unfortunately, assessing the situation or level of development of the financial system is difficult as there are no adequate empirical counterparts for the various concepts involved. In light of this difficulty, the literature has opted to use a series of proxies in lieu of this unobservable concept—typically commercial bank credit to GDP, M2 to GDP, or a measure of the fraction of borrowers that fails to get access to credit (among others variables also used).^{*} The common feature of such proxies is that they are outcomes which are assumed to be linked to the unobservable true concept of interest in some particular way. Thus, it is important to keep in mind two elements: i) the nature of those relationships is mostly assumed and, ii) the stability of such relationships over time and across countries is an additional assumption.

Formality. Formality refers to a firm’s level of compliance with legal regulations and tax obligations. In this sense, full informality is a rather extreme outcome most likely to appear at the level of self-employment and micro-firms. In most cases, firms would keep a (likely variable) fraction of its operations and employees off the books. The measurement problem here is apparent, as by definition informal activities are hidden from official records. The papers in the

series have opted to use an indirect method to approximate formality, relying on household or industrial surveys, or administrative data.

* The typical direct measures of credit rationing are taken from surveys in which respondents report having problems in obtaining credit (including those that are denied credit). It is important to note that such measures are very crude proxies for credit rationing since—by definition—even the most concerned and informed agents cannot appropriately discriminate between “good” and “bad” risks using both public and private information.

3.4 Overview of the Main Results

Table 4 gives an overview of the main qualitative results of the series regarding formality and credit conditions, with the results corresponding to the estimation of equation (1)—except for Colombia (see Section 5.3). Although formality definitions, size categories, and sometimes credit measures do not exactly match across the various countries, it is still possible and valid to present them together, as the concepts and measures are still highly comparable with each other.

In the table below, “Contract” and “Soc. sec.” stand for definitions of labor formality based on the presence of a formal contract, and contributions to the social security system respectively. “Tax compl.” represents the alternative definition based on tax compliance in Caro, Galindo, and Melendez (2012).¹⁸ Alternatively, “Priv. cred.” and “Firm cred.” stand respectively for credit measures based on credit to the private sector, and credit to private firms; “M2” corresponds to credit proxied by M2, and “Bank cred.” stands for bank credit relative to sector output.

The symbols in the table represent the sign and statistical significance of the estimated coefficient (γ^c) in equation 1. “+”, “++”, and “+++” indicate that the estimated coefficient is positive and statistically significant at 10 percent, 5 percent, and 1 percent, respectively (similarly “-” to “- - -”); “0” indicates that the estimated coefficient is not statistically different from zero, and “.” indicates that the concept is not estimated.

¹⁸ See the analysis for Colombia below.

Table 4. Qualitative Results: Formality and Credit Conditions

Summary results credit and formality															
Size	Brazil				Colombia	Mexico				Peru				Uruguay	
	Contract		Soc. sec		Tax compl.	Contract		Soc. sec		Contract		Soc. sec		Contra	Soc. sec
	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Bank cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Priv. cred.
Self-employed	.	.	0	0	.	0	0	0	0	+++	+++	0	0	0	++
Small	0	0	0	0	.	.	.	.	.	.
Medium	+++	+++	+++	+++	.	--	--	0	0	0	0	0	0	0	0
Large	+++	+++	+++	++	.	0	0	0	0	0	0	+	0	+++	+++
No size break	+++	+++	+++	++	++	-	--	-	0	.	.	.	.	+++	++

Summary results credit and formality.

+, ++, +++ indicate a positive relation at 10%, 5%, and 1% (similarly for "-"); "0" indicates not statistically significant; "." indicates the concept is not represented.

"Contract" and "S. Sec" stand for definitions of labor formality based on the presence of a formal contract, and contributions to the social security system respectively. "Tax compl." corresponds to the alternative definition of Caro, Galindo, and Melendez (2012) (see the analysis for Colombia below for details). Alternatively, "Priv. cred." and "firm cred." stand respectively for credit measures based on credit to the private sector, and credit to private firms; and "Bank cred." to bank credit relative to sector output. The size categories "Self-employed", "Small", "Medium" and "Large" accommodate the various size categories used in the regressions. "No size break" corresponds to the regression results for the sample including firms of all sizes.

Table 4 readily displays the aspects described earlier—namely, that the empirical relevance of the relationship appears to depend on country-specific factors (possibly institutional and economic conditions). In particular, that table provides the first two results of the series on formality and credit conditions:

1. Estimations of the empirical relationship between formality and credit conditions are somewhat fragile in terms of their statistical significance.
2. For the countries considered, the overall effect of credit conditions on formality seems to be driven by the results of a particular size category, which suggests that these effects are heterogeneous conditional on firm size.

Although the previous table provides a useful overview of the results—and allows us to draw some inferences—it is instructive to go a step further and explore the quantitative results.

3.5 Quantitative Results

Table 5 present the main quantitative results from the series regarding formality and credit. The concepts are the same as described for Table 4 above. Since the results for Colombia reflect a different methodology, the coefficients are not reported in this table.¹⁹

The quantitative results reinforce the initial inference from Table 4. In particular, regarding point 1 listed above, Table 5 shows that negative point estimates are more prevalent than suggested by Table 4, as they are not restricted to the case of Mexico (see results for Peru). However, it is important to note that these additional negative coefficients are not statistically significant.

Table 5. Quantitative Results: Formality and Credit Conditions

Size	Brazil				Mexico				Peru				Uruguay	
	Contract		Soc. Sec.		Contract		Soc. Sec.		Contract		Soc. sec.		Contract	Soc. sec.
	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Priv. cred.
Self-employ.	.	.	0.1309	0.3684	0.017	0.061	-0.207	-0.402	0.079***	0.084***	0.0659	0.065	0.05	0.263**
Small	.	.	.	.	-0.212	-0.441	-0.103	-0.143	.	.	.	.	.	.
Medium	0.207***	0.422***	0.175***	0.344***	-0.460**	-0.976**	-0.263	-0.417	0.967	0.673	-0.459	-0.481	0.17	0.19
Large	0.111***	0.217***	0.105***	0.200**	0.032	0.025	-0.148	-0.21	0.181	0.276	0.286*	0.286	0.327***	0.385***
No size break	0.103***	0.219***	0.108***	0.216**	-0.146*	-0.340**	-0.166*	-0.247	.	.	.	.	0.280***	0.186**

Summary results credit and formality.

*, **, *** indicate a statistically significant value at 10%, 5% and 1% respectively. "Contract" and "S. Sec" stand for definitions of labor formality based on the presence of a formal contract, and contributions to the social security system respectively. Alternatively, "Priv. cred." and "firm cred." stand respectively for credit measures based on credit to the private sector, and credit to private firms. The size categories "Self-employed", "Small", "Medium" and "Large" accommodate the various size categories used in the regressions. "No size break" corresponds to the regression results for the sample including firms of all sizes.

The Coefficients indicate the relative difference in the change in formality rates between two sectors separated by a unit of the FD measure, following a 1% change in the credit measure.

Moreover, Table 5 further supports the inference stated in point 2 above, as the estimated coefficients for the pooled samples and the various size categories show large difference across countries.²⁰

Before continuing with the analysis of these results, it is worthwhile to stress the meaning of the coefficients reported in Table 5. These coefficients can be used to compute the difference in formality rates between sectors with different financial dependence ratios that would result from a change in credit. Take, for example, a change of 1 percent in the ratio of private credit to GDP and two sectors with significantly different financial dependence ratios: "Publishing,

¹⁹ Note that the inclusion of the results for Colombia in Table 4 above is legitimate since we were interested in the qualitative results, and the methodology adopted for that country provides an alternative estimation of largely the same underlying concept.

²⁰ The exception appears to be in the preliminary results for Argentina, where the estimated coefficients are similar across size categories.

printing and reproduction of recorded media,” and “Water transport” (sectors with low and high dependence on external funding, respectively).²¹ In Peru, within the segment of self-employment, we see that formality increases 3.4 percent more in the sector with relative high dependence on external funding. Considering these same two sectors, but for all firms (without size breaks) in Brazil and Uruguay, we find that the relative increase in formality rates is 4.4 percent and 11.9 percent, respectively.²²

Table 6 below shows the typical point estimates conditioning alternatively on the credit concept and the definition of formality.^{23,24} This table shows that the typical (median) point estimate of the coefficient γ (γ^c) from equation (1) is quantitatively similar under alternative definitions of formality. When conditioning on the concept of credit used in the regressions, the estimated coefficients continue to be similar for smaller firms but somewhat different for large firms (the typical estimate for the coefficient γ for large firms is 0.14 using credit to the private sector and 0.21 using credit to private firms). Table 6 further explores this difference, showing that the difference is in part driven by the results under the contract definition of formality when using credit to the private sector. Overall, the results in Table 6 indicate that the typical estimate of the coefficient γ is not strongly influenced by the use of alternative credit measures or definitions of formality.

²¹ The sectors are ranked using the dependence ratios reported in Morón, Salgado and Seminario (2013).

²² Computing the effect requires the specific values of the financial dependence ratio for the sectors under consideration. The rate at which formality would differ between any two sectors would be given by the expression $\gamma(FD_j - FD_i) \times \Delta credit\ measure$.

²³ As indicated in the corresponding description, median values are computed with different number of observations given the varying coverage of concepts. The median coefficient for the estimation using the pooled samples (no size breaks) and credit to firms as the relevant credit measure is not reported since there are too few observations to warrant a minimum validity.

²⁴ The “smaller size” category comprises the categories “self-employment,” “small,” and “medium” from Tables 4 and 5.

Table 6. Typical Results by Credit and Formality Definition

	Median point estimates				
	By credit		By formality definition		All results
	Credit private sector	Credit to firms	Contract	Social security	
Sample					
No size break	0.103	*	0.103	0.108	0.105
Large firms	0.111	0.208	0.181	0.200	0.190
Smaller firms	0.066	0.061	0.070	-0.019	0.063

Summary results credit and formality: median point estimates.

Median values of the coefficient g in equation (1) for the estimates from table 3.2 (median correspond to different number of observations). Medians are computed with different number of observations depending on original coverage of the concepts.

"Credit to private sector" and "Credit to firms" stand respectively for credit measures based on credit to the private sector (including households) and credit to private firms. The size category "Smaller firms" comprises the categories "Self-employed", "Small", and "Medium" in tables 3.1 and 3.2. "Large" accommodate the largest categories used in the regressions. "No size break" corresponds to the regression results for the sample including firms of all sizes.

The Coefficients indicate the relative difference in the change in formality rates between two sectors separated by a unit of the FD measure, following a 1% change in the credit measure.

3.6 Remarks on Formality and Credit Conditions

The main general conclusion from the results provided by the series on formality and credit conditions can be summarized as follows:

- The link between formality and credit conditions appears to be empirically relevant, although there is some degree of fragility in the statistical significance of the estimated coefficients—which may marginally expand into sign fragility when considering the results for Mexico (Tables 4 and 5).²⁵
- The evidence suggests the presence of heterogeneous effects conditional on firm size. The typical point estimate is significantly larger for samples of large firms relative to the typical estimates in samples of smaller firms: the typical coefficient using pooled data—no size breaks—is 0.105, increasing to 0.190 when the samples are restricted to large firms and to 0.063 for all other size categories (see last column in Table 6).
- The use of alternative formality concepts (presence of a formal contract vs. contribution to social security) and credit measures (private credit vs credit to private firms) do not appear to have a strong influence on the typical point

²⁵ The negative coefficients that show up in the estimations for Peru are statistically insignificant.

estimates—although there can be sizable differences in particular cases (Tables 4 and 5).

The first two points of this list are relatively more relevant from a policy standpoint and warrant some further discussion on the potential factors leading to those results. Regarding the first point—namely, the cross-country variation in size and significance of the point estimates—two factors that can potentially justify this variation are differences in institutional and economic conditions. As previously noted, institutional conditions affect to a large extent the result of a firm’s cost-benefit analysis. Consider for instance the potential differences in the optimization processes that would follow a firm in a mostly-free and open market based economy vs. a firm in a centrally-planned and state-run system. Assume that a firm is facing the decision to formalize its employees in order to maximize the probability of obtaining additional financing from formal credit institutions to cover a given investment project. Under mostly-free market arrangements, the firm will have a relatively higher flexibility to adjust the use of labor services (quantity and allocation) in response to the various possible outcomes (from no additional credit to full financing of the project). Moreover, possible negotiations will most likely involve just two parties (the firm and the credit institution). Under a heavily planned and state-intervened system, the decision to formalize will take into account the diminished flexibility to allocate labor services to various uses (with or without new financing). More important, in this case obtaining additional loans to finance the new investment project will most likely be dependent on political factors (for instance, the central authorities may have decided that no new loans will be directed towards specific projects or sectors). As a result, the formalization response to a given change in credit conditions is likely to be different under these alternative arrangements.

The last consideration emphasizes the role of state policies in shaping the response of formalization to changes in credit conditions. However, it is important to note that state intervention in the allocation of credit is not restricted to extreme cases. Governments often intervene to direct credit towards sectors that are deemed important for the economy (energy projects, export industries) and control access in others (health services, communications, defense industries). Moreover, governments may impose stronger supervision on specific sectors or segments (e.g., large industrial exporting companies) while being more “lenient” with others. These preferences for the allocation of credit and levels of formalization in specific sectors are crystallized in various institutional arrangements, such as taxes, subsidies, quantitative

restrictions, regulations, and outright prohibitions—all of which may affect the observed relation between credit and labor formality. Other institutional elements can also be relevant. For instance, as noted by Bazdresch and Werner (2014), social programs and non-formalizing credit arrangements (such as micro-credits) can be potentially important in shaping the formalization response to changes in bank credit.²⁶ Alternatively, the importance that banks attach to certain aspects of formality is likely to vary from country to country conditional on the specific regulations issued by the financial authorities. For instance, as noted above, McKenzie and Sakho (2010) point out that banks in Bolivia pay more attention to municipal registration than to tax status when considering granting a loan. Also, labor legislation is different in each country, resulting in different direct costs of formalization (these can include registration costs, payroll taxes, firing costs, etc.).

In turn, economic conditions would also affect the optimization problem involving the benefits of having the chance to access additional credit from formal credit institutions vs. the certain costs of formalization.²⁷ In this regard, stagnant or poor overall economic conditions are likely to weaken the formalization response to given improvements in financial conditions. Firms' expectations about the nature of the economic and financial cycle are also factors that can play a role in shaping the response of formality to changes in credit conditions. In particular, if a financial expansion is largely seen as unsustainable firms would be more hesitant to incur what can be permanently higher labor costs. Thus, both institutional and overall economic conditions are potential explanations for the observed differences in cross-country estimates.

The second point (heterogeneous effects conditional on firm size, with larger effects for larger firms) can in part be rationalized by the presence of significant costs associated to formalization. Formalizing workers also generates fixed costs, as it would typically require disclosing other assets (therefore increasing tax obligations), and would also put the firm at risk of paying fines for past informal activities. Moreover, formalizing workers may require additional investments to meet safety and employment conditions (including sanitation and even housing arrangements)

²⁶ Non-formalizing credit arrangements show a high degree of variation in the region. Bazdresch and Werner (2014) report that the overall penetration of micro-credit in Mexico is relatively large at 22.6 percent (measured as the number of micro credit clients as a fraction of the employed population that reports working on their own or being owners of their businesses), while in Peru it reaches 28.8 percent of the independent worker population. In turn, penetration in Colombia is 16 percent and in Brazil percent, followed by Uruguay with 2.3 percent and Argentina with only 0.6 percent.

²⁷ In a sense, formalizing some activities can be seen as an investment decision and may therefore inherit some of the stylized behavior generally observed for firms' investments in general.

imposed by regulations, and may require the payment of additional licensing or authorization fees.

4. Firm Size and Financial Conditions in Latin America

The series continued the study of the relationship between financial conditions and other firm outcomes focusing on firm size, growth, and investment. In this case, instead of systematically replicating the same methodology over broadly comparable datasets (as in the case of formality) the series adopted alternative methodologies for each country. This alternative approach is appropriate for at least two reasons. First, there has been more research in this area than in the case of formality, and there are fewer potential gains from replicating a unique methodology. Second, industrial surveys across the region do not share the same degree of methodological similarities as do household surveys, and this would impose unnecessary limitations on the results. Thus, by adopting alternative methodologies specifically adapted to exploit the particular sets of information available for each country the series has also managed to deliver useful results for future research and policy discussions.

The second series of papers in the project “Credit, Formalization, and Firm Growth” has been focused mostly on firm size. Although there is no single way to measure firm size, the literature has usually focused on a few metrics such as the number of workers, sales, and assets—and these are the metrics considered by the papers in the series. Additionally, the series has also focused on other firm outcomes—such as investment in the case of Uruguay. Table 7 below summarizes the different measures of firm performance explored in this part of the series.

Table 7. Alternative Measures of Firm Performance

	Employ.	Sales	V.added	Assets	Investment
Country					
Argentina	•	•			
Brazil	•				
Colombia		•		•	
Peru	•		•		
Uruguay				•	•

Main concepts of firm performance.

4.1 Qualitative Results

Table 8 below presents the main qualitative results from the various country studies.²⁸ Each column indicates the results from the main specifications. Firm size is approximated by sales, employment, assets, and value added. One thing that quickly becomes apparent is that the different studies tend to find statistically significant relationships between credit conditions and firm size.

Table 8. Qualitative Results Credit and Firm Performance

	Arg.		Bra. ^(a)		Col. ^(b)		Per.				Uru.
	Priv. Cred		Int. rate	Ov. Costs	Fin. Liab / assets		Fin. Inst. / Adults		At least 1 fin. Inst.		Bank cred.
	Sales	Empl.	Empl.	Empl.	Sales	Assets	Empl.	VA	Empl.	VA	Investment
Formal firms											
Small	.	.	.	.	+	+	.	.	.	.	.
Medium	.	.	.	.	+	+	.	.	.	.	.
Large	.	.	.	.	+	+	.	.	.	.	.
All sizes	.	.	-	-	+	+	.	.	.	.	0
Agriculture	+++	+++	.	.	.	.	.	.	.	.	.
Manufacturing	0	0	.	.	.	.	.	.	.	.	.
Agric. & Manuf.	+	++	.	.	.	.	.	.	.	.	.
Formal and informal firms											
Small	.	.	.	.	.	.	0	+++	++	++	.
Medium	.	.	.	.	.	.	+++	+++	0	0	.
Large	.	.	.	.	.	.	0	0	+++	0	.
All sizes	.	.	.	.	.	.	+++	+++	+++	++	.

Summary of results. Source: Auguste et al. (2013), D'Erasmus (2013), Galindo and Meléndez (2013), Morón et al. (2013), Gandelman and Rasteletti (2013).

Credit conditions: private credit to GDP (Argentina), money market rates and overhead costs financial institutions (Brazil), financial liabilities to asset at firm level (Colombia), financial institutions to adults and presence of at least one financial institution (Peru), and bank credit (Uruguay).

Firm size measured by sales, employment, assets, and value added. **Investment** is measured relative to capital in the previous period.

+, ++, +++ indicate a positive relation at 10%, 5%, and 1% (similarly for "-"); "0" indicates not statistically significant; "." indicates the concept is not represented.

(a) Results for Brazil correspond to a CGE model and therefore do not have the same interpretation in terms of statistical significance.

(b) Results for Colombia capture the accumulated impact over a 6-year horizon (corresponding to the estimated impulse-response functions).

4.2 Quantitative Results

Similarly to the case of informality, to gain further insight about the results it is necessary to pay attention to the specific quantitative results. In this case however, given the diversity of methodologies, it is not appropriate to compute average or median coefficients and there is little gain from grouping them in a single table. Therefore we present here the main results from each study covering the two main common results: the presence of heterogeneous effects, and the role of alternative financing sources (internal funds).²⁹

²⁸ "+", "++", and "+++" indicate a statistically positive relation at 10%, 5%, and 1% (similarly for negative effects); "." indicates the concept is not covered. In the case of Brazil, the "-" indicates a negative relationship in the calibrated model. For Colombia, "+" indicates a positive accumulated affect over a 6-year horizon.

²⁹ See section 5 for additional details.

4.2.1 Heterogeneous Effects

One element that appears in the studies for Argentina, Peru, Colombia, and Uruguay is the presence of heterogeneous effects conditional on firm size. Auguste, Bebczuk and Sánchez (2013) study the relationship between credit conditions and firm size in Argentina following a variation of Rajan and Zingales (1998). In this case, instead of using the measure of financial dependence described in the previous section, the authors use the leverage ratio (loans to sales ratio) observed for 2000 (prior to the 2001-2002 crisis). The main specification is $S_{i,t} = \alpha + \eta(FD_{2000} \times PC_t) + \theta D_i + \lambda D_t + \varepsilon_{i,t}$ where $S_{i,t}$ is the average firm size (sales or employment) of industry i at year t , FD_{2000} is the loans to sales ratio for 2000, PC represents private credit over GDP, and D_i and D_t are industry and time dummies. This specification is later expanded to account for the effects of internal funds. Table 9 presents the main estimation results.

Table 9. Credit and Firm Size (Argentina)

	Sales		Employment	
	Priv. credit	Internal funds	Priv. credit	Internal funds
Mod. without int. funds				
Agriculture	0.113***	.	0.053***	.
Manufacturing	-0.0001	.	-0.0006	.
All	0.031*	.	0.014*	.
Mod. with int. funds				
Agriculture	0.099**	0.064***	0.041**	0.015*
Manufacturing	0.057*	0.056***	0.0133	0.00663
All	0.054**	0.046**	0.00946	0.00696

Summary results from Auguste et al. (2013).

Dependent variable is firm growth by sales or employment. "Priv. credi" stands for the ratio of private credit to GDP. "Internal funds" is proxied by GDP growth rate.

*, **, *** indicate a statistically significant relation at 10%, 5%, and 1% respectively.

"." indicates the concept is not represented.

An element that emerges from this table is the presence of differential effects conditional on the type of sector, with the effects of credit conditions being significantly larger for the agriculture sector (under both measures of firm size). This result is likely a reflection of technological differences since—as the available evidence indicates—the agriculture sector in Argentina is highly intensive in physical capital and also displays a high total factor productivity

(TFP) growth rate, two technological characteristics likely to be associated with greater demand for external funding.³⁰

Further evidence of heterogeneous effects is found by Galindo and Meléndez (2013) for Colombia. In this case, the authors estimate a VAR model using panel data. They estimate the following equation $x_{ijt} = \Gamma_0 + \Gamma_1 x_{ijt-1} + \alpha_i + d_{jt} + \varepsilon_t$ where x_{ijt} is a two-variable vector of a measure of change in firm performance and change in external financing, i denotes an individual firm, j denotes the sector of activity, t denotes time, α_i is a firm specific effect, d_{jt} are sector dummies, and ε_t represent the error terms. The two measures of firm performance are sales and assets growth in real terms; external financing is measured by the ratio of financial liabilities to assets (see Colombia in Section 5 for more details). Table 10 shows the cumulative impact on firm growth over a six-year horizon captured by the estimated impulse-response functions following a financial shock.³¹ Similarly to previous results, Table 10 shows that financial shocks have a heterogeneous effect conditional on firm size (the differential effect conditional on export orientation and credit constraints is discussed later on). Interestingly, these results repeat the pattern found in the previous sections where the estimated coefficients were greater for larger firms.

³⁰ Coremberg (2009) calculates for 2006 that the capital-output ratio in the agricultural sector (including livestock) is 4.1 and just 1.8 in the manufacturing sector. Total factor productivity grew 22.3 percent in the former and 5.4 percent in the latter between 1990 and 2006.

³¹ Per cent cumulative effect on growth rates over six years following a 10% shock to the debt to assets ratio.

Table 10. Credit and Firm Size (Colombia)

	Sales	Assets
By firm size		
Small	0.3	2.4
Medium	2.5	3.0
Large	8.9	6.7
All	3.1	3.0
Export orientation		
Non-exporter	2.9	3.2
Exporter	5.4	4.5
By credit constraints		
Constrained	3.3	3.3
Unconstrained	2.7	2.9

Per cent cumulative effects on growth rates over six years, following a 10% shock to the debt to assets ratio.

Ordering corresponds to a Cholesky decomposition that assumes a contemporary effect of financial conditions on growth, and a lagged effect of growth on borrowing.

Morón, Salgado and Seminario (2013) also use a variation of the Rajan and Zingales (1998) approach to explore the effects of credit conditions on firm size. In this case the main departures from the original approach are the use of regional variations in the distribution of credit (instead of variations over time) and a different level of aggregation with the focus on firm level data rather than sector level (see Section 5.5 for additional details) The main estimation is $S_{it} = \delta_i + \delta_t + \gamma(\text{credit}_{tp} \times FD_a) + \varepsilon_{it}$ where S_{it} indicates the size of a firm i at period t , and δ_i and δ_t are firm and time dummies, $Credit_{tp}$ is the credit or financial development measure at each reference year at the province level, FD_a is the index of “financial dependence” at the industry level. Table 11 presents the main estimation results for Peru. When firm size is measured by the number of employees, (almost) only the results for the category of medium-sized firms has statistically significant results.³² The pattern is less clear when size is defined by value-added but still the estimated coefficient is increasing in firm size when credit availability is measured by the number of financial institutions.

³² The coefficient for the estimation using all firm sizes is roughly a third of the estimated coefficient using the sample of medium-sized firms.

Table 11. Credit and Firm Size (Peru)

	Firm size and credit conditions			
	N° Fin. Inst / adults	At least 1 fin. Inst. in prov	Employ. fin. services / adults	Employ. fin.serv. (ex. self-empl.) / adults
Size (employment)				
Small	0.028	0.067***	0.067	0.023
Medium	0.127***	0.226***	0.239***	0.148***
Large	0.048	0.196	-0.113	-0.055
All	0.039***	0.080***	0.064**	0.029
Size (value added)				
Small	0.087**	0.221**	0.028	0.007
Medium	0.179***	0.212	0.453***	0.163
Large	0.263***	0.21	0.302	0.223*
All	0.125***	0.244**	0.167**	0.053

Summary of results in Moron and Salgado (2013).

*, **, *** indicate a statistically significant relation at 10%, 5%, and 1% respectively.

"N. fin. inst. / adults" indicates the number of financial institutions (including branches) per adults in a given province;

"At least 1 fin. inst. in prov." refers to the presence of at least one financial institution within the province; "Empl. fin. services / adults" is the number of financial workers (corresponding to sector 65) by adults; the last column repeats the previous concept but excludes self-employed workers.

Firm size by employment is classified into small (1-2), medium (3-10), and large (11 and above).

Differential effects conditional on firm size are also present in Gandelman and Rasteletti (2012), who focus on the effects of credit conditions on firm investment in Uruguay. In this case, however, the authors do not present separate estimation for samples of different firm sizes or sector but rather incorporate it in a single estimation through a dummy identifying firms in the upper 33 percent of firm distribution by output. The results (see Table 21) show that size affects the impact of internal funds on investment.

Thus, the results for Argentina, Colombia, Peru, and Uruguay indicate that financial conditions are likely to affect firms differently conditional on firm size, in general finding larger effects associated with bigger firms.

4.2.2 Financing Alternatives

Another element that appears to play an important role in shaping the results is the availability of alternative financing sources—more specifically, of internal funds. This aspect is directly considered in Auguste, Bebczuk and Sánchez (2013), illustrated in Table 9 above. In their work the authors find that internal funds present a statistically significant relationship with sales for both agriculture and manufacturing firms, and only for firms in the agriculture sector when measuring size by the number of workers. A similar observation can be made on the results in

Gandelman and Rasteletti (2012). In this case (see Table 21), when the specification accounts for profits (a proxy for internal funds) credit growth turns out to be statistically insignificant.³³ Finally, Galindo and Meléndez (2013) classify firms in the sample as subjected or not to credit constraints and find little difference between the two types following a financial shock (on average, the cumulative effects differ by less than 20 percent), suggesting that there are other sources of financing are playing a role (see Table 10 above).

4.3.2 Remarks on Firm Size and Credit Conditions

The overall message delivered by the various papers in the series dealing with firm size and credit conditions can be described in the following terms:

- The relationship between credit conditions and the various firm performance measures (employment, valued added, sales, investment, asset growth) appears to be statistically significant and economically relevant in the countries under consideration.
- Similar to the case of formality, the evidence suggest the presence of heterogeneous effects conditional on firm size—and also on market or sector of operation.
- Adequate consideration of the relationship of these various outcomes with formal credit conditions appears to require explicit consideration of alternative funding sources (in particular, cash flows and retained earnings).

The main message from these results, particularly from a policy discussion perspective, is that overall there are statistically significant and economically relevant relationships between formal credit conditions and the various firm performance measures. Those relationships should be considered in light of the two additional common results: the presence of heterogeneous effects (particularly conditional on firm size) and the effects of alternative sources of financing.

³³ This would be in the full specification which also accounts for macroeconomic conditions.

5. Summary of the Country Studies

This section offers a more detailed summary of the results for each country.

5.1 Argentina

5.1.1 Firm Size

Auguste, Bebczuk, and Sánchez (2013) explore the link between credit conditions and firm size in Argentina, under the hypothesis that the 2001-2002 crisis can be seen as introducing an exogenous change in the underlying credit-generating processes. The main reflections of this hypothesis in the data are the different levels of credit before and after the crisis. While in 2000 the credit-to-GDP ratio reached 23.9 percent, the average for the 2001-2010 period was 12.1 percent.

The authors compile information on approximately 93,000 formal firms, employing around 1 million workers, including primary and manufacturing sectors. An important aspect of the data is that they are sourced from the central bank and the national revenue agency (AFIP) and as a result the sample only covers formal firms. In addition, the sample is not representative of all firms in the primary and manufacturing sector. It is worth noting that even firms registered with the revenue agency may display significant informality, as records may underestimate firm size. Using these data, the authors proceed to estimate the following models:

$$S_{i,t} = \alpha + \eta(FD_{2000} \times PC_t) + \theta D_i + \lambda D_t + \varepsilon_{i,t} \quad (2)$$

$$S_{i,t} = \alpha + \eta(FD_{2000} \times PC_t) + \phi(\Delta FD_{t-2000} \times \dot{Y}_t) + \theta D_i + \lambda D_t + \varepsilon_{i,t} \quad (3)$$

where $S_{i,t}$ is the average firm size (sales or employment) of industry i at year t , FD_{2000} is the loans to sales ratio for year 2000, PC represents private credit over GDP, and D_i and D_t are industry and time dummies. Equation (3) is the same as before but with an additional term to capture the effect of internal funds, where ΔFD_{t-2000} is the change in the financial dependence measure between year t and the base year, and \dot{Y}_t is GDP growth.³⁴ The idea underpinning the

³⁴ The GDP growth rate is used as a proxy for internal funds given the procyclical link between these concepts.

inclusion of this interaction term is that the more distant a sector is from the “frictionless” level of 2000, the more it needs internal funds to substitute the receding credit and sustain growth.

The empirical strategy rests on two assumptions: i) that the 2001-2002 crisis generated an exogenous credit shock changing the credit process in Argentina, and ii) the use of the loans-to-sales ratio for the year 2000 is a valid proxy for the concept of “financial dependence” in lieu of the usual measure from Rajan and Zingales (1998). By using this alternative ratio the authors attempt to avoid the problems associated with the use of Rajan and Zingales’ ratio. The alternative ratio, however, introduces some additional considerations, of which the most relevant are that: i) the ratio is computed for years partially overlapping with those used in the sample, and ii) it is based on data for just one year, which is also a pre-crisis year (this can be problematic as real and financial variables tend to display stylized patterns in the years surrounding a crisis).

Table 12 repeats for convenience the results presented in Table 9. The upper portion of Table 12 presents the results for equation (2), and the lower portion presents the results for equation (3). The results for the first equation show a statistically significant relationship between firm size (under both concepts) with private credit. However, running separate regressions for firms in the agriculture and industrial sector reveals that the overall significance could be driven by the agriculture sector. The lower section of Table 12 presents the expanded results including the proxy for internal funds. This modification affects the size of the coefficient for private credit (η in equations (2) and (3)) in non-uniform ways, and show a statistically significant effect for internal funds (coefficient ϕ in equation (3)). These are the main results. However, various econometric exercises delivered fragile and ambiguous results regarding the relative sector sensitivity to changes in bank lending (not shown here).

Table 12. Credit and Firm Size (Argentina)

	Sales		Employment	
	Priv. credit	Internal funds	Priv. credit	Internal funds
Mod. without int. funds				
Agriculture	0.113***	.	0.053***	.
Manufacturing	-0.0001	.	-0.0006	.
All	0.031*	.	0.014*	.
Mod. with int. funds				
Agriculture	0.099**	0.064***	0.041**	0.015*
Manufacturing	0.057*	0.056***	0.0133	0.00663
All	0.054**	0.046**	0.00946	0.00696

Summary results from Auguste et al. (2013).

Dependent variable is firm growth by sales or employment. "Priv. credi" stands for the ratio of private credit to GDP. "Internal funds" is proxied by GDP growth rate.

*, **, *** indicate a statistically significant relation at 10%, 5%, and 1% respectively.

"." indicates the concept is not represented.

The results indicate that for the formal firms covered by the sample, there is a positive relationship between reported size (measured by size or workers), which appears to be driven by firms in the agriculture sector. The results also stress the importance of accounting for the role of internal funds when considering the dynamic response of firm size to credit conditions.

In terms of the quantitative implications of these estimates, Auguste, Bebczuk and Sánchez (2013) compute the relative contribution to the contraction in sales resulting from the 2001-2002 crisis, and the effect of internal funds (GDP growth). According to their calculations, the 2001-2002 credit crunch caused a contraction in firm sales 5.3 times larger in highly dependent industries than in less financial-dependent industries. In a similar exercise they estimate that the higher GDP growth rate in 2010 in relation to 2000 (8.5 percent vs. -0.8 percent) enabled the more financially dependent industries to grow 8.7 times faster than the rest.³⁵

5.1.2 Main Conclusions

Auguste, Bebczuk and Sánchez (2013) find a positive relationship between credit conditions and internal funds with firm size, which appears to be quantitatively different for agriculture and manufacturing sectors. The estimations indicate that the credit crunch since 2001 had a larger

³⁵ The economic expansion would have provided internal resources that would have compensated the reduction in leverage (loans-to-sales declined from 0.37 in 2000 to 0.11 in 2010 in highly dependent industries, and from 0.07 to 0.04 in the other industries).

effect on those industries that were more dependent on credit before the crisis. Furthermore, the availability of internal funding appears to have had a positive effect on the primary but not on the manufacturing sector (suggesting that the highly financially dependent primary sector benefited more from access to internal funding in the post-crisis period).

5.2 Brazil

5.2.1 Formality

Catão, Pagés, and Rosales (2009) adapt the methodology of Rajan and Zingales (1998) to estimate the relationship between labor formality and credit conditions in Brazil. The sample for the estimations covers the years 2002-2007, and the main data source is the “Pesquisa Nacional por Amostra de Domicílios” (PNAD, Brazil’s main household survey). Workers are count as formal if they report either making contributions to social security or having a formal contract. The variable $\frac{Credit}{GDP}$ in equation (1) refers to the ratio of credit to the private sector to GDP, and credit to private firms to GDP. The key findings for Brazil are the following (see Tables 4 and 5):

1. Formality rates show a positive and statistically significant relationship with bank credit adjusted by the level of sector financial dependence (coefficient γ in equation (1)).
2. The point estimates for coefficient γ are roughly the same for both definitions of formality, and about two times larger when using credit to private firms instead of credit to the private sector.
3. These results are mostly robust to reasonable changes in the financial dependence measure (discretization to a dichotomic variable, use of interest rates) and the inclusion of additional regressors (GDP growth, and rate of change in the real exchange rate). Overall, the results show a statistically significant correlation between formality rates and bank credit, in line with the hypothesis that firms react to an increase in credit availability with higher formalization efforts in order to take advantage of the new credit opportunities.

5.2.2 Firm Size (and Informality)

D’Erasmus (2013) continues the exploration of firm performance and credit condition in Brazil, departing from the econometric approach followed in the other papers of the series. Instead, D’Erasmus (2013) calibrates a firm dynamics model with endogenous formal and informal sectors to try to assess how much of the observed changes in firm size and formality in Brazil in previous years can be traced back to changes in financial conditions.³⁶

Although all the equations in the model contribute to the resulting equilibrium, it is still instructive and intuitive to describe the assumptions of the model that are likely to have a higher relative importance shaping the results we are interested in. The model considers endogenous entry and exit that incorporates capital financing and bankruptcy decisions. It also allows for the existence of a formal and an informal sector; operating in the formal sector is costly but allows firms to access credit markets with better commitment and greater efficiency. Financial intermediaries are modeled as having access to international markets at a risk-free rate but incur a proportional cost when issuing debt. The degree of debt enforcement affects the interest rate that non-financial firms face because there is equilibrium default.

The calibration of the model relies on estimates from previous models, and data from various sources and the targeted moments approximate those from the data as noted in the table below.

Table 13. Observed vs. Calibrated Moments

	Target moments	
	Data	Model
Size formal sector %	46.16	46.15
Avg. size formal firm	11.69	11.18
Avg. corporate credit to GDP %	15.2	16.8
Avg. exit rate formal sector	12.9	11.58
Avg. age informal firms (years)	8.84	7.69
Avg. exit rate large formal firms	5	4.7

Source: D’Erasmus (2013). Targeted moments.
"Data" reports values corresponding to 2003.

With this model the author simulates a reduction in the cost of funds for financial intermediaries from 7.5 percent to 4.7 percent, and a reduction in the cost of issuing loans from

³⁶ Given the mathematical complexities of the model, we will avoid presenting the specific equations which need to be considered in relation to the rest of the model to get a sense of the model.

5.6 percent to 3.3 percent, using data from 2003 to 2010 to match the observed reduction in the money market interest rate and overhead costs for financial firms (Table 14 below shows some selected variables). In the model, the reduction in credit costs generates an increase in the credit-to-GDP ratio from 16.8 percent to 31.57 percent, an increase of formality of almost 21 points to 66.95 percent, and a reduction in the average size of formal firms of one worker (to 10.18). The former two results are intuitive, but the latter needs some additional explanation. In this model, the reduction in the costs of credit increases the value of entering the market, resulting in a wage increase. Thus, as a result of the reduction in financial costs and the wage increases firms have strong incentives to substitute labor for capital (there are more firms and more formal workers, but the average firm size measured by workers goes down).

Table 14. Change in Credit Costs: Data vs. Simulation

	Simulation: reduction in the costs of credit	
	Benchmark	Reduction costs of credit
Corporate credit to GDP %	16.8	31.57
Formal labor force %	46.15	66.95
Avg. size formal firm	11.18	10.18

Source: D'Erasmus (2013). Selected results from a reduction in the costs of credit.

"Benchmark" correspond to the calibrated values using 2003 data. "Reduction costs of credit" corresponds to the same calibration after adjusting the interest rate and overhead costs to match the change between 2003 and 2010.

Although this approach does not present the identification problems resulting from the use of econometric models, it is important to understand that models of this type nonetheless impose various assumptions and simplifications at different levels in the model, which play a role in the derivation of the results. More importantly, there are multiple plausible values of the underlying parameters and alternative models that can produce also good approximations to the observed data. However, these types of models offer an alternative way to deal with endogeneity problems and in that sense are important tools in policy discussions.

5.2.3 Main Conclusions

The relationship of labor formality and credit conditions in Brazil have been explored in the series first by Catão, Pagés and Rosales (2009) and then by D'Erasmus (2013) using two different approaches. Catão, Pagés and Rosales (2009) use an econometric approach and find that formalization rates respond relatively more to financial deepening in sectors where firms are

typically more dependent on external finance (see Tables 4 and 5). In turn, D’Erasmus (2013) relies on calibrations from a dynamic model to assess how much of the change in the size of the formal sector can be attributed to an increase in the efficiency of the financial sector. The quantitative simulations shows that a reduction in the cost of funds for financial intermediaries from 7.5 percent to 4.7 percent and a reduction in the cost of issuing loans from 5.6 percent to 3.3 percent is associated with an increase in the size of the formal labor force of 21 points, along with a reduction of one worker in the average size of formal firms (see Tables 13 and 14). Although the data for 2010 shows that the average size of formal firms is 12.95 workers, the difference between the simulation and the data should not be taken as a failure of the model, since the simulations are focused on the effects of a particular change while the data reflects multiple changes occurring between 2003 and 2010. It is always possible to argue that the model may not be capturing relevant variables or that some of the underlying assumptions may require additional adjustments to approximate the conditions of the Brazilian economy; however, it is important to highlight that the model matches quite well the targeted moments (see Table 13) and helps isolate the effects of financial changes. Finally, it is also worth stressing that this methodology tries to pin down concepts more closely related to the notion of financial development—which is a distinctive aspect in comparison to the other approaches in the series which rely on credit ratios to approximate financial conditions.

5.3 Colombia

5.3.1 Formality

Caro, Galindo, and Meléndez (2012) depart significantly from the methodology followed in the papers exploring formality in Argentina, Brazil (Catão, Pagés and Rosales, 2009), Mexico, Peru, and Uruguay. To begin with, the authors elect not to use Rajan and Zingales’ (1998) index of “financial dependence” at the industry level, employing instead an alternative measure of credit restrictions. Additionally, the main concepts are measures using data taken from industrial surveys—as opposed to household surveys as in the case of the other studies focused on formality. This change of sources introduces an additional difference with the other studies in the series, as the measure of formality has to be adjusted to the information provided by the industrial survey. More specifically, the most significant methodological differences are the following:

1. The sample covers only formally registered manufacturing establishments. This introduces a problem of selection, as the sample covers firms that have already moved into formality.
2. The authors use the correlation between investment and cash flow at the firm level as a measure of financial constraints: if the correlation is high (upper third of the sample distribution) a firm is considered as credit constrained; if the correlation is low (lower third of the sample distribution) a firm is said to be unconstrained; if the coefficient falls in between, the firm is considered “likely to be constrained” (the main drawback of this approach is that it is difficult to argue about its exogeneity with respect to informality).³⁷
3. A new concept of labor formality: given the different nature of the sample and the available data, Caro, Galindo and Meléndez (2012) use an alternative measure of labor formality based on the relationship between a proxy of actual tax compliance and estimation of legal tax obligations. This firm-level measure of formality for a firm i in a sector j is $f_{ij} = \left(\frac{\text{Estimated payroll tax}}{\text{Legal payroll tax}} \right)_{ij}$ where *Legal payroll tax* is an approximation of the legal taxes on labor that the firm should pay and *Estimated payroll tax* is an approximation of actual tax payments based on self-reported data.

There are various caveats to this measure of formality. Some of these are the following: i) under less than perfect credibility regarding confidentiality firms have an incentive to misreport actual payroll payments (biasing the index upwards); ii) with limited information and given the high complexity of the tax legislation, an accurate measure of the legal payroll tax obligations can be very difficult to compute (reducing the precision of the index) and; iii) provided that informal arrangements within the firm are correlated with salaries, the index may show an upward bias relative to a headcount ratio of informality.

4. Credit measures: Caro, Galindo and Meléndez (2012) use credit data at the sector level instead of credit aggregated at the country level, which in

³⁷ The measure has been used in Calomiris and Hubbard (1995) and Hubbard (1998).

principle should improve the efficiency of the point estimates given the disaggregation of information.

These changes relative to the previous studies introduce at least four methodological considerations: i) there is a potential problem of sample selection given the restriction of coverage to formally registered firms; ii) imperfect credibility may bias upwards the measure of formality, and it can also induce censoring if firms report more or less truthfully up to a given unobservable—potentially sector-specific—threshold; iii) the exogeneity of the correlation coefficient between investment and cash flow (the proxy for the presence of credit constraints) with respect to the informality may be a strong assumption, and iv) the external validity of the results can be relatively low even for other firms in Colombia.

Given these methodological considerations, in particular i) and ii) above, Caro, Galindo and Meléndez (2012) proceed with a Tobit regression of equation (4) below:

$$f_{ijt} = \alpha + \beta_1 C_{jt-1} + \beta_2 Corr_{ij} + \beta_3 (Corr_{ij} \times C_{jt-1}) + T_t + \mu_{ijt} \quad (4)$$

where f_{ijt} represents a proxy of labor informality for firm i in sector j at time t , C_{jt-1} is the ratio of bank credit to output for sector j during the previous period, $Corr_{ij}$ is the coefficient of correlation between investment and cash flow for firm i in sector j , and T_t are time dummies. The main regression results are presented in Table 15 below.

Table 15. Tobit Regressions to Explain Labor Formality

	(1)	(2)	(3)
Credit	0.091**	0.098**	0.096**
Coef. correl. invest-cash flow	0.022*	0.023*	0.023*
Coef. correl. x credit	-0.173**	-0.175**	-0.173**
Additional controls	No	Yes	Yes
Time dummies	Yes	Yes	Yes

Tobit regressions. Dependent variables is (effective payroll tax/legal payroll tax). The correlation between investment and cash flow is at the firm level. Credit is the ratio of bank credit to sector output. Additional controls include: ratio of white collar employment to total employment, ratio of white collar wages to total wages, ISIC 3-digit sector share.

The regression results indicate that there is a statistically significant association between formality and sector credit, and that this relationship is stronger for firms whose investment plans

are less correlated with the generation of internal funds.³⁸ A point to note on these results relative to those for Argentina, Brazil, and Uruguay is that the argument for the exogeneity of the right-hand-side variables is somewhat weaker than in those cases, and that the point estimates may be influenced as well by the (almost certain) upward bias in the formality measures.

5.3.2 Firm size

Galindo and Meléndez (2013) explore the relationship between firm size and financial conditions relying on a panel vector autoregression approach which imposes an exogenous structure on the relationship between the variables in order to identify impulse-response functions (cumulative effects)—in this case, from exogenous changes in financial conditions to firm performance. The authors use administrative data from the “Superintendencia de Sociedades” (a government agency supervising commercial companies) and from customs records, which they arrange in an unbalanced panel (the baseline P-VAR results end up using 4,733 firms). The sample covers large, medium, and small formal firms but leaves out micro and informal firms. With these data the authors estimate the following model:

$$x_{ijt} = \Gamma_0 + \Gamma_1 x_{ijt-1} + \alpha_i + d_{jt} + \varepsilon_t \quad (5)$$

where x_{ijt} is a two-variable vector of a measure of change in firm performance and change in external financing, i denotes an individual firm, j is the sector of activity, t represents time, α_i is a firm specific effect, d_{jt} are sector-time dummies that control for any changing variables in a year that affect all firms in a sector, and ε_t represents the error terms. The two measures of firm performance are sales and assets growth in real terms; external financing is measured by the ratio of financial liabilities to assets.

The central aspect of this methodology is that it imposes little structure on the underlying relationships, allowing for the interactions to be captured by the estimated coefficients. In turn, its weakness is that the researchers have to impose exogenous restrictions on the model in order to identify the effects of shocks. Regarding this latter aspect of the methodology, a very common practice is to use the so-called Cholesky decomposition. This restriction imposes (in this case) a

³⁸ A firm with a high correlation between investment and cash flows is a firm that relies relatively more on internal funds—that is, it is a relatively more constrained firm. Firms with lower correlation depend relatively more on external funds and therefore are expected to display higher levels of formality.

temporal ordering on the influence of shocks.³⁹ In the case of Galindo and Meléndez (2013), the assumption is that financial shocks affect firm performance contemporaneously, while shocks to firm performance only impact external financing after one period (year). It is important to note here that the empirical validity of these restrictions cannot be resolved within the model and the opposite ordering is equally valid—the data cannot resolve which identification assumption is valid; these assumptions can only be argued about.⁴⁰ The estimation results are summarized in the following table.

Table 16. Cumulative Effects of a Financial Shock on Growth Rates over Six Years

	Sales	Assets
By firm size		
Small	0.3	2.4
Medium	2.5	3.0
Large	8.9	6.7
All	3.1	3.0
Export orientation		
Non-exporter	2.9	3.2
Exporter	5.4	4.5
By credit constraints		
Constrained	3.3	3.3
Unconstrained	2.7	2.9
Per cent cumulative effects on growth rates over six years, following a 10% shock to the debt to assets ratio. Ordering corresponds to a Cholesky decomposition that assumes a contemporary effect of financial conditions on growth, and a lagged effect of growth on borrowing.		

Table 16 shows the cumulative responses to a 10 percent change in the ratio of financial liabilities to assets. Considering the results for the entire sample (last row in the first group), the accumulated response until the effect of the financial shocks fades away leads to an increase of 3.1 percent and 3.0 percent in the growth rate of sales and assets, respectively. When considering

³⁹ Alternative structures have been explored by Bernanke (1986), Blanchard and Quah (1989), and King et al. (1991).

⁴⁰ As an additional methodological note, since the P-VAR is estimated with fixed effects the authors apply forward mean-differencing and remove the mean of all future observations available for each firm each year in order to avoid the correlation emerging from the use of fixed effects and lagged dependent variables.

firms by size, the results using growth in sales indicate that small firms barely react to financial shocks, while large firms see their growth increase by 8.9 percent.

An interesting result is reported in the last two rows of Table 16. Following Caro, Galindo and Meléndez (2012), the authors compute the correlation between firm investment and firm cash flow, and they use the results to classify firms as credit constrained or unconstrained. According to this result, there is a small quantitative difference due to credit restrictions in the response to financial shocks. This can be in part the result of a sample that considers formal firms which have no major problems to access credit.

The results of splitting firms between exporters and non-exporters suggest that the former respond more to financial shocks. In the model with sales growth, a financial shock of similar size leads to an increase in sales growth of exporting firms that is 86 percent larger than that of non-exporters (a 10 percent financial shock increases sales growth by 5.4 percent over a six-year horizon for exporters and 2.9 percent for non-exporters. In the case of asset growth the cumulative effect is 40 percent larger for exporters. If export orientation is taken as a proxy for productivity, the results suggest that more productive firms tend to take better advantage of external financing.

Given that the Cholesky decomposition established an arbitrary set of restrictions (in the sense that their validity is not testable within the model), the authors re-estimate the impulse-response functions reversing the temporal ordering (financial shocks affecting firm performance with a lag, while shocks to firm performance impact external financing contemporaneously). Table 17 shows the results based on the previous ordering and the new one (ordering 1 and 2, respectively).

Table 17. Cumulative Effects under Alternative Identification Assumptions

	Sales		Assets	
	Ordering 1	Ordering 2	Ordering 1	Ordering 2
Firm size				
Small	0.3	2.1	2.4	0.0
Medium	2.5	3.5	3.0	0.0
Large	8.9	8.7	6.7	2.0

Cumulative effects of a financial shock on growth rates over six years.

Ordering 1 corresponds to a Cholesky decomposition that assumes a contemporary effect of financial conditions on growth, and a lagged effect of growth on borrowing; ordering 2 assumes the opposite.

Table 17 shows that the use of alternative identification assumptions can alter the results—something rather usual with this methodology. This case emerges when considering growth in assets, as using the alternative ordering (that is, the alternative identifying assumption) leads to the conclusion that financial shocks have no statistically significant effects on growth for most firms in the sample—and only relatively small effect for large firms. The interesting result however is that the alternative identifying assumption has relatively little impact on the cumulative response in medium and large firms when using sales as the relevant metric for firm size.

5.3.3 Main Conclusions

The results for Colombia suggest that there is a statistically significant relationship between formality and credit which appears to change conditional on firm size. Quantitatively, the results suggest that a 10 percent increase in the ratio of credit to sector output is positively associated with increases in labor formality between 0.76 and 1.14 percentage points (depending on the set of controls), and that this relationship weakens as a firm’s financial constraint increases. In turn, Galindo and Meléndez (2013) estimated the cumulative impact of a 10 percent financial shock on firms’ growth rate, which is about 3 percent over a six-year horizon for all firms. Two additional relevant results in this case are the following: i) these effects are heterogeneous conditional on firm size, and ii) the size of the effects on sales growth for medium and large formal firms is quantitatively similar under alternative identification assumptions.⁴¹

5.4 Mexico

5.4.1 Formality

Bazdresch and Werner (2014) also adapt the methodology in Rajan and Zingales (1998) to investigate the empirical links between formality and credit conditions in Mexico. The significant difference relative to other works in the series also adopting a similar methodology is the inclusion of agricultural workers. Firm-size categories correspond to tiny (0-1 workers), micro (2-5), small (6-15), and “medium+” (16 or more workers). In turn, there are three

⁴¹ It is important to remember that these are two possible identifying assumptions, and that reversing the ordering does not exhaust the possible alternatives.

definitions of formality: i) presence of a “signed contract,” ii) self-reporting as a worker with a “defined salary,” and iii) presence of “social benefits” provided by the employer.

The results for Mexico tend to be the opposite of those registered for other papers in the series. More precisely, estimates of γ in equation (1) are usually statistically insignificant, and for the cases where they are statistically significant the resulting signs are the opposite of those found in other papers in the series (and also opposed to the arguments made in Section 3). As can be seen in Tables 4 and 5, considering the results with the pooled sample (no size breaks, last line in Tables 4 and 5), formality shows a negative association with credit conditions. Regressing equation (1) over samples by size categories shows only significant coefficients (but still negative) for medium-sized firms (6-15 workers). For all other cases the coefficients are statistically insignificant.

5.4.2 Possible Explanations

The authors consider that these results constitute a “puzzle”—although this may be a strong statement, as there are no well-established results for these regressions or an unequivocal theoretical link between the concepts. In any case, the authors put forward various hypotheses that may help explain what they consider unexpected results. Their main arguments are the following:

1. “*Seguro Popular*.” This is a social program not linked to employment which may reduce the incentives to formalize employment. This explanation presents at least two problems (as noted by the authors). One is that the quantitative effects of the program on labor informality are still a subject of research with no robust results; the second problem is that it is not clear what mechanisms would induce the negative signs observed in the estimations (though point 4 below may suggest a potential mechanism).
2. *Low levels of credit penetration*. This may explain a low response particularly if credit is allocated to already highly formal firms. Alternatively, firms may share the expectation that the credit expansion is transitory and therefore may optimally choose not to overreact to the credit expansion. Again, this factor may help explain the lack of association, but it does not account for the reversal of expected signs.

3. *High costs of labor formalization.* This can induce a relatively low elasticity of formality to credit conditions. The explanation still does not account for the negative coefficients.
4. *Shifts towards capital-intensive production methods.* Here the causal chain is more complex. First, improved financial conditions could induce a change towards the use of more capital intensive methods and result in the expulsion of labor—possibly of relatively more low-skilled labor (which is more likely to engage in informal labor arrangements). Given high costs of formalization, and possibly the presence of “seguro popular,” these workers may be reabsorbed into the labor market mostly as informal workers.

5.4.3 Main Conclusions

In contrast to the typical results in the series, the estimates in Bazdresch and Werner (2014) suggest that more financial slack in an industry results in lower labor formality in that industry. This finding is robust to different sub-periods and alternative methods of estimation as well as to different indicators of aggregate credit slackness. These results are an indication that econometric specifications used in the series to explore the relation between formality and financial conditions may not be capturing important variables (see the last part of Section 3 for a discussion).

5.5 Peru

5.5.1 Formality

Morón and Salgado (2011) adapt the methodology of Rajan and Zingales (1998) for Peru, with one potentially relevant methodological consideration relative to other papers in the series: they remove from the sample industries with formality rates “constantly” close to 100 percent. Also, they compute the financial dependence ratio for a different period. Keeping in mind those methodological differences, from the estimation of equation 1 they find (see Tables 4 and 5):

1. Under the “contract” definition of formality, only self-employed workers appear to react to credit conditions.
2. Under the “social security” definition of formality, only large large firms appear sensitive to credit conditions.

3. The estimated coefficients tend to be quantitatively similar using credit to the private sector or credit to private firms.

The most significant way in which the results for Peru differ from the other papers in the series is in the overall lack of association between credit conditions and formality for large firms. This again stresses the importance of considering idiosyncratic conditions (and alternative econometric specifications).

5.5.2 Size

Morón, Salgado and Seminario (2013) explore the impact of credit conditions on firm size (and other variables of firm performance) employing yet another variation of the approach followed by Rajan and Zingales (1998). The main differences relative to other works adapting that methodology are the following: i) the data are taken from a census (instead of a survey) covering both formal and informal firms; ii) since they have usable data for only two years they exploit the regional variation in the distribution of credit to achieve identification; and iii) the unit of relevance is the firm.⁴² Thus, the main empirical specification is the following:

$$S_{it} = \delta_i + \delta_t + \gamma(\text{credit}_{tp} \times FD_a) + \varepsilon_{it} \quad (6)$$

where S_{it} indicates the size of a firm i at period t , δ_i and δ_t are firm and time dummies, credit_{tp} is the credit or financial development measure at each reference year at the province level, and FD_a is the index of financial dependence at the industry level. Equation (6) formalizes another difference in this approach, as the dependent variable is measured at the firm level and the term $(\text{credit}_{tp} \times FD_a)$ adjusts aggregate credit at the regional and sector level. Additionally, the authors estimate the following equation:

$$Y_{at} = \delta_t + \delta_a + \delta_p + \gamma(\text{credit}_{tp} \times FD_a) + \varepsilon_{at} \quad (7)$$

where Y_{at} can be the share of either new firms, small firms, employment, or value-added at the industry level; δ_t , δ_a , and δ_p are dummies for year, industry sector, and province, and credit_{tp} and FD_a are as before.

⁴² The main sources of data are the national economic censuses of 1994, and 2008.

The main results are described in Table 18, which shows the estimations of the parameter γ in equation (6). Each column corresponds to the alternative measures used by the authors to approximate financial conditions. In order, these measures are: the number of financial institutions, a dummy variable for the presence of at least one financial institution, the proportion of workers in financial activities relative to adults under 65, and the fourth column corresponds to the same previous concept but excluding self-employment within the financial sector. In turn, the firm size categories are the following: small (1-2 workers), medium (3-10), and large (11 or more).

Table 18 shows a positive and statistically significant relationship between firm size (measured by employment) and the first three measures of financial conditions adjusted by “financial dependence.” Interestingly, running separate regressions by firm size to explore the possibility of heterogeneous effects reveals that these overall relationships are driven almost entirely by the results of medium-sized firms. In effect, in large and small firms, size appears mostly inelastic to credit conditions. Measuring size by value added shows a qualitatively similar result for the estimation using the pooled sample (last row). In this case however, there is no readily obvious pattern (across measures of financial conditions) in terms of statistical significance with the estimations by size categories.

Table 18. Firm Size and Credit Conditions

Size (employment)	Firm size and credit conditions			
	N° Fin. Inst / adults	At least 1 fin. Inst. in prov	Employ. fin. services / adults	Employ. fin.serv. (ex. self-empl.) / adults
Small	0.028	0.067***	0.067	0.023
Medium	0.127***	0.226***	0.239***	0.148***
Large	0.048	0.196	-0.113	-0.055
All	0.039***	0.080***	0.064**	0.029
Size (value added)				
Small	0.087**	0.221**	0.028	0.007
Medium	0.179***	0.212	0.453***	0.163
Large	0.263***	0.21	0.302	0.223*
All	0.125***	0.244**	0.167**	0.053

Summary of results in Moron and Salgado (2013).

*, **, *** indicate a statistically significant relation at 10%, 5%, and 1% respectively.

"N. fin inst. / adults" indicates the number of financial institutions (including branches) per adults in a given province;

"At least 1 fin. inst. in prov." refers to the presence of at least one financial institution within the province; "Empl. fin. services / adults" is the number of financial workers (corresponding to sector 65) by adults; the last column repeats the previous concept but excludes self-employed workers.

Firm size by employment is classified into small (1-2), medium (3-10), and large (11 and above).

Table 19 below summarizes estimation coefficient γ from equation (7). In this case the results are somewhat heterogeneous. Two interesting results are those for the shares of small and new firms. First, the absence of at least one financial institution is associated with a higher proportion of small firms, but an increasing number of financial firms seems to have no relation with the proportion of small firms. This result could be interpreted as suggesting that the presence of financial institutions helps expand the operations of a fraction of small firms (probably those with better growth prospects) but not to all of them. Second, the availability of credit (presence and number of financial institutions) makes it easier for new firms to enter the market.

Table 19. Firm Outcomes and Credit Conditions

	FI / adults	At least 1 FI	Empl. FI / Adults	Sal. emp. FI/adults
Concept contribution to sector's totals				
Small firms	0.000	-0.021*	0.002	0.005
New firms	0.009**	0.027**	0.002	0.007
Value added	-0.001	0.000	0.014**	0.003
Employment shares	-0.002	-0.003	0.012**	0.003

Effects of credit conditions on the contributions to sector's shares.

+, ++, +++ indicate a positive relation at 10%, 5%, and 1% (similarly for "-"); "0" indicates not statistically significant. "." indicates the concept is not represented.

FI/adults indicates the number of financial institutions (including branches) per adults in a given province; "At least 1 FI" refers to the presence of at least one financial institution within the province; "Empl. FI / adults" is the number of financial workers (corresponding to sector 65) by adults; "Sal. emp. FI / adults" repeats the previous concept but excludes self-employed workers.

Firm size by employment is classified into small (1-2), medium (3-10), and large (11 and above).

5.5.3 Main Conclusions

The results from Morón and Salgado (2011) suggest that credit conditions would affect the relative rates of formality in more financially dependent industries only within the category of self-employment when formality is defined by registration (if the firm carries accounting books) and in large firms when measuring formality by contribution to social security (see Tables 4 and 5). Turning to firm size, the results of Morón, Salgado and Seminario (2013) indicate that credit availability would be associated with relatively higher firm sizes in more financially dependent industries (first two columns of Table 18), and with a larger share of new firms (Table 19).

5.6 Uruguay

5.6.1 Formality

Gandelman and Rasteletti (2012) use data for Uruguay between 2000 and 2010 and also adapt the empirical strategy of Rajan and Zingales (1998). In this case, two of the three measures of

labor formality they employ fit relatively well into the classification of “contract” and “social security,” while their third measure is more idiosyncratic. More precisely, for the third measure formal workers are identified based on the right to health coverage at a private health maintenance organization (HMO).

In this case, the pooled sample estimates gives statistically significant coefficients under the three definitions of formality (first row, Table 20). However, the result changes when considering the estimates from samples for the different size categories. In this case, under the “contract” definition of formality the coefficient is only significant for large firms; and under the “social security” definition of formality the effect is insignificant for medium-sized firms (see Table 5). Moreover, under all definitions of formality the estimated coefficients show instability over various sub-samples (five-year rolling windows) as captured by Table 20.

Table 20. Formality and Credit: Full-Sample and Rolling-Window Estimates

Periods	Definition of formality		
	Health rights	Contract	Social security
2001-2010	0.290***	0.280***	0.186**
2000-2005	0.305**	.	.
2001-2006	0.328***	0.332***	0.104
2002-2007	0.286***	0.256***	0.94
2003-2008	0.641***	0.615***	0.521***
2004-2009	0.680	0.1142**	0.321
2005-2010	0.1603	0.740	0.768

Source: Gandelman and Rasteletti (2012).

Dependent variable: share of formal to total employment according to various definitions. Independent variable: Credit to the private sector (as percentage of GDP) interacted with Rajan and Zingales' (1998) measure of financial dependence. *, **, and *** indicate statistical significance at 10%, 5%, and 1% respectively.

This table gives an approximation to the time-stability of the parameters. It presents the estimation using the whole sample 2001-2010 (firs row), and then the estimation using rolling 5-year subsamples.

Table 20 shows that point estimates are quite stable for the first three windows (2000-2005 to 2002-2007) under all definitions of formality, with the statistical significance of the estimated coefficients declining towards the last years of the sample. In the case of formality defined by health rights, this could be influenced by a comprehensive health reform that took effect after 2008, which may also have affected formality as measured by the alternative

definitions. These results raise questions regarding the omission of relevant variables and the possibility that the estimates could be affected by one-time policy changes or economic shocks.

5.6.2 Firm Investments

Gandelman and Rasteletti (2013) focus on the effects of credit conditions and informality on firm investment. They estimate an investment function derived from a neoclassical model of firm behavior, modified to accommodate costly capital adjustments, and expanded to account for the possible effects of sector informality (defined by the presence of contributions to social security). The resulting investment equation restricts the validity of standard estimation methods due to the likely simultaneous determination of the dependent variable and some regressors.⁴³ To address this endogeneity problem, the authors adopt the GMM method proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which is particularly specified to deal with the structure of this problem—namely, a linear dynamic panel where some regressors are simultaneously determined with the dependent variable (which also enters in lagged form as another regressor). Following that methodology, the authors estimate two (error correction) investment models—the second of them trying to account for the effect of sector formality on firms’ investments. The estimations are carried out using an unbalanced panel of annual data constructed with information from the “Encuesta anual de actividad económica” (economic activity survey) and other sources. The data spans from 1997 to 2008, covering a variable number of firms ranging from 783 firms in 2006 to an average of 2,100 for the period 2000-2005. The panel excludes information about the financial, agriculture, and construction sectors, as well as information from firms with less than five employees.

Table 21 below summarizes the results from the specifications with and without formality in the regressor set. Columns A1 to A3 represent the model without reference to sector informality and show that, after accounting for internal funds and the financial crisis, credit growth does not appear to have a statistically significant relationship with firm investment for the firms in the sample (quantitatively, the effect of a 1 percent increase in credit to the private sector would translate into changes in the rate of investment ranging from 0.42 percent to 0 percent depending on the specification). In turn, columns B1 and B2 present the results of the investment model expanded to account for the possibility of effects from sector formality. The results

⁴³ The likely simultaneous determination in the investment equation, and the use of lagged values of the dependent variable within the control set would render inconsistent estimates under OLS.

indicate that there is not a direct effect running from sector formality to firm investment, but there does appear an indirect negative effect conditional on the level of available internal funds.

Table 21. Investment Equation

	Investment equation				
	Without formality			With formality	
	A1	A2	A3	B1	B2
Lagged investment	0.031**	0.030**	0.036**	0.043***	0.045***
Output growth	0.055***	0.057***	0.049**	0.039*	0.040*
Lagged output growth	0.097***	0.094***	0.084***	0.079***	0.073***
Credit growth	0.420*	0.398*	-0.0347	.	.
Labor formality	.	.	.	0.0667	0.0776
Lagged profits	.	0.002*	0.005**	.	0.012**
Lagged profits x formality	.	.	.	.	-0.015*
Lagged profits x firm size	.	.	-0.004*	.	.
Firm size (dummy top 33%)	.	.	0.000*	.	.
Country risk (proxy crisis cond.)	.	.	0.0559	.	.
Lagged profits x country risk	.	.	-0.00098	.	.
Error correction term	-0.062**	-0.061**	-0.051*	-0.060**	-0.054*

Summary results based on Gandelman and Rasteletti (2013).

Labor formality definition based on contribution to social security.

*, **, *** indicate a statistically significant relation at 10%, 5%, and 1% respectively. "." indicates the concept is not represented.

The dependent variable is investment relative to capital in the previous period $I / K(-1)$.

Dummy for size captures firms at the top 33% by output. Country risk is the spread between the yield of Uruguayan and US bonds. Profits are deflated by capital in the previous period. Credit refers to credit to the private sector.

The results indicate that, after controlling for internally generated funds, and macroeconomic conditions that could affect simultaneously the dependent variable and various regressors, bank credit does not seem to have a statistically significant effect on investment for those firms in the sample. Alternatively, the results from the second model indicate that the levels of sector formality do not appear to have a direct effect on investment—only an indirect negative effect.

5.6.3 Main Conclusions

The results for Uruguay suggest that changes in credit conditions have played a role in the relative evolution of formality conditional on financial dependence and appear to be stronger for large firms. Interestingly, the relationships show some instability over time with the statistical significance of the coefficients weakening towards the last years of the sample. This pattern may have been influenced by the introduction of institutional reforms.

In terms of the relationship between firm investments and credit conditions, the econometric results indicate that the measured effect of credit growth on investment may turn out to be statistically insignificant after accounting for internally generated funds and macroeconomic conditions (column A3 in Table 21). In turn, the investment equation modified to account for the effects of labor formality shows that the latter may not be a relevant direct factor affecting the investment rate. However, it appears that higher levels of formality would reduce investment indirectly, which is consistent with the view that formalization is costly.

6. Overall Conclusions

6.1. Summary of Findings

The project “Credit, Formalization, and Firm Growth” has produced a series of empirical research papers studying the relation between formal credit conditions, formalization, and firm growth (and some additional outcomes) delivering a series of qualitative and quantitative results that are useful to guide additional research and inform policy discussions.

Of particular significance is the contribution the project has made regarding the relationship between credit conditions and labor formality. The series of papers commanded by the IDB’s Research Department have delivered a novel set of highly comparable cross-country quantitative results which are likely to serve both future research and policy discussion. The main quantitative implications are capture by Tables 22 and 23 below, which for convenience reproduce Tables 5 and 6).

Table 22. Quantitative Results: Formality and Credit Conditions

Size	Brazil				Mexico				Peru				Uruguay	
	Contract		Soc. Sec.		Contract		Soc. Sec.		Contract		Soc. sec.		Contract	Soc. sec.
	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Firm cred.	Priv. cred.	Priv. cred.
Self-employ.	.	.	0.1309	0.3684	0.017	0.061	-0.207	-0.402	0.079***	0.084***	0.0659	0.065	0.05	0.263**
Small	.	.	.	.	-0.212	-0.441	-0.103	-0.143	.	.	.	.	.	.
Medium	0.207***	0.422***	0.175***	0.344***	-0.460**	-0.976**	-0.263	-0.417	0.967	0.673	-0.459	-0.481	0.17	0.19
Large	0.111***	0.217***	0.105***	0.200**	0.032	0.025	-0.148	-0.21	0.181	0.276	0.286*	0.286	0.327***	0.385***
No size break	0.103***	0.219***	0.108***	0.216**	-0.146*	-0.340**	-0.166*	-0.247	.	.	.	.	0.280***	0.186**

Summary results credit and formality.

*, **, *** indicate a statistically significant value at 10%, 5% and 1% respectively. “Contract” and “S. Sec” stand for definitions of labor formality based on the presence of a formal contract, and contributions to the social security system respectively. Alternatively, “Priv. cred.” and “firm cred.” stand respectively for credit measures based on credit to the private sector, and credit to private firms. The size categories “Self-employed”, “Small”, “Medium” and “Large” accommodate the various size categories used in the regressions. “No size break” corresponds to the regression results for the sample including firms of all sizes.

The Coefficients indicate the relative difference in the change in formality rates between two sectors separated by a unit of the FD measure, following a 1% change in the credit measure.

Table 23. Typical Results by Credit and Formality Definition

	Median point estimates				
	By credit		By formality definition		All results
	Credit private sector	Credit to firms	Contract	Social security	
Sample					
No size break	0.103	*	0.103	0.108	0.105
Large firms	0.111	0.208	0.181	0.200	0.190
Smaller firms	0.066	0.061	0.070	-0.019	0.063

Summary results credit and formality: median point estimates.

Median values of the coefficient g in equation (1) for the estimates from table 3.2 (median correspond to different number of observations). Medians are computed with different number of observations depending on original coverage of the concepts.

"Credit to private sector" and "Credit to firms" stand respectively for credit measures based on credit to the private sector (including households) and credit to private firms. The size category "Smaller firms" comprises the categories "Self-employed", "Small", and "Medium" in tables 3.1 and 3.2. "Large" accommodate the largest categories used in the regressions. "No size break" corresponds to the regression results for the sample including firms of all sizes.

The Coefficients indicate the relative difference in the change in formality rates between two sectors separated by a unit of the FD measure, following a 1% change in the credit measure.

These results fit the standard theoretical arguments discussed in Sections 2 and 3—namely that the expected positive relationship is likely to be affected by idiosyncratic factors (possibly by varying institutional and economic conditions). The main general conclusions can be summarized as follows:

- The positive relationship between formality and credit conditions appears to be empirically relevant, although idiosyncratic factors may be affecting the statistical significance of the relationship.
- The use of alternative formality concepts (presence of a formal contract vs. contribution to social security) and credit measures (private credit vs. credit to private firms) do not appear to have a strong influence on the typical point estimates—although there can be sizable differences in particular cases.
- The evidence suggests the presence of heterogeneous effects conditional on firm size. The typical point estimate is significantly larger for samples including only large firms than for samples including only smaller sizes. This is consistent with the view that formalization represents a substantial cost for firms.

The second series of papers in the project focused on the relationship between financial conditions and other firm outcomes: firm size, growth, and investment. In this case, the approach was to adopt alternative methodologies and focus on alternative measures of firm performance in

order to take advantage of the different sets of information provided by each country. The overall results are summarized by the following table (which reproduces for convenience Table 8).

Table 24. Qualitative Results Credit and Firm Performance

	Arg.		Bra. ^(a)		Col. ^(b)		Per.				Uru.
	Priv. Cred		Int. rate	Ov. Costs	Fin. Liab / assets		Fin. Inst. / Adults		At least 1 fin. Inst.		Bank cred.
	Sales	Empl.	Empl.	Empl.	Sales	Assets	Empl.	VA	Empl.	VA	Investment
Formal firms											
Small	.	.	.	.	+	+	.	.	.	.	.
Medium	.	.	.	.	+	+	.	.	.	.	.
Large	.	.	.	.	+	+	.	.	.	.	.
All sizes	.	.	-	-	+	+	.	.	.	.	0
Agriculture	+++	+++	.	.	.	.	.	.	.	.	.
Manufacturing	0	0	.	.	.	.	.	.	.	.	.
Agric. & Manuf.	+	++	.	.	.	.	.	.	.	.	.
Formal and informal firms											
Small	.	.	.	.	.	.	0	+++	++	++	.
Medium	.	.	.	.	.	.	+++	+++	0	0	.
Large	.	.	.	.	.	.	0	0	+++	0	.
All sizes	.	.	.	.	.	.	+++	+++	+++	++	.

Summary of results. Source: Auguste et al. (2013), D'Erasmus (2013), Galindo and Meléndez (2013), Morón et al.(2013), Gandelman and Rasteletti (2013).

Credit conditions: private credit to GDP (Argentina), money market rates and overhead costs financial institutions (Brazil), financial liabilities to asset at firm level (Colombia), financial institutions to adults and presence of at least one financial institution (Peru), and bank credit (Uruguay).

Firm size measured by sales, employment, assets, and value added. **Investment** is measured relative to capital in the previous period.

+, ++, +++ indicate a positive relation at 10%, 5%, and 1% (similarly for "-"); "0" indicates not statistically significant. "." indicates the concept is not represented.

(a) Results for Brazil correspond to a CGE model and therefore do not have the same interpretation in terms of statistical significance.

(b) Results for Colombia capture the accumulated impact over a 6-year horizon (corresponding to the estimated impulse-response functions).

The results for this part of the series can be described in the following terms:

- The relationship between credit conditions and the various firm performance measures (employment, valued added, sales, investment, asset growth) appears to be statistically significant and economically relevant in the countries under consideration. This is somewhat different from the qualitative results on credit and formality, where the estimated coefficients were relatively more fragile in terms of statistical significance.
- Similar to the case of formality, the evidence suggests the presence of heterogeneous effects conditional on firm size (and market or sector of operation).
- There is some evidence suggesting that the explicit consideration of alternative funding sources is important, particularly of cash flows and retained earnings, in order to obtain a more adequate measure of the quantitative relation between credit provided by formal financial institutions and firm performance.

6.2 The Common Thread: One Size Does Not Fit All and Alternative Funding Sources

Probably the most relevant common factor to all the results in the series is the message that the effects of credit conditions on firm performance (formality, size, investment) are heterogeneous conditional on firm size. In the case of formality, this is probably best captured by the size difference of the typical coefficients for large and smaller firms: 0.181 vs. 0.065. This result also continues to be present in the second part of the series—although the pattern is less obvious and cannot be readily summarized in a single metric given the methodological differences. However, the upside of this methodological diversity has been to show that these heterogeneous effects are likely also to be present conditional on other dimensions (sector of activity and market type). From a policy perspective, this result is of importance as it highlights that there can be some predictable patterns on the distribution of costs and benefits following an intervention affecting credit conditions.

Another element that emerges from the project is that the assessment of the relationship between formal credit and firm performance would benefit from accounting for the effects of alternative sources of financing. Some of the papers in the series have made progress in this area accounting in alternative ways for internally generated funds. The results show that incorporating that information into the analysis may have non-trivial effects on the estimations. These results are certainly useful and informative, but there is a clear need to advance on a framework that includes other sources of financing such as internal funds, commercial credit, and informal credit.

Annex 1. Data Sources

This annex describes the main data and sources used in the papers of the project.

Argentina

Auguste, Bebczuk, and Sánchez (2011): Permanent Household Survey (EPH, Encuesta Permanente de Hogares) 1996-2010. The sample used corresponds to salaried 15-65 years old who work in non-agricultural activities. An individual is classified as informal if he/she does not contribute to Social Security. Self-employed, employers, domestic workers, military personnel and unpaid workers are excluded. Firm size categories correspond to 1, 2-25, and more than 25 employees. Credit measures are: private credit and M2 (both relative to GDP).

Auguste, Bebczuk, and Sánchez (2013): Assembled panel dataset combining information from the Central Bank and the national tax revenue agency (Administración Federal de Ingresos Públicos -AFIP). The sample covers 33 activities from the primary and manufacturing sectors—nine primary and 24 manufacturing industries—from 2000 to 2010.

Brazil

Catão, Pagés, and Rosales (2009): Data on formal employment are obtained from the Pesquisa Nacional por Amostra de Domicílios (PNAD), the main Brazilian household survey. The sample used corresponds to salaried and self-employed individuals between 15-65 years old who work in non-agricultural activities. Employers, domestic workers, military personnel and unpaid workers are excluded. Firm size categories correspond to 1, 2-10, and more than 10 employees. Main credit measures are credit to the private sector and credit to firms.

D'Erasmus (2013):

Net Interest Margin: Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets (Beck, Demirgüç-Kunt and Levine, 2009)

Real Money Market Interest Rate: Interest Rates, Money Market Rate (International Financial Statistics)

Bank Overhead Costs: Value of a bank's overhead costs as a share of its total assets (Beck, Demirgüç-Kunt and Levine, 2009).

Corporate loan interest rates (median, average, distribution): Koan interest rate. (Central Bank of Brazil)

Formal Size Distribution (RAIS, Relação Anual de Informações Sociais)

Informal Size Distribution (ECINF survey, Pesquisa de Economia Informal Urbana)

Taxes (profit and payroll), entry cost formal sector and firing costs (Doing Business dataset, World Bank)

Data for D'Erasmus (2013) available at:

[http://www.iadb.org/en/research-and-data/publication-details,3169.html?pub_id=IDB-DB-106]

Colombia

Caro, Galindo, and Meléndez (2012): The primary data source used in this paper is the Annual Manufacturing Survey (AMS) conducted by the national statistical agency, DANE. Financial data are from Financial Superintendency (Superfinanciera). Financial constraint is the correlation coefficient between each firm's investment and its cash flow. The main credit measure is banking credit going to manufacturing firms.

Galindo and Meléndez (2013): Main dataset constructed with data from Superintendencia de Sociedades (Supersociedades) and international trade information obtained directly from official customs records. The resulting dataset is an unbalanced panel of formal firms incorporated as companies that contains the universe of large firms (with income or assets at or above 50,000 minimum monthly wage or MMW) and larger medium firms (with income or assets at or above 30,000 MMW and below 50,000), a representative sample of the smaller medium sized-firms (with income or assets at or above 5,000 MMW and below 30,000), and a representative sample of small firms (with income or assets at or above 500 MMW and below 5,000). The dataset is not representative of micro firms: firms falling in this category by the size of their income or assets

were eliminated from this study. The data contain information about each firm's sales, assets, exports, sector of activity and, financial debt.

Mexico

Bazdresch and Werner (2014): The formality data come from Mexico's ENIGH survey, produced by the INEGI. The main conclusions of the paper are based on the 2000-2010 samples. The distinction between informal and independent follows two different methodologies for the years 2000-2006 and then for 2008-2010 due to changes in data collection. There are three alternative definitions of formal worker: i) if they state that they are under a permanent or a temporary contract, ii) if they say they are receiving a well-defined wage, and iii) if a worker declares receiving social benefits linked to the job. The size categories are tiny (0), micro (2-5), small (6-15), and medium+ (16 and over).

Peru

Morón and Salgado (2011): Main data source is the National Household Survey (ENAHO). A worker is considered informal if the firm he/she works for does not carry accounting books (registration informality); whereas for the second measure, a worker is considered informal if he/she is not making contributions to any pension system, either public or private (pension informality). The size categories are self-employed, firms with 2-10 employees, and firms with 10 or more employees. The sample covers 2002-2009.

Morón, Salgado and Seminario (2013): The measures of firm growth and performance are from the National Economic Census of 1994 and 2008. There is no distinction between formal or informal firms. Financial conditions are approximated by the following variables: the number of financial institutions, a dummy variable for the presence of at least one financial institution, the proportion of workers in financial activities relative to adults under 65, and the fourth column corresponds to the same previous concept but excluding self-employment within the financial sector. In turn, the firm size categories are the following: small (1-2 workers), medium (3-10), and large (11 or more).

Uruguay

Gandelman and Rasteletti (2012): Pseudo-panel data constructed from repeated cross-sectional household surveys, which cover the years 2000 to 2010. To construct the dataset, observations from the household surveys are averaged across the economic sector and calendar year dimensions. There are three alternative measures of informality: i) “health rights” defines a worker as informal if he or she does not have an HMO, despite being employed; ii) a worker is considered informal if he or she does not receive a thirteenth salary; and iii) a worker is informal if he or she does not pay social security taxes. Data available at:

[http://www.iadb.org/en/research-and-data/publication-details,3169.html?pub_id=IDB-DB-109].

Gandelman and Rasteletti (2013): All the information on firms comes from the Encuesta Anual de Actividad Económica (Economic Activity Survey). The data on sector level informality are produced using the Encuesta Continua de Hogares (Continuous Household Survey). The dataset on firms is an unbalanced panel containing annual observations spanning the years 1997-2008. The coverage of the surveys also varies substantially across years. Between 1997 and 1999 about 1,400 firms were included in the survey each year. Between 2000 and 2005 the number of firms included increased, to an average of 2,100 firms per year. Since then, the number of firms surveyed fell considerably. Only 783 firms were surveyed in 2006, a figure that then rose somewhat to 971 in 2007 and 1,034 in 2008. This drop in the sample size is mainly due to reduction in the sample size of the strata of firms with less than 50 employees. The size of the sample of firms with more than 50 employees did not change significantly in those years. Informality is measured as in Gandelman and Rasteletti (2012).

Bibliography

- Aidis, R., and Y. Adachi. 2007. "Russia: Firm Entry and Survival Barriers." *Economic Systems* 31(4): 391-411.
- Aisen, A. et al. 2013. "Credit Contraction and International Trade: Evidence from Chilean Exporters." *World Development* 44: 212-224.
- Almeida, R., and P. Carneiro. 2009. "Enforcement of Labor Regulation and Firm Size." *Journal of Comparative Economics* 37(1): 28-46.
- Andreoni, J., B. Erard and J. Feinstein. 1998. "Tax Compliance." *Journal of Economic Literature* 36(2): 818-860.
- Angelini, P., and A. Generale. 2008. "On the Evolution of Firm Size Distributions." *American Economic Review* 98(1): 426-438.
- Arellano, M., and O. Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models." *Journal of Econometrics* 68(1): 29-51.
- Arellano, C., Y. Bai and J. Zhang. 2012. "Firm Dynamics and Financial Development." *Journal of Monetary Economics* 59(6): 533-549.
- Arnold, L.G., and J.G. Riley. 2009. "On the Possibility of Credit Rationing in the Stiglitz-Weiss Model." *American Economic Review* 99(5): 2012-2021.
- Auguste, S., R. Bebczuk and G. Sánchez. 2011. "Formality and Credit Markets: The Case of Argentina." Washington, DC, United States: Inter-American Development Bank. Mimeographed document.
- Auguste, S., R. Bebczuk and G. Sánchez. 2013. "Firm Size and Credit in Argentina." Working Paper Series IDB-WP-396. Washington, DC, United States: Inter-American Development Bank.
- Azeker, M. 2012. "A Structural Model of Firm and Industry Evolution: Evidence from Chile." *Journal of Economic Dynamics and Control* 36(6): 891-913.
- Azuma, Y., and H.I. Grossman. 2002. "A Theory of the Informal Sector." NBER Working Paper 8823. Cambridge, United States: National Bureau of Economic Research.
- Bazdresch, S., and A.M. Werner. 2014. "Finance and Employment Formalization: Evidence from Mexico's Income-Expenditure Surveys, 2000-2010." Working Paper IDB-WP-324. Washington, DC, United States: Inter-American Development Bank.

- Beck, T. et al. 2008. "Finance, Firm Size, and Growth." *Journal of Money, Credit and Banking* 40(7): 1379-1405.
- Beck, T., A. Demirgüç-Kunt and R. Levine. 2009. "Financial Institutions and Markets across Countries and over Time: Data and Analysis." Policy Research Working Paper 4943. Washington, DC, United States: World Bank.
- Beck, T., A. Demirgüç-Kunt and V. Maksimovic. 2008. "Financing Patterns around the World: Are Small Firms Different?" *Journal of Financial Economics* 89(3): 467-487.
- Berger, A.N., and L.K. Black. 2011. "Bank Size, Lending Technologies, and Small Business Finance." *Journal of Banking & Finance* 35(3): 724-735.
- Berger, A.N., R.J. Rosen and G.F. Udell. 2007. "Does Market Size Structure Affect Competition? The Case of Small Business Lending." *Journal of Banking & Finance* 31(1): 11-33.
- Bernanke, B., 1986. "Alternative Explorations of the Money-Income Correlation." *Carnegie-Rochester Series on Public Policy* 25: 49-99.
- Blanchard, O.J., and D. Quah. 1989. "The Dynamic Effects of Aggregate Demand and Supply Disturbances." *American Economic Review* 79(4): 655-673.
- Blundell, R.W., and S.R. Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87(1): 115-143.
- Borck, R. 2004. "Stricter Enforcement May Increase Tax Evasion." *European Journal of Political Economy* 20(3): 725-737.
- Buch, C.M., and C. Pierdzioch. 2005. "The Integration of Imperfect Financial Markets: Implications for Business Cycle Volatility." *Journal of Policy Modeling* 27(7): 789-804.
- Buera, F.J., J.P. Kaboski and Y. Shin. 2011. "Finance and Development: A Tale of Two Sectors." *American Economic Review* 101(5): 1964-2002.
- Calomiris, C.W. and R.G. Hubbard. 1995. "Internal Finance and Investment: Evidence from the Undistributed Profits Tax of 1936-1937." NBER Working Paper 4288. Cambridge, United States: National Bureau of Economic Research.
- Campbell, J.R. 2011. "Competition in Large Markets." *Journal of Applied Econometrics* 26(7): 1113-1136.

- Campbell, J.R., and H.A. Hopenhayn. 2005. "Market Size Matters." *Journal of Industrial Economics* 53(1): 1-25.
- Caro, L., A.J. Galindo and M. Meléndez. 2012. "Credit, Labor Informality and Firm Performance in Colombia." Working Paper IDB-WP-325. Washington, DC, United States: Inter-American Development Bank.
- Catão, L.A., M. Rosales and C. Pagés. 2009. "Financial Dependence, Formal Credit and Informal Jobs: New Evidence from Brazilian Household Data." Working Paper IDB-WP-118. Washington, DC, United States: Inter-American Development Bank.
- Chong, A., and M. Gradstein. 2007. "Inequality and Informality." *Journal of Public Economics* 91(1): 159-179.
- Chor, D., and K. Manova. 2012. "Off the Cliff and Back? Credit Conditions and International Trade during the Global Financial Crisis." *Journal of International Economics* 87(1): 117-133.
- Clarke, G.R., R. Cull and G. Kisunko. 2012. "External Finance and Firm Survival in the Aftermath of the Crisis: Evidence from Eastern Europe and Central Asia." *Journal of Comparative Economics* 40(3): 372-392.
- Coluzzi, C., A. Ferrando and C. Martínez-Carrascal. 2009. "Financing Obstacles and Growth: An Analysis for the Euro-Area Non-Financial Corporations." Working Paper 997. Frankfurt, Germany: European Central Bank.
- Cooley, T.F., and V. Quadrini. 2001. "Financial Markets and Firm Dynamics." *American Economic Review* 91(5): 1286-1310.
- Coremberg, A. 2009. "Midiendo las Fuentes del Crecimiento en una Economía Inestable: Argentina. Productividad y Factores Productivos por Sector de Actividad Económica y por Tipo de Activo." *Estudios y Perspectivas* 41. Buenos Aires, Argentina: Comisión Económica para América Latina.
- Cravo, T.A. 2011. "Are Small Employers More Cyclically Sensitive? Evidence from Brazil." *Journal of Macroeconomics* 33(4): 754-769.
- Cull, R., and L.C. Xu. 2005. "Institutions, Ownership, and Finance: The Determinants of Profit Reinvestment among Chinese Firms." *Journal of Financial Economics* 77(1): 117-146.

- D'Erasmus, P.N. 2013. "Access to Credit and the Size of the Formal Sector in Brazil." Working Paper IDB-WP-404. Washington, DC, United States: Inter-American Development Bank.
- D'Erasmus, P.N., and H.J. Boedo. 2012. "Financial Structure, Informality and Development." *Journal of Monetary Economics* 59(3): 286-302.
- Da Silva, G.F. 2002. "The Impact of Financial System Development on Business Cycles Volatility: Cross-Country Evidence." *Journal of Macroeconomics* 24(2): 233-253.
- Dabla-Norris, E., M. Gradstein and G. Inchauste. 2008. "What Causes Firms to Hide Output? The Determinants of Informality." *Journal of Development Economics* 85(1): 1-27.
- Dabla-Norris, E., and J. Koeda. 2008. "Informality and Bank Credit: Evidence from Firm-Level Data." IMF Working Paper 08/94. Washington, DC, United States: International Monetary Fund.
- Desai, M.A., C.F. Foley and K.J. Forbes. 2004. "Financial Constraints and Growth: Multinational and Local Firm Responses to Currency Crises." NBER Working Paper 10545. Cambridge, United States: National Bureau of Economic Research.
- Diamond, D.W. 1989. "Reputation Acquisition in Debt Markets." *Journal of Political Economy* 97(4): 828-862.
- Djankov, S. et al. 2002. "The Regulation of Entry." *Quarterly Journal of Economics* 117(1): 1-37.
- Djankov, S., and R. Ramalho. 2009. "Employment Laws in Developing Countries." *Journal of Comparative Economics* 37(1): 3-13.
- Drakos, K., and N. Giannakopoulos. 2011. "On the Determinants of Credit Rationing: Firm-Level Evidence from Transition Countries." *Journal of International Money and Finance* 30(8): 1773-1790.
- Eichengreen, B., A. Rose and C. Wyplosz. 1996. "Contagious Currency Crises: First Tests." *Scandinavian Journal of Economics* 98(4): 463-484.
- Eichengreen, B. et al. 1995. "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks." *Economic Policy* 10(21): 249-312.
- Evans, D.S. 1987. "Tests of Alternative Theories of Firm Growth." *Journal of Political Economy* 95(4): 657-674.

- Fajnzylber, P., W.F. and G.V. Montes-Rojas. 2011. "Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program." *Journal of Development Economics* 94(2): 262-276.
- Feldmann, H. 2009. "The Unemployment Effects of Labor Regulation around the World." *Journal of Comparative Economics* 37(1): 76-90.
- Friedman, E. et al. 2000. "Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries." *Journal of Public Economics* 76(3): 459-493.
- Galindo, A.J., and M. Meléndez. 2013. "Small is Not Beautiful: Firm-Level Evidence of the Link between Credit, Firm Size and Competitiveness in Colombia." Working Paper IDB-WP-395. Washington, DC, United States: Inter-American Development Bank.
- Gandelman, N., and A. Rasteletti. 2012. "The Impact of Bank Credit on Employment Formality in Uruguay." Working Paper IDB-WP-302. Washington, DC, United States: Inter-American Development Bank.
- Gandelman, N., and Alejandro Rasteletti. 2013. "Credit Constraints, Sector Informality and Firm Investments: Evidence from a Panel of Uruguayan Firms." Working Paper IDB-WP-392. Washington, DC, United States: Inter-American Development Bank.
- García-Verdú, R. 2007. "Measurement of the Shadow Economy or Shadowy Measurement?" Washington, DC, United States: World Bank. Mimeographed document. Available at: <http://www.webmeets.com/files/papers/LACEA-LAMES/2007/157/rgv-informality.pdf>
- Gordon, R., and W. Li. 2009. "Tax Structures in Developing Countries: Many Puzzles and a Possible Explanation." *Journal of Public Economics* 93(7-8): 855-866.
- Grossman, S.J., and O.D. Hart. "The Costs and Benefits of Ownership: A theory of vertical and lateral integration." *The Journal of Political Economy* (1986): 691-719.
- Guner, N., G. Ventura and Y. Xu. 2008. "Macroeconomic Implications of Size-Dependent Policies." *Review of Economic Dynamics* 11(4): 721-744.
- Hancock, D., and J.A. Wilcox. 1998. "The 'Credit Crunch' and the Availability of Credit to Small Business." *Journal of Banking & Finance* 22: 983-1014.
- Havrylchyk, O. 2012. "The Effect of Foreign Bank Presence on Firm Entry and Exit in Transition Economies." *Journal of Banking & Finance* 36(6): 1710-1721.
- Holmstrom, B., and J. Tirole. 1997. "Financial Intermediation, Loanable Funds and the Real Sector." *Quarterly Journal of Economics* 52: 663-691.

- Honoré, B.E., and E. Kyriazidou. 2000. "Panel Data Discrete Choice Models with Lagged Dependent Variables." *Econometrica* 68(4): 839-874.
- Hooks, L.M. 2003. "The Impact of Firm Size on Bank Debt Use." *Review of Financial Economics* 12(2): 173-189.
- Hsieh, C., and P. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *Quarterly Journal of Economics* 124(4): 1403-1448.
- Hubbard, R.G. 1998. "Capital-Market Imperfections and Investment." *Journal of Economic Literature* 36: 193-225.
- Ihrig, J., and K.S. Moe. 2004. "Lurking in the Shadows: The Informal Sector and Government Policy." *Journal of Development Economics* 73(2): 541 - 557.
- Johnson, S., D. Kaufmann and P. Zoido-Lobaton. 1998. "Regulatory Discretion and the Unofficial Economy." *American Economic Review* 88(2): 387-392.
- Johnson, S., J. McMillan and C. Woodruff. 2002. "Property Rights and Finance." *American Economic Review* 92(5): 1335-1356.
- Kaplan, D.S. 2009. "Job Creation and Labor Reform in Latin America." *Journal of Comparative Economics* 37(1): 91-105.
- King, R.G., and R. Levine. 1993. "Finance and Growth: Schumpeter Might Be Right." *Quarterly Journal of Economics* 108(3): 717-737.
- King, R.G. et al. 1991. "Stochastic Trends and Economic Fluctuations." *American Economic Review* 81(4): 819-40.
- Klapper, L., L. Laeven and R. Rajan. 2004. "Business Environment and Firm Entry: Evidence from International Data." NBER Working Paper 10380. Cambridge, United States: National Bureau of Economic Research.
- Klein, B., R. Crawford and A. Alchian. 1978. "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process." *Journal of Law and Economics* 21: 297-326.
- Kumar, K.B., R.G. Rajan and L. Zingales. 1999. "What Determines Firm Size?" NBER Working Paper 7208. Cambridge, United States: National Bureau of Economic Research.
- La Porta, R., and A. Shleifer. 2008. "The Unofficial Economy and Economic Development." *Brookings Papers on Economic Activity* 39(2): 275-363.
- La Porta, R. et al. 1997. "Legal Determinants of External Finance." *Journal of Finance* 52: 1131-1150.

- Li, D., and M.P. Ferreira. 2011. "Institutional Environment and Firms' Sources of Financial Capital in Central and Eastern Europe." *Journal of Business Research* 64(4): 371-376.
- Loayza, N.V. 1996. "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America." *Carnegie-Rochester Conference Series on Public Policy* 45: 129-162.
- Loayza, N.V. 2008. "Causas y Consecuencias de la Informalidad en el Perú." *Revista Estudios Económicos* 15: 43-64.
- Lucas, R.E., J. 1978. "On the Size Distribution of Business Firms." *Bell Journal of Economics* 9(2): 508-523.
- Marcouiller, D., and L. Young. 1995. "The Black Hole of Graft: The Predatory State and the Informal Economy." *American Economic Review* 85(3): 630-646.
- Martinelli, C. 1997. "Small Firms, Borrowing Constraints, and Reputation." *Journal of Economic Behavior & Organization* 33(1): 91-105.
- Matsuyama, K. 2007. "Aggregate Implications of Credit Market Imperfections." NBER Working Paper 13209. Cambridge, United States: National Bureau of Economic Research.
- Mauro, P. 1995. "Corruption and Growth." *Quarterly Journal of Economics* 110(3): 681-712.
- McKenzie, D., and Y.S. Sakho. 2010. "Does It Pay Firms to Register for Taxes? The Impact of Formality on Firm Profitability." *Journal of Development Economics* 91(1): 15-24.
- Minetti, R., and S.C. Zhu. 2011. "Credit Constraints and Firm Export: Microeconomic Evidence from Italy." *Journal of International Economics* 83(2): 109-125.
- Morón, E., E. Salgado and C. Seminario. 2013. "Regional Financial Development and Firm Growth in Peru." Working Paper IDB-WP-398. Washington, DC, United States: Inter-American Development Bank.
- Morris, S., and H.S. Shin. 1998. "Unique Equilibrium in a Model of Self-Fulfilling Currency Attacks." *American Economic Review* 88(3): 587-597.
- Nisbet, C. 1967. "Interest Rates and Imperfect Competition in the Informal Credit Market of Rural Chile." *Economic Development and Cultural Change* 16(1): 73-90.
- Pang, J., and H. Wu. 2009. "Financial Markets, Financial Dependence, and the Allocation of Capital." *Journal of Banking & Finance* 33(5): 810-818.

- Paravisini, D. et al. 2011. "Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data." NBER Working Paper 16975. Cambridge, United States: National Bureau of Economic Research.
- Perry, G.E. et al. 2007. *Informality: Exit and Exclusion*. Washington, DC, United States: World Bank.
- Porta, R.L. et al. 1997. "Legal Determinants of External Finance." *Journal of Finance* 52(3): 1131-1150.
- Qian, Y. 2007. "Do National Patent Laws Stimulate Domestic Innovation in a Global Patenting Environment? A Cross-Country Analysis of Pharmaceutical Patent Protection, 1978–2002." *Review of Economics and Statistics* 89(3): 436-453.
- Raddatz, C. 2006. "Liquidity Needs and Vulnerability to Financial Underdevelopment." *Journal of Financial Economics* 80(3): 677-722.
- Rajan, R.G., and L. Zingales. 1998. "Financial Dependence and Growth." *American Economic Review* 88(3): 559-586.
- Roland, G. 2002. "The Political Economy of Transition." *Journal of Economic Perspectives* 16(1): 29-50.
- Rossi-Hansberg, E., and M.L.J. Wright. 2007. "Establishment Size Dynamics in the Aggregate Economy." *American Economic Review* 97(5): 1639-1666.
- Saidenberg, M.R., and P.E. Strahan. 1999. "Are Banks Still Important for Financing Large Businesses?" *Current Issues in Economics and Finance* 5(12). New York, United States: Federal Reserve Bank of New York. Available at: http://data.newyorkfed.org/research/current_issues/ci5-12.pdf
- Sala-I-Martin, X.X. 1997. "I Just Ran Two Million Regressions." *American Economic Review* 87(2): 178-183.
- Sarte, P-D.G. 2000. "Informality and Rent-Seeking Bureaucracies in a Model of Long-Run Growth." *Journal of Monetary Economics* 46(1): 173-197.
- Schneider, F., and D.H. Enste. 2000. "Shadow Economies: Size, Causes, and Consequences." *Journal of Economic Literature* 38(1): 77-114.
- Straub, S. 2005. "Informal Sector: The Credit Market Channel." *Journal of Development Economics* 78(2): 299-321.

- Su, X. 2012. "A Re-Examination of Credit Rationing in the Stiglitz and Weiss Model." NHH Dept. of Finance & Management Science Discussion Paper 10. Bergen, Norway: Norwegian School of Economics.
- Timberg, T.A. and C.V. Aiyar. 1984. "Informal Credit Markets in India." *Economic Development and Cultural Change* 33(1): 43-59.
- Tornell, A., and P.R. Lane. 1999. "The Voracity Effect." *American Economic Review* 89(1): 22-46.
- Williamson, O.E. 1985. *The Economic Institutions of Capitalism*. New York, United State: Free Press.
- Yamada, G. 1996. "Urban Informal Employment and Self-Employment in Developing Countries: Theory and Evidence." *Economic Development and Cultural Change* 44(2): 289-314.
- Yasar, M., C.J.M. Paul and M.R. Ward. 2011. "Property Rights Institutions and Firm Performance: A Cross-Country Analysis." *World Development* 39(4): 648-661.