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Eduardo Morón
Edgar Salgado
Cristhian Seminario

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Inter-American Development Bank
Department of Research and Chief Economist

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Eduardo Morón*
Edgar Salgado**
Cristhian Seminario*

* Universidad del Pacífico
** University of Sussex

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Abstract[*]

This paper documents the relationship between regional financial development and firm growth in the Peruvian manufacturing sector. In order to control for mutual causality between credit availability and firm growth, industry differences in financial dependence on external funds are exploited. The 1994 and 2008 rounds of the National Economic Census are used, permitting analysis at the firm level as well as the activity level. Results suggest a significant and positive effect of financial deepening on surviving firms' growth. However, this effect is smaller for micro enterprises, suggesting that the cost of external funding decreases with financial development mainly for large firms. The conclusions remain unchanged when entering and exiting firms are included. The paper further finds that credit expansion have encouraged not only firm growth but also firm entry. The results are robust using an alternative measure of financial dependence.

JEL classifications: D22, D53, G21, L11, L60, O14
Keywords: Firm growth, Manufacturing, Financial development, Peru

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1 Introduction

Growth is perhaps the primary concern of a policymaker, not only at an aggregate level but also at a micro level: what is aggregate growth but the sum of individual growth? Moreover, to determine the sources of growth at the macroeconomic level, it is necessary to explicitly document the way these sources are shaped at the microeconomic level. Financial development has been postulated as one of the key factors explaining growth. There is a vast literature, since at least Schumpeter (1911), that emphasizes the influence of the financial sector on per capita income growth. This linkage has its theoretical foundation in the role that financial sector plays as a means of reallocating capital.

However, empirically testing the relation between growth and financial development is a challenge. In particular, there is an obvious mutual causality between both variables: is financial development working as a facilitator of economic growth, or is it just a reflection of the state of an economy? The empirical efforts testing this link date from Goldsmith (1969), McKinnon (1973) and Shaw (1973), who documented that high-growth economies tend to have well-developed financial sectors. As illustrative as they are, these works point to the existence of a correlation rather than of a causal link. It was not until a couple of decades later that King and Levine (1993) tried to resolve the causality problem using a lagged indicator of financial development as predictor of growth. Nevertheless, in the absence of theoretical underpinnings for the finance-growth mechanism operating, there is still room for omitted variables to explain the causal link. It is in this context that Rajan and Zingales (1998) proposed an alternative approach to assess causality which consists of *focusing on the details of theoretical mechanisms through which financial development affects economic growth, and document their working.*

Thus, what we do in this paper is to follow the Rajan and Zingales (1998) strategy, but instead of a cross-country analysis we conduct a *within-country* analysis. This strategy enables us to use firm-level data instead of only activity-level data (for cross-country analysis the former are hardly available). To preview our empirical results, we find evidence supporting the operation of a causal relation

between financial development and growth. In particular, financial development (measured in alternative ways) seems to induce firms to increase their size measured as value added and number of workers, which ultimately means a positive effect on labor productivity. The effect, however, is differentiated by firm size. Large firms are more capable of growth in terms of labor and value added than medium and small firms: the effect on the number of workers is 2 percent larger than that of medium firms and almost three times that of small firms. At the activity level, the share of new firms entering the market increases within industries with high dependence on external funding as a consequence of financial development, which suggests that financial development influences not only firm growth but also creation of new firms. As a robustness check we also performed estimations using the growth rate of the surviving firms and cross-section estimation of the firm size using only the 2008 census, and the results remained unchanged. A final robustness check utilizes a different measure of financial dependence, the one suggested by Braun (2002), and the interpretation of the results remained unchanged as well.

The rest of the paper is organized as follows. Section 2 describes the Peruvian context that motivates the analysis, and Section 3 reviews the relevant literature for this analysis, emphasizing work undertaken in Peru. Section 4 explains the testing strategy implemented and the particular improvements made in reference to the literature. In Section 5 we present the data sources used in this paper as well as discuss their suitability. Section 6 explains the econometric strategy adopted in this paper to elucidate the effect of financial deepening on firm growth. Finally, Section 7 concludes the analysis.

2 Institutional Setting and Motivation

The importance of assessing the effect of financial development on firms is particularly interesting in the Peruvian context of i) greater credit availability and ii) a shift to the right in the firm size distribution—i.e., firms in the lowest size categories increase their share in the economy between 1994 and 2008. The question

is, then, how credit expansion has interacted with growth performance among Peruvian firms.

Currently, credit growth in most Latin American countries is recovering from the recent 2008-2009 crisis. In some cases, this recovery has been very fast, raising questions about how sustainable it is. In this context, the effects of a new wave of credit on firm growth merits evaluation. Figure 1 shows that financial deepening measured as domestic credit over GDP resumed its trend in 2003 after the 1998 crisis, although it has still not reached its 1998 peak (29 percent). This aggregate number, however, hides important geographic differences. Figure 2 suggests that credit (measured as thousands of 2006 nuevos soles loaned by financial institutions) has not only grown, but also shown important differences at the regional level.

On the other hand, if we explore the change in the firm size distribution (FSD) between the two rounds of census data for Peruvian manufacturing sector (see Figure 4), we can see an increasing number of firms located at the left tail of the FSD—i.e., very small firms. Moreover, the manufacturing sector has experienced a contraction in average firm size and age, which suggests major entry of new small firms during the period under consideration. In fact, recent evidence for the Peruvian case (see Seminario (2012)), shows how firms surviving to the same period have effectively experienced a transition path where, despite the distinct configurations for small and large firms, companies have effectively grown. In particular, Seminario (2012) documented a transition process where large firms displayed very dynamic growth behavior and small firms faced relatively higher restrictions on within-firm growth. The transition matrix reported in Table 2 supports these conclusions. Furthermore, it is important to point out the fact that the lack of dynamic growth performance in small firms does not invalidate the possibility that financial development could have had an impact on this business category. Financial development perhaps influenced the few small firms that grew in the period. Moreover, a priori, expansion in credit supply could be more decisive for small firms than large ones.

It is evident that firm performance and credit availability are associated. Figure 3

shows that manufacturing GDP is highly correlated with the availability of credit every year and in every region. This is of course an equilibrium outcome, which nonetheless shows the mutual correspondence between these two variables. In the figure, manufacturing GDP is highly correlated with credit expansion measured either simply as credit by region or as credit by financial institution by region. Although illustrative, correlations are not useful in determining causality. In this line, this paper will focus on assessing whether the strong financial development observed in Peru between 1994 and 2008 has had an impact on the growth of Peruvian manufacturing firms during the same period.

3 Literature Review

Since the focus of this paper is to explain the relation between credit availability and growth in Peru, it is worthwhile to review the literature surveying that relationship in the Peruvian case. Undoubtedly, the lack of firm-level data has prevented researchers from performing an analysis similar to that undertaken in this paper. The best approximation, however, is the work of Paravisini, Rappoport, Schnabl, and Wolfenzon (2010), which offers an interesting approach to studying the credit supply elasticity of exports. Although not related to the growth literature, this work investigates the effect of credit availability on a growth-driving variable: exports. Using firm-level custom data obtained from the Superintendency of Tax Administration (SUNAT) and bank data on loans obtained from the Peruvian bank regulator, the Superintendency of Banking, Insurance, and Pension Funds (SBS), the authors find that exports react strongly to changes in the supply of credit in the intensive margin (within), that is, firms tend to export more as a consequence of a positive credit shock. That reaction is similar across different firm sizes.

Closely related to our paper, the work of Aguilar (2011) assesses the relationship between the availability of microcredit and economic growth at the regional level. Using regional-level production data level to estimate the rate of economic growth and the provision of loans, also at the regional level, the author finds

evidence suggesting a positive relationship between economic growth and the expansion of microcredit availability. Interestingly, using an alternative measure of financial deepening such as bank intermediation, the author neglects any effect of this variable on economic growth at the regional level. As a simulation exercise, she shows that if the provision of loans from rural banks, municipal banks and banks specialized in microcredit reaches 10 percent of GDP, that would imply a 4 percentage points increase in the growth rate of GDP per capita. One important drawback stemming from this study is the assumption of homogeneity of the relationship between credit expansion and the development of regions. It also seems probable that activities with different credit requirements are concentrated in different regions, and this difference is not taken into account in the analysis.
Seminario (2012) uses the same data set we use in this paper to investigate the dynamics of manufacturing firms in Peru and does so for the same period. Through a Markovian analysis, the author documents the presence of both selection and within-firm growth mechanisms operating asymmetrically on small and large-scale firms. Although this paper estimates the job share of different firm categories, it does not explain what is behind the mechanism. Thus, the Seminario (2012) work constitutes a base for this paper, since now we are interested in seeing whether credit availability accounts for this dynamism, i.e., growth.
Finally, the work of Morón, Salgado, and Seminario (2012), using household data and aggregate data, explains the effect of greater aggregate-level credit availability on the level of formalization across industries. Analyzing the period of 2002-2009, the authors find a significant and positive effect of credit growth on formalization only for the self-employment firms category. Using an alternative measure of informality (lack of pension enrollment), the results suggest a positive effect on formalization for firms with more than 10 employees. The authors also find a significant between effect, which explains the transition from small to large due to greater credit availability.
Our paper seeks to fill a large gap in firm-level analysis in Peru. There are few studies that make use of such detailed data. Thus, this paper is a more detailed investigation addressing the same question as Aguilar (2011).

4 Methodology

The strategy provided by Rajan and Zingales (1998) enables us to reach our first goal: to evaluate the causality stemming from financial development to firm growth. We focus on the specific theoretical mechanism through which the development of the financial market reduces transaction costs and moral-hazard and adverse selection problems, and as a consequence the firm's cost for external funds. Thus, *if the channel of financial development that reduces credit costs faced by firms is actually inducing them to decide to grow, firms belonging to more dependent activities on external resources should be, ceteris paribus, growing disproportionately more than those in less dependent activities in those places with deeper financial development.*

The use of *firm-level (instead of activity-level) data* strongly enriches this analysis. The first reason is because, even when using activity-level data, the hypothesis can be tested by looking at whether *"more dependent activities have shown higher growth rates than ..."*, we cannot see exactly what is driving this higher absorption of labor or value added. Are more firms entering the market in more dependent activities, or are incumbent firms growing? This distinction is not negligible. Firm-level data enable us to precisely determine the effect of financial development on these two different channels. Second, and related to the previous point, testing the aforementioned hypothesis at the activity level does not allow us to determine whether credit expansion increases firm size—a key task in this paper. In contrast, the firm-level approach allows us to make inferences at both levels. Third, there are methodological advantages of using firm-level data rather than activity-level data. We can explore firm composition within an industry and take advantage of its variability instead of just work with mean values at the industry level. Finally, it is important to highlight that these three main advantages are not diminished when we assess regional-level credit availability. Instead, we expect that exploiting the aggregate variability across regions will allow us to explore the causal link between financial development and growth.

There are three alternative data sources that permit us to work with establishment or firm-level data in Peru. The first is the Annual Economic Survey (EEA

in Spanish), which collects information on a subsample of establishments in the economy among all economic activities in Peru (excluding the financial and agriculture sectors). This sample is at the establishment level, and data have been collected since 2000. However, the EEA has three main problems. First, in the EEA data there is no way to identify whether an establishment leaving the sample for any year is effectively exiting the market or was simply not included. This imposes a restriction when trying to identify survivors, exit and entry firms. Second, EEA is not highly successful in including micro enterprises. Moreover, the 2008-2010 modules will reflect the impact of the financial crisis. Finally, collapsing the establishment data at firm level in a subsample survey is not reliable since rarely are all the establishments in an included firm observed.

The second available source is the Annual Survey for Micro and Small Rnterprises (EMYPE in Spanish), which collects information on a subsample of firms with less than 25 workers and has been conducted since 2010. Clearly, with the exception of the establishment-firm conversion problem, it has exactly the same problems as the EEA.

Finally, there is the National Economic Census (CENEC, in Spanish), which is comprehensive in terms of including all establishments operating in the economy. This clearly enables us to run the analysis without the problems posed by the previous alternatives, and we therefore make use of census data in this paper. In particular, we will use the two available rounds of this dataset for the years 1994 and 2008. The 1994 census has as reference years 1991, 1992 and 1993, while the reference period for the 2008 census is 2007.

Although very rich, the available census data pose one difficulty: the 14-year gap between the two censuses makes it difficult to track relationships with financial development, which is crucial for the estimation strategy. For example, Morón, Salgado, and Seminario (2012) use the size of financial sector in terms of GDP to proxy financial development for the period from 2002 to 2009. That strategy works well for panel data, where there is time variability. But in this case we have only two periods, and thus the estimation strategy is slightly different. Although the final dataset we work with is a panel of only two years, two diffi-

culties exist: i) those are not consecutive years, and ii) we are not able to use lags of the variables we are interested in. We instead exploit regional variation in financial development in both periods interacted with our measure of financial dependence on external funding (which is another source of variability). With our strategy we try to observe if firms more dependent on external funding are developing relatively faster than less dependent firms in the provinces that are more financially developed.[1] If this is proved we are able to conclude that we have enough evidence to support the hypothesis that financial deepening has had a positive and significative effect on firms' growth and performance—and even on the creation of new firms—and by extension on economic growth. This approach, of course, has an important similarity with what Rajan and Zingales (1998) did at the cross-country level.

Nonetheless, there are still some caveats regarding the possible exogeneity of the regional financial development measure. Here, we will argue that such caveats are not warranted. First, for a financial deepening measure to be considered exogenous in this analysis, the measure must at least not be particular to the underlying observation—i.e., the firm. Then, the partially aggregate condition of the province-year level index provides us some exogeneity. Likewise, despite the drawback that in this line the province-level measure represents in comparison to the country-level version—as used, for instance, in Morón, Salgado, and Seminario (2012)—the firm-level data that we use here for the main regression provide us a similar argument for relying on the acceptable exogeneity of this index: if before we could state that each activity was small enough not to affect financial development at the country level, analogously we can argue that each firm is small enough to affect financial development at the province level. Moreover, it is important to highlight that the credit growth observed in Peru's

[1]Note that we are working at the firm level, so firms constituted in Lima but having establishments operating in other departments should not introduce problems into the analysis to the extent that their relevant financial development should be that of Lima. Ultimately, this is an assumption of the paper: for the case of multi-plant firms we identify the location of the principal plant as the relevant location for credit identification. In the census data it is clearly stated where the principal plants are located, thus regional information for every firm has been collapsed to the region of the principal plant referred to in the census.

provinces during the period considered has largely involved credit booms rather than credit growth resulting from improvements in firms' growth performance.[2] Finally, in econometric terms, we care about the exogeneity of our right-hand side variable, which is not solely financial development but the interaction of financial development and the financial dependence index estimated with US data.

An additional concern is the estimation itself, which uses a combination of micro units and aggregate variables. As stated by Moulton (1990) and later by Bertrand, Duflo, and Mullainathan (2004), ignoring this issue leads to downward-biased standard errors, thus spuriously increasing the likelihood of finding impacts. To correct for this, we follow the procedure suggested by Bertrand, Duflo, and Mullainathan (2004) and consider an arbitrary variance-covariance matrix at province level. This is implemented in a straightforward way by using the cluster command in STATA and choosing the provinces (not the province-year cell) as clusters. This ensures that we are controlling for any kind of correlation (spatial and temporal) among the errors within each province. By doing this we potentially reduce the bias in the estimation of the standard errors from 45 percent to 6 percent, although we expect an even more consistent estimator of the variance-covariance matrix, since the number of provinces (clusters) used in the analysis is very large (192).

A final remark on the use of census data is in order. When focusing only on survivors we capture a relationship from a group in which firms' access to credit may vary considerably. This focus limits the scope of the implications that can be drawn from the results, as we can only infer the effect of financial development on economic growth only for survivors. Although this is a valuable finding in itself, the question remains of what happens to companies not included in the analysis. This paper implements two additional experiments to include these firms. First, we run an activity-level regression that includes all firms at each census round. Taking the premise that the entire firm size distribution changes very little in a 14-year period, this experiment allows us to make inferences on the finance-

[2] Appendix B explores this issue in detail. The main argument is that we do not find evidence that manufacturing development predicts credit allocation at the regional level.

growth link based on a group of firms with representative conditions of access to credit. However, as stated above, this does not permit us to see in detail if entry, exit or within-firm growth is driving the effect. That is precisely the significance of the survivors regression approach. Second, we also implement a cross-section analysis within the firms in the 2008 census round, attempting to cover all the mass of firms in the analysis of credit availability and firm size. Surely, it would be interesting to see exactly how credit expansion affects firms' growth imposing a shorter period. However, this is impossible given the available data. One possibility would be to use an activity-level regression based on Annual Economic Surveys[3] but, again, without the capacity to infer that this effect is attributable only to surviving firms. Then, the surviving firms approach should be seen more as an improvement of the analysis than as a limitation.

The model we implement to identify the finance-growth nexus for the context described above will consist of a fixed-effects model featuring a baseline-endline approach where the Rajan and Zingales (1998) strategy will allow us to face the endogeneity problems involved in this kind of effort. Although it may look appealing to conduct a diff-in-diff analysis, the impossibility of clearly identitying control and treatment groups constrains that possibility.[4] One might think that having such a detailed dataset as the one that census data provides, the *treatment* variable in this case is not allocated at the firm level.

In particular, the methodology will consist of i) estimating whether and to what extent changes in the financial deepening induce firms belonging to industries that are intrinsically more dependent on external funds to increase their formality levels faster relative to the less financially dependent, ii) separately analyzing the significance and the operation of the finance-growth channel for each starting firm size, and iii) implementing a firm-level and an activity-level approach for the

[3]In fact, not even this can be implemented for the Peruvan case to estimate younger firms' size since EEA is at the establishment level (and impossible to collapse to the firm level) and EMYPE does not cover companies above 25 workers.

[4]That impossibility is based on the lack of firm-level data needed to determine the level of financial dependence on external sources for each firm. Unfortunately the census data include no data with such characteristics.

regression model, first to focus on the growth behavior of firms surviving from one period to the other and, secondly, to include entering and exiting firms in the analysis. The latter is done with the aim of providing a comprehensive analysis of the shift observed in Figure 4 for the manufacturing FSD.

5 Data Description

The analysis undertaken in this paper requires us to build three types of measures. The first concerns the evolution of the size of the firm (namely growth) and its performance. Second, we need to know the level of financial development in each period; in particular, we need a measure one that proxies credit availability or expansion rather than deposits. Finally, we need information on the theoretical mechanism that will enable us to tackle the exogeneity issue.

Measures of Firm Growth and Performance

The National Economic Census (CENEC), conducted in 1994 and 2008, is our source of information for measuring firm growth and performance. The 1994 census was conducted through 1993 and finished in 1994, with a reference period from 1991 to 1993 depending on the region. The 2008 census has 2007 as a reference period for all firms surveyed. We focus on the manufacturing sector.
Both datasets contain information on production, value added, labor force, fixed assets, and general data on the establishment and the firm. For the manufacturing sector the total number of surveyed firms is 38,319 for 1994 and 75,345 for 2008. However, firms that actually provide information on the main variables used in this document (labor and value added) are 29,037 and 57,826, respectively. This means a rate of non-response of 24.22 percent for 1994 and 23.25 percent for 2008. Most of those firms with no data (99.87 percent for 1994 and 69.9 percent for 2008) are firms that started operations years after the reference period and consequently do not have information to report for the fiscal year (i.e., 1991, 1992 or 1993 in CENEC 1994 and 2007 in CENEC 2008). Both censuses

include the whole distribution of firms in the economy for the period. There is no distinction between formal and informal firms.

Although data were originally collected at the establishment level, we focus our analysis on the firm level since growth decisions are more likely to be taken at that level rather than individually at the establishment level. Data are therefore collapsed to the firm level. A more practical reason for conducting firm-level analysis is that there is no way to track establishments between the two waves of census data, as they do not share a common identifier at this level. For a further discussion of the algorithm and resulting matched firms, see Appendix A.

To begin with, Table 1 provides some descriptive statistics for the Peruvian case. We can see that the share of small-scale firms increases from 1994 to 2008. The share of firms between 1 and 4 workers grew from 80.3 percent to almost 90 percent. Consequently, the average number of workers per firm dropped from 9.54 to 8.15.

Regarding the distribution of workers across size categories, the most remarkable change is the labor absorption of the large firms group. Initially, in 1994 very large firms absorbed 25.17 percent of manufacturing employment. In 2007, however, they were responsible for 42.71 percent of manufacturing employment. This result points out to the relevance of having large firms in the market, since they might be driving job creation. Thus, in this context the growth of firms becomes an important issue.

The total number of surviving firms we end up working with is 4,843. That does not include firms that we were not sure of being the same in both periods.

Firm size, and consequently, firm growth will be measured as the number of employees within a firm and the amount of value added at 2006 prices generated along a specific year. On the other hand, firm performance will be measured as labor productivity (value added per worker).

Proxies for Financial Development

We face a time constraint when looking at the development of financial indicators. We have only two time periods with no information in between. This

makes it difficult to infer an evolution or trend in the financial situation of the economy (there were two financial crisis in between: 1998 and 2001). In order to make up for this lack of time variability we rely on regional variability. Whereas, for instance, Catao, Pages, and Rosales (2009) and Morón, Salgado, and Seminario (2012) use a nationwide indicator of financial development to investigate the effect of credit expansion on formalization, we develop financial indicators at the regional level which account for the same expansion but also incorporate regional variability. In other words, we use a version of financial development at province level. Figure 2 shows a map for 1991 and 2006 with the amount of credit (in thousands of 2006 nuevos soles) per financial institution at province level. There we can see that there is enough regional variability, and that some regions have increased the level of this index more than others.

In order to control for mutual causality in the same year, we use financial indicators for the year prior to the reference period in each census. Since for the 2008 census the reference period is 2007, we use 2006 as the year to construct the financial indicators. The 1994 census has three reference periods, 1991, 1992 and 1993.[5] To deal with the different reference period in the 1994 census we express all financial indicator variables for the year 1991.

We divide financial development indexes into two groups: i) those related to the expansion of financial services and ii) those related to the efficiency of financial services. The first group takes into account growth in access to financial services. In this group we have four variables. The first is the number of financial institutions (FI) in a province. For 2006 we use National Superintendency of Insurance and Banking (SBS) data on the number of branches operating in a province. Unfortunately, SBS has no available records for the number of financial institutions disaggregated at province level for years prior to 2001. To deal with this issue, we use the 1994 census: unlike 2008 census, the economic census for 1994 did include the financial sector, thus making it possible to estimate the number

[5]The Lima and Callao regions have data for 1991; the reference period for the regions Chavín, Inka, La Libertad, José Carlos Mariátegui and San Martín is 1992; whereas for the regions Andrés A. Cáceres, Arequipa, Grau, Libertadores Wari, Lima Provincias, Loreto, Nor Oriental del Marañón and Ucayali the reference period is 1993

of financial institutions operating in a province. We do this by considering a establishment that operates under ISIC Rev. 3 industry code 65 as a financial institution. The second variable is simple a dummy variable generated from the number of FI in a province. This dummy variable takes a value of 1 if there is at least one FI in the province and zero otherwise. The third variable is the number of financial employees (or people that expressed ISIC code 65 as the activity they were working in) over the number of adults within a province. Both the number of people who said they were working within activity 65 of ISIC Rev. 3 and the number of adults is estimated using the population census of 1993. The fourth variable corrects the third variable for self-employment. Here we have excluded those people reporting they were working under the ISIC code 65 and were self-employed, instead considering only salaried financial workers. We use IPUMS International[6] data for this purpose since the census data available at the INEI do not allow us to make that distinction.

The second group of variables proxies financial efficiency. While it could be the case that the number of FI in a province did not grow too much, the FI already established there may be providing more credit than before. We construct two indexes in order to account for this. First, we estimate the amount of credit per FI. The second index, instead of correcting for the number of FI, uses the number of adults in a province. The source for the credit data is the SBS, for the years 1991 and 2006, expressed in 2006 prices.

Financial Dependence Index

Our estimation strategy relies heavily on finding an external source of variability in order to identify the impact of credit expansion on the growth and performance of Peruvian firms. In that regard we follow the Rajan and Zingales (1998) approach of using a measure of firms' requirement for external funds.

We use data from firms in the Standard and Poor's 1500 index available at Bloomberg. The *Financial Dependence* measure is computed as the ratio of

[6]http://international.ipums.org/international

capital expenditures minus cash from operations to capital expenditures—i.e., capital expenditures financed by flows from external agents. In particular, we obtain this index for each firm in the sample as the ratio between the sum of external finance over 2002 to 2006 and the sum of capital expenditures in the same period. Then, the estimates are collapsed to the median firm of each activity (2-digit ISIC-Rev3) category. We use the same indexes estimated in Morón, Salgado, and Seminario (2012).

Two features of the adopted approach need discussion. First, the reliance on data for U.S. firms is done—in line with the related literature—under the assumption that firms in this sample are those that address the most frictionless credit market and, consequently, those that represent the most accurate estimation of the requirement for external funds, at least in the sense that we need. The identification strategy on which we rely to identify the causal relationship from financial development to (firm) growth requires us to recognize the activities that *intrinsically* depend more heavily on financial resources—and consequently those that should benefit more from exogenous improvement in financial services. This intrinsical estimated measure should have nothing to do with (credit) frictions related to country-specific factors. Then, estimating the financial dependence measure from Peruvian firms—or from any other country less frictionless than the United States—would entail more problems than benefits for the identification strategy. In this line we also choose the fairly stable period of 2002-2006 with the aim of achieving a financial dependence estimation that represents the intrinsic requirement for the included activities.

Second, there are other alternatives besides that of Rajan and Zingales (1998) for approximating financial development propensity at the firmlevel.[7] We rely here on the sufficiency, simplicity and popularity of the Rajan and Zingales (1998) method. While the alternative procedures do not provide more insightful features to our identification strategy, they require data on variables less widely available (such as value of fixed assets) and—related to the previous point—with underlying assumptions less suitable to the Peruvian context (such as amount

[7]See, for instance, Braun (2002), Manova (2008) and Carluccio and Fally (2012).

of investment in research and development efforts). However, as a robustness check on our results, we show in Appendix C the results for the main regressions considering the Braun (2002) approach: how in poorly developed capital markets there is an excessive weight given to the availability of hard assets (fixed assets) in the allocation of financial funds. Financial suppliers in poorly developed financial markets demand a higher amount of fixed assets as collateral to be insured against the possibility of default. So the less developed a financial market is, the higher the requirement of hard (tangible) assets for the financial relation. We can see how the financial-firm growth hypothesis remains unchanged under this specification.

6 Econometric Evidence

This section evaluates whether the financial expansion at both national and regional levels observed for the period 1994-2008 in Peru has had a causal effect on business growth and performance in the manufacturing sector. As explained above, our approach follows the Rajan and Zingales (1998) methodology of identifying financial dependence across industries, which in turn provides us with an interesting source of exogeneity. The prior hypothesis is that greater credit availability induces firms to grow, which also implies an effect on their performance. If it is true that credit expansion reduces firms' costs of relying on external finance and that this reduction is extremely important in the firm growth process, financial development would represent a catalyst for companies' growth. Thus, a first way to assess this hypothesis is by testing whether more financially dependent activities displayed relatively higher growth rates compared to those activities less dependent on external funds in provinces where financial development was higher (controlling for region-industry fixed effects). However, the use of two rounds of census data (a source that, as was already argued in detail, clearly outperforms the alternative sources for the Peruvian case) covering a 14-year period imposes some limitations on including all the necessary controls that a cross-section anal-

ysis typically requires.[8] Instead we implement a baseline-endline approach that allows us to control for fixed effects at the firm level and to exploit not only time variance on firm size and regional financial development, but also cross-sectional variance. The identification strategy then turns to analyzing not only whether firms in more dependent activities have systematically showed higher growth rates in those provinces with higher financial development, but also if at each point of time the gap between firms in more dependent activities and those in less dependent ones is larger as one considers more financially developed provinces. If we can demonstrate this, we can conclude that the credit channel is effective in inducing firms to grow and consequently in acting as a growth-booster for the economy.

It is important to note that this is an alternative approach. Moreover, this particular approach will not try to characterize all the determinants of firm growth; instead, it only seeks to verify the extent to which the partially aggregate shock on the financial sector generates effective incentives to grow. So we isolate the influence of the credit channel on growth and compare the performance of financially dependent activities and non-financially dependent activities. Therefore, we treat the rest of the variables just as controls, without trying to understand their effective relation with growth—or the narrative behind them.

Finally, the firm size dimension could be relevant for the interaction between access to credit supply and the growth process. Then, we further explore heterogeneity in that relationship depending on the firm's size category. That is, if any effect is found, it might be concentrated in some firm category. Thus we implement a decomposition of the sample into three categories: small, medium and large firms, each representing respectively firms with 1 to 2, 3 to 10 and above 10 workers, respectively. This distinction allows us to ensure that our estimates of financial dependence are not assimilating size effects. The model we finally estimate is represented in equation (1).

[8]We include for robustness purposes, from Table 16 to Table 21, the results of a regression with this specification. Besides control variables for fixed effects at the region-activity level, we include the initial size (1994 size) and a variable representing informality (lack of RUC). Results with statistical significance mimic results in the main regressions.

$$size_{it} = \mu_i + \delta_t + \gamma FDeep_{t,prov} * FD_{act} + \epsilon_{it} \quad (1)$$

where the dependent variable is $size_{it}$, the size of firm i, at period t. We control for the firm's fixed effect μ_i, and a dummy variable for the time period in order to account for aggregate shocks represented by δ_t. Finally, we have the variable that represents credit supply for each province and activity ($FDeep_t^{prov}$) interacted with external finance dependence at the industry level (FD_{act}). The effect on the dependent variable is expressed in coefficient γ. It could be useful to interpret this multiplicative variable as a weighted shock where the shock component is represented by the dynamic of credit deepening and the *weighting factor* is estimated by the external dependence of the corresponding activities. This is the equation for estimating the *within* effect of credit deepening on firm growth.

Additionally, as discussed above, we are also interested in estimating the model at the activity level. This allows us to assess whether financial development is affecting, besides growth rates of surviving companies, the exit and entry of firms, namely the net effect. With this estimation we can test how credit expansion is influencing the entire size distribution of the manufacturing sector. If it is true that financial development also influences the entry of firms into the market, this mechanism should be taking place with more emphasis on financially dependent sectors. Thus, we estimate the model represented in equation (2), where the dependent variable can be the share of new firms within the industry, the share of small firms within the industry, the share of employment absorbed by the industry, or the share of value added absorbed by the industry.

$$Y_{act,t} = \delta_t + \delta_{act} + \delta_{prov} + \gamma FDeep_{t,prov} * FD_{act} + \epsilon_{act,t} \quad (2)$$

Equations (1) and (2) are the main equations we test using different measures of firm's outputs and financial development. The same equations are used when

testing for differences across firm's size category. We consider three separate subsamples for each category, defined by the size in term of number of workers of the firm in 1994.

As stated previously, the variable used to test the finance-growth causal relation hypothesis is reasonably exogenous. Then, both models are estimated using a fixed-effects model featuring a baseline-endline approach in order to control for the presence of unobservable characteristics inherent in each firm (activity) in the determination of their growth rates.

Turning to the results, Table 4 presents the results for three output variables. The first two, labor and value added, measure the size of the firm, whereas the third, labor productivity, is a measure of firm performance. The four variables measuring financial development are number of financial institutions over the number of adults in a province, a dummy variable denoting just the existence of at leas one financial institution within the province. The third output variable is the ratio of financial workers to the number of adults in the province. Finally the last column shows the results for the number of salaried financial workers over the number of adults within a province. This is the main table with results for the whole sample of surviving firms; the reported coefficient is γ from equation (1). Three out of four financial development variables report coefficients are statistically significant. Paying attention to the extent of the elasticity, we can see that the coefficient for value added is larger than the other two. This also means that if the effect of credit availability is larger for value added than for labor, labor productivity must be increasing. The last is confirmed in the third row of the table, although only for the first financial development measure, the number of financial institutions over the number of adults.

By construction, the impact of greater financial deepening depends upon the industry's external financial dependence.[9] Hence, we have to assess the impact of financial deepening depending on the level of financial dependence. Two extreme industries relevant for the Peruvian sample can be considered: manufacture of

[9]Since $\partial size_{jt}/\partial(FDeep_t) = \hat{\gamma}FD$, we must evaluate the impact of $(FDeep_t)$ depending on given value of $\overline{FD}$. This value is nothing more than the industry's external dependence on funding.

wood (industry 20), with the highest dependence on external funding, and publishing, printing and reproduction of recorded media (activity 22), with the lowest.[10] Thus, the way of reading the results for the second column implies that changing from being a province in 1994 with no financial institution to being a province with at least one in 2008 would increase the number of hired workers in the most financially dependent sector relative to the least financially dependent sector by 29.5 percent [=(-0.66 - (-4.304))*0.08*1]. That is, in the context of financial expansion (measured as the existence of at least one FI in 2008 where there was no FI in 1994) within the same province, firms in industry 20 are hiring 29.5 percent more workers than industry 22. Replicating the same exercise for value added implies an increase of 89.3 percent [=(-0.66 - (-4.304))*0.244*1] percent for firms highly dependent on external funding. This confirms that firms in activities with high dependence on external funds for operation benefit disproportionately more than less dependent firms. If we read the results with a different financial development variable, say, the first column, number of financial institutions over adults in the province, a 10 percent increase in the number of FIs over adults increases the number of workers hired in the most financially dependent sector relative to the least financially dependent sector by 1.42 percent [=(-0.66 - (-4.304))*0.039*10]. Presumably, the impact of changing from not having access to credit at all to having at least one financial institution (as measured in the second column) is more dramatic than the increase of credit in the already available financial institutions. The latter is somewhat confirmed if we use measures of financial development related to efficiency rather than to expansion. Table 8 shows that only the amount of credit over the number of adults has a positive and statistically significant effect on expansion in the number of workers hired workers at the firm level. A 10 percent increase in this variable increases the number of hired workers by 0.18 percent. Although a modest effect, it is statistically significant.

We replicate the exercise in Table 4 for the different firm size categories. Results are reported in Tables 5, 6 and 7. At first glance we can see that a heterogeneous

[10] See Table 3

impact is found: the still statistically significant effect of credit expansion on firm categories is different depending on the category. For comparison purposes we are going to focus on the impact of the first financial development measure: the number of FI over adults at province level. We see that the extent of the coefficients is consistently larger for larger categories, and statistically significant for almost all firms' outputs. Focusing on the impact on labor, the coefficient for the group of medium firms (0.127) is the only one that is statistically significant. If we recall the first set of results, however, the overall coefficient is (0.039), which implies that the impact on the group of small firms (although only statistically significant at 10 percent) is driving the overall result. Focusing on value added, it is interesting to note that the differences between large, medium and small are important: whereas the impact on value added of large firms is 0.263, the impact on small firms is 0.087, or less than half. Comparing large and medium firms, we can see that the impact on large firms is almost 47 percent larger than that on medium firms (0.263 vs. 0.179). Comparing these individual impacts with the overall impact (0.125), we suspect that the medium firms category is driving the result, or at least the extent of the effect is closer to the effect on that category. In terms of labor productivity the effect on the group of large firms (0.157) is more than twice the effect on small firms (0.059). No statistically significant effect was found for the labor productivity of the medium size group of firms in the first column—although, had it been statistically significant, the effect would nonetheless have been smaller than that on small firms. The remaining three columns of Tables 5, 6 and 7 show a similar story: when statistically significant, the impact on the group of large firms is larger than that on the other two groups.

As stated above, Table 8 replicates the same exercise for the whole group of surviving firms but considering the second group of proxies for financial development, the efficiency indexes.[11] We find that only credit over the number of adults

[11]In some provinces there are no financial institutions and therefore no data for credit of salaried workers, but we need data in those places too in order to take the logarithm of the financial development variable. To solve this issue, we proceed as Fafchamps and Schundeln (2010) and replace those locations where zero is the value with half of the minimum number found in the distribution of the financial development variable

in the province has any impact on the firm performance variables.

Analyzing by the firm's size category we find some interesting results. Tables 9, 10 and 11 report the results. In general, we do not find any statistically significant effect on the group of small firms, something that suggests that the major issue with small firms is one related to access or expansion rather than efficiency. The latter seems to be an issue relevant for medium and large firms. To confirm this, we have to pay attention to the second column of each table, the amount of credit over adults at province level. There is a positive and statistically significant effect on both labor and value added for both groups, medium and large, although the impact is larger for the group of medium firms. For instance, the effect on labor is 0.066, whereas for the group of large firms the effect is 0.056.

Now we turn our attention to the regression of equation 2, that is, the regression at activity level. Again, the reported parameter is γ. Doing this implies that we do not care about only surviving firms, but all firms operating within an industry each year. Tables 12 and 13 replicate the exercise but now considering all the firms for each period. We include entering and exiting firms for 2008 and run the regressions at province-activity level. At the activity level we considered four variables: i) the share of small firms, ii) the share of new firms, iii) the share of value added absorbed by the activity, and iv) the share of labor absorbed by the activity. The results suggest that the share of new firms is larger in activities with high dependence of external funds. Also, their share of value added and labor increases due to greater credit availability. These activities are accumulating more labor and value added than those industries less dependent on external funding.

The interpretation of this, combined with previous results, is that activities with high dependence on external funds are not only seeing firms grow faster, but also entering new small firms into the market. This constitutes evidence that these sectors are more attractive for running businesses in a context of greater credit availability.

Robustness

In order to confirm that we have identified an effect of credit development on firms' output, we need to conduct some robustness check of the results. First we attempted a cross-section regression using only information from the 2008 census. This regression takes into consideration only the cross-section variability and not the temporal dimension. It would be a regression like equation (1) but without either the t subscript or the firm fixed effect μ_i. The latter poses some problems since we were relying on the unobserved fixed effect to account for the firm's idiosyncratic characteristics. In an attempt to overcome this problem we include a couple of new controls in the regression: the age of the firm and its square and a dummy variable that accounts for informality (0 if the firm had RUC and 1 otherwise).

Table 14) presents the results of this exercise. The results suggest that regional variation is enough to explain differences in size between firms. Firms operating in industries with more dependence on external funding are generally larger than firms operating in industries less dependent on external funding, and regional variability in the credit variable can explain those differences. This result is confirmed in the second column, although the extent of the coefficient is smaller compared to the second column of Table 4. This suggests that the temporal dimension is also important when explaining the impact on firm output (especially if we want to account for having a province that changed from not having to having financial institutions). The results remain unchanged even with the financial efficiency variables (Table 15), which ultimately suggests that, even considering only regional and cross-sectional variation, we find a statistically significant effect of greater credit availability on firm output.

We also tried a *growth* specification of regression 1. We evaluated the change in the firm's output variables and regressed against the change in financial development variables. The problem here again is that the firm's fixed-effect disappears from the estimation when taking first differences of the variables. To address this issue, we included the lag of the dependent variable (which in this case is going to be the value reported in 1994) and a variable denoting informality in 1994. Results are shown in Tables (tables 16, 17 and 18) for the group of financial

expansion variables; and Tables 19, 20 and 21 do so for the group of efficiency in financial development variables. No impact is found for the group of small firms (table 9), but an impact is found for the group of medium firms. Financial expansion measured as the number of FI over adults by province (first column of Table 10) has an impact on the growth of labor hired and value added. The third column (number of financial workers over adults in the province) has statistically significant impacts for the three outputs. For the group of large firms there is only a significant impact on value added if we use the number of salaried financial workers over adults in the province. Regarding the *efficiency* group of financial development variables, we again find a significant impact on the group of medium firms. This might be a consequence of the long period between both years.
Finally, Appendix C attempts an alternative measure of dependence on external funding (an alternative to the Rajan and Zingales (1998) approach) and finds the the theoretical channel is capable of explaining the effect of credit on firm's performance.

7 Conclusions

In this paper we attempted to identify the link between financial development and the growth and performance of Peruvian firms in the manufacturing industry. The importance of assessing this causal linkage stems from the structural role that firms' performance could play in the country's welfare through higher productivity and salaries. Moreover, the current Peruvian context of financial expansion rises questions on the real impact of this phenomenon on the size of the firms and on its likely asymmetric impact.

The key hypothesis tested in this paper is whether financial development causes firms that operate in industries highly dependent on external funds to grow faster than those in less dependent industries. This identification strategy follows the Rajan and Zingales (1998) approach to solve the typical endogeneity problem in the study of the finance-growth link, and it does so by focusing on the theoretical mechanisms through which financial development affects economic growth. In particular, we rely on the fact that financial development reduces transaction costs and moral-hazard and adverse-selection problems, which in turn reduces the firm's cost of raising external funds and facilitates its insertion on a dynamic growth path.

There are two additional factors that favor our methodology. The first is the use of firm-level data, which are crucial in exhaustively observing the way in which the studied channel is operating. Conducting the analysis only at the activity level will enable us only to see whether greater credit availability induces activities to grow, with no clear idea whether such growth is driven by the entry of new small firms or whether small firms actually grew and created more jobs or more value added. Instead, being able to identify the groups of surviving firms from one census to the other and entering and exiting firms enables us to reach conclusions about each specific group of firms and not only conclude whether credit availability is motivating the entry of new firms into the market, but also test its effect on the growth rates of surviving firms. We have surveyed the related literature and, to the best of our knowledge, the present study pioneers the study of the finance-growth linkage at the firm level in Peru.

The use of regional variation in measures of financial development, besides giving us a source of important variability fitting the characteristics of our census data, keeps the required exogeneity on which we can rely to identify the causal relation of the finance-growth nexus. Then, the measures performed in this paper for financial development fulfill the requirments of not being particular either for any firm and any activity and not representing a correlated placement of banks and the difference between growth rates of firms at the more financially dependent activities and those of firms at the less dependent ones. This has been also argued by Fafchamps and Schundeln (2010) and has important similarities with what Rajan and Zingales (1998) did at the cross-country level.

Results at the firm level suggest that for both measures of size, labor and value added, financial deepening has a positive and significant effect on growth of surviving firms. However, when splitting the sample of firms by different firm sizes in 1994, we can see a different effect on each group. For the group of small firms we see that the impact is robust and consistently smaller for the three output variables. On the other hand, medium and large firms benefit more from the credit expansion. This result is probably an indication of the difficulty faced by small firms firms at early stages of growth, mainly when they have to raise external funds for the planned growth. For the group of medium firms, the effect of credit expansion is very strong on labor, which suggests that medium firms are driving the general impact of credit expansion on growth through this variable.

In contrast, using the efficiency indexes, we find that only the credit by adults variable has a positive impact on the firm size variables. This stage allows us to check the robustness of our results to different measures of regional financial development and firm size. It seems quite clear that the credit expansion experienced across Peru has had an influence on inducing firms to grow.

Both approaches are replicated at the province-activity level. Here, besides the surviving firms, we include in the analysis firms entering and exiting the market during the census period. We use industry shares of new firms, small firms, value added and labor to try to measure the influence of credit expansion on the whole configuration of the firm distribution. The activity regressions suggest industries

with large dependence on external funding experienced an increase in the share of new firms, value added and labor in the face of greater credit availability. These results complement the previous ones in the sense that activities that are highly dependent on external funds are more attractive to entrepreneurs, which allows us to infer that financial development is motivating new firms to enter the manufacturing sector. This makes a firm more likely to enter the market in this sector, thus populating the firm size distribution on the left with new and small firms entering the market as a consequence of the recent context of financial development.

The results are robust to different specifications and changes in the financial dependence index. The robustness of the results is confirmed by running the model only for a cross-section sample, the 2008 census: regional availability can explain differences in size within the firm size distribution. Also, using a growth specification we find that greater credit availability influences larger growth rates. Using an alternative measure of financial dependence on external funding as proposed by Braun (2002), the results seem to follow the same theoretical channel. These findings could be understood as encouraging results since financial development has evolved even more between 2006 and 2011. Moreover, in terms of policy, they underscore the importance of financial services in terms of driving growth and welfare.

Finally, as a further agenda, the inclusion of more sectors in the analysis is needed. The effect of credit on growth might have a different configuration if we consider the interactions between sectors. For the purposes of this paper we estimated a very simple productivity measure (value added over labor). Useful as it is, it does not consider the role of capital. An immediate extension then involves a better estimation of productivity at firm level. Departing from that, the association between productivity and the life cycle of the firm can be explored, and the role of credit in that relationship. Finally, a sustained appreciation trend in the real exchange rate might be altering the optimal capital/labor ratio in each sector, making it cheaper to increase capital rather than labor. This should be more evident in sectors in which are exposed heavily to credit.

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Appendices

A Details on the Algorithm Built to Track Survivors

A critical stage of the analysis conducted in this paper is the way in which observations are tracked between the two rounds of census data. First, it is important to highlight that raw data are available at the establishment level, which is not, in principle, the dimension at which the finance-growth particular link assessed in this paper develops. We are interested in seeing if broader financial access induces firms to grow—independently of what the firm decides to do with each of its establishments. Moreover, there was no tracking approach in the design of either census round, so tracking survivors based on form identifiers would be impossible at the establishment-level. Then, we rely on information on the RUC (unified taxpayer identifier) code at the company level to collapse both datasets to the firm-level. For establishments without an RUC code (informal in that sense), we assume single-plant firms.

Another difficulty in the Peruvian case is that the RUC code existing in 1994 has almost no correlation with the current one. In contrast to the 12-digit current code, the so-called *libreta tributaria* was a tax identifier of 4 to 8 characters, in some cases including both letters and numbers. Although in some cases the change from one version to another consisted only of adding two new digits at the beginning ("20" or "10" depending on having or not business status) and one at the end, there is not in general an exhaustive public algorithm of equivalences. Thus, building an algorithm to identify businesses surviving, entering or exiting the market during the 14-year period was the first challenge faced in this study. The algorithm relied on three variables for tracking firms from one census to the next: company name, ISIC class and geographical specific location. The strategy consisted first of standardizing companies' names (i.e., removing variations such as punctuation, accentuation, and capitalization). We then established a ratio of coincidence between a 1994 company's name and each member of the potential

pair in 2008 in such a way that each firm in 1994 has a ratio of coincidence for each firm in 2008. Then, we excluded low-coincidence cases and applied controls on ISIC classes and geographic locations to keep, first, the 2008 alternative with the best chance of matching the 1994 firm case, and second, those for whom name-coincidence ratios and ISIC/location filters enable us to assign the condition of survivors between the two census rounds. It is worth mentioning here that particular care was taken to impose sufficiently strong filters on the algorithm so that those firms classified as survivors were in fact survivors. In other words, the probability of the algorithm classifying as non-survivors (exiting) firms that actually survived in the period 1994-2008 is higher than of classifying as survivors those who effectively left the market. If we define as the null hypothesis "to have survived between census rounds," we are more frequently experiencing Type I error than Type II error. This result was obtained by construction because, as will become clearer below, it is paramount to the terms of the paper to achieve the least contaminated survivor sample possible. The arising share of firms surviving from CENEC 1994 to CENEC 2008 is of 4,285 firms, that is only 11.18 percent companies of the entire population of the Peruvian manufacturing sector in 1994. Table A.1 describes the distribution of survivor firms according to labor size reported in CENEC 94. This is consistent with the basic fact of firms exiting more frequently as its scale is smaller. As can be seen in Table A.1 and Table 1 the share of lower size categories of firms is reduced as we restrict our analysis from the whole distribution to the survivor one.

Clearly, the built-algorithm strategy represents a second best alternative, and it will inevitably introduce some biases into the analysis. However, we argue here that these problems are not severe. What we mainly lose is firms changing name or geographic location but effectively surviving the period. In the first instance a major change makes tracking the firm impossible; the second instance involves our matching requirement of staying within the districts or provinces where the company used to have establishments, depending on their levels on name coincidence ratio, ISIC class and department location. For example, a firm keeping its name merely unchanged, staying in the same ISIC 2-digit class and being

Table A.1: Survivors Firms, by size categories

Size94	Survivor Firms	%	Cum. %
1-4	3629	74.93	74.93
5-9	407	8.40	83.33
10-19	337	6.96	90.29
20-29	108	2.23	92.52
30-49	95	1.96	94.48
50-99	109	2.25	96.73
100-199	65	1.34	98.07
200-499	54	1.12	99.19
500+	39	0.81	100.00
Total	**4843**		

Own Calculations.
Source: CENEC 1994 and 2008.

located in Lima is allowed to change district but not province. This requirement becomes stricter as the name coincidence ratio becomes lower. Finally, we also lose firms that, while surviving the period, change their ISIC 2-digit class (once the conversion between ISIC revisions has been made). This was done, as mentioned above, in order to obtain a survivors sample that is as clean as possible. Our argument, then, is that the potential biases are not so great that changes of name, location or ISIC class would in principle be disproportionally concentrated in any size category, 2-digit ISIC subsector or location. This at least applies to a sector such as manufacturing where, as we can see in Table 3, the 2-digit ISIC classes are sufficiently differentiated. Consequently, the survivors choice made by the algorithm would not constitute a sample of firms that are disproportionally large or small, financially dependent or influenced by particular regions' financial development.

B Endogeneity Issues

Throughout this paper, and particularly in the estimation strategy, we claim that using lags of the financial expansion variables allows us to infer the impact (combined with the external financial dependence variable) of credit expansion on firm size.

There is an obvious correlation between credit availability and firm performance (size, production, etc). However, making use of province-level credit variables and looking for their impact on firm-level variables allows us to argue that a single firm is too small to have any influence on the credit available at province level. It is the combined action of all firms within a region what shapes credit allocation, if that is the case. Not only that, but in this paper we are considering only manufacturing firms, which makes it even less likely that a very narrow sector or, more importantly, individual performances would affect the total amount of credit provided in a province.

In this section we will try to prove that, even controlling for aggregate manufacture output, there is a lack of evidence that the performance of the sector influences the amount of credit provided to the region. In this simple exercise we have used regional-level data from the National Institute of Statistics (INEI) covering the the period 2001-2012 for the 24 regions of Peru.[12] The variables used are i) manufacturing GDP, ii) number of financial institutions, iii) amount of credit in region, and iv) credit by financial institutions. Regarding financial information we considered information from Banks, Municipal and Rural Cajas, and Edpymes. All values are deflated to 1994 prices.

To begin with, there is an obvious correlation between GDP and credit. The correlation coefficient between manufacturing production and our three measures of credit availability are positive and high (0.8800 with the number of FI, 0.8615 with the amount of credit in the region, and 0.6984 with the ratio credit/FI).

In order to prove that it is unlikely that manufacture GDP influences the amount

[12] Callao is considered within Lima

of credit that a region receives, we run a simple model:

$$lf_t^c = \mu^c + t + \beta lgdp_{t-1}^c + \varepsilon_t^c \tag{3}$$

in which we are controlling for region fixed effects μ^c and a trend t. The coefficient of interest is the β that captures the effect of the GDP level lagged one period over the level of credit the region in the next period, lf_t^c. The idea is that if there is any influence of manufacturing GDP on the allocation of credit in region c, it should be related to the previous year's level of GDP, controlling for year developments in aggregate terms, and for the region's fixed and unobservable characteristics.

Table B.1 shows the results of the estimations undertaken in this exercise.

Table B.1: Credit variables explained by manufacture GDP

	(1)	(2)	(3)
	A	B	C
VARIABLES	lfi	lcredit	lefficiency
L.lgdp	0.0581	-0.156	-0.151
	(0.130)	(0.249)	(0.215)
Year	0.134***	0.229***	0.0953***
	(0.00675)	(0.0130)	(0.0108)
Constant	-279.7***	-466.6***	-188.6***
	(13.64)	(26.18)	(21.74)
Observations	240	240	264
R-squared	0.850	0.802	0.466
Number of ubi	24	24	24
Region FE	YES	YES	YES

Source: INEI 2001-2012
Own estimations

We do not find any statistically significant result supporting the idea that the performance of manufacture GDP in one period shapes the allocation of credit during the next period within the same region. The exercise was replicated using per capita values and the results (not shown) remained unchanged.

We also tried a differenced version of equation (3), and including as additional control the the lagged value of the financial (left hand side) variable:

$$\triangle lf_t^c = \psi^c + t + \beta \triangle lgdp_{t-1}^c + \delta lf_{t-1}^c + \omega_t^c \tag{4}$$

where ψ^c is the region fixed effect in the growth regression, and δ captures the effect of the previous level of financial development within the region.

Table B.2: Credit variables explained by manufacture GDP - In differences

	(1)	(2)	(3)
	A	B	C
VARIABLES	D.lfi	D.lcredit	D.lefficiency
LD.lgdp	0.149	0.151	0.00753
	(0.117)	(0.265)	(0.263)
Year	0.0705***	0.145***	0.0529***
	(0.00874)	(0.0163)	(0.00859)
L.lfi	-0.461***		
	(0.0563)		
L.lcredit		-0.620***	
		(0.0649)	
L.lefficiency			-0.601***
			(0.0645)
Constant	-146.1***	-296.5***	-104.3***
	(18.08)	(33.09)	(17.13)
Observations	216	216	240
R-squared	0.284	0.340	0.315
Number of ubi	24	24	24
Region FE	YES	YES	YES

Source: INEI 2001-2012
Own estimations

Table B.2 shows that the result remains unchanged: no influence of the manufacture GDP on credit availability in the next period within the region.

C Alternative Source of Exogenous Variation: Tangibility as in Braun (2002)

In order to provide robust results of the theoretical channel through which credit operates, one could explore an alternative way to generate an exogenous source of variation but keeping the central theoretical idea untouched. Braun (2002) offers an alternative approach to estimate the effect of greater credit availability on firm size and growth.

He shows how, in poorly developed capital markets, excessive weight is given to the availability of hard assets (fixed assets) in the allocation of financial funds. Financial suppliers in poorly developed financial markets demand a higher amount of fixed assets as collateral to insure against the possibility of default. So the less developed a financial market is, the higher the requirement of hard (tangible) assets for a financial relation to arise.

This allows us to modify our identification strategy. We take the *tangibility* index computed by Braun (2002)—based, as in our basic approach, on U.S. firms' data—as the ratio of net property, plant and equipment over total assets, and collapsed to the 3-digit ISIC-Rev3 level. Then, we re-run equation 1 for the complete set of financial development variables in order to test the robustness of our estimations.

If before we expected the more dependent activities to perform better than the less dependent ones in those regions with more developed financial markets, now we should expect the activities with less hard assets to perform less poorly in reference to those with higher tangible indices in those regions with more developed financial markets. In other words, while in the basic approach the difference (in performance) between the more dependent activities and the less dependent ones tends to rise with financial development, in the Braun (2002) approach the difference between the activities with higher tangible ratios and those with smaller ones tend to disappear. So, while in the basic approach we expected the coefficient of the interacted variable ($FDeep * FDependence$) to be positive to confirm the financial-growth nexus, now we need the coefficient of the new interacted variable ($FDeep * Tangibility$) to be negative. We can see in the following tables

this hypothesis prevailing for all the basic specifications.

Table C.1: Financial expansion effect on firm variables: total sample of surviving firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	-0.374***	-0.755***	-0.638	-0.321
Ln of value added	-1.046***	-2.015**	-1.245	-0.496
Ln of VA/Labor	-0.618**	-1.232	-0.500	-0.157

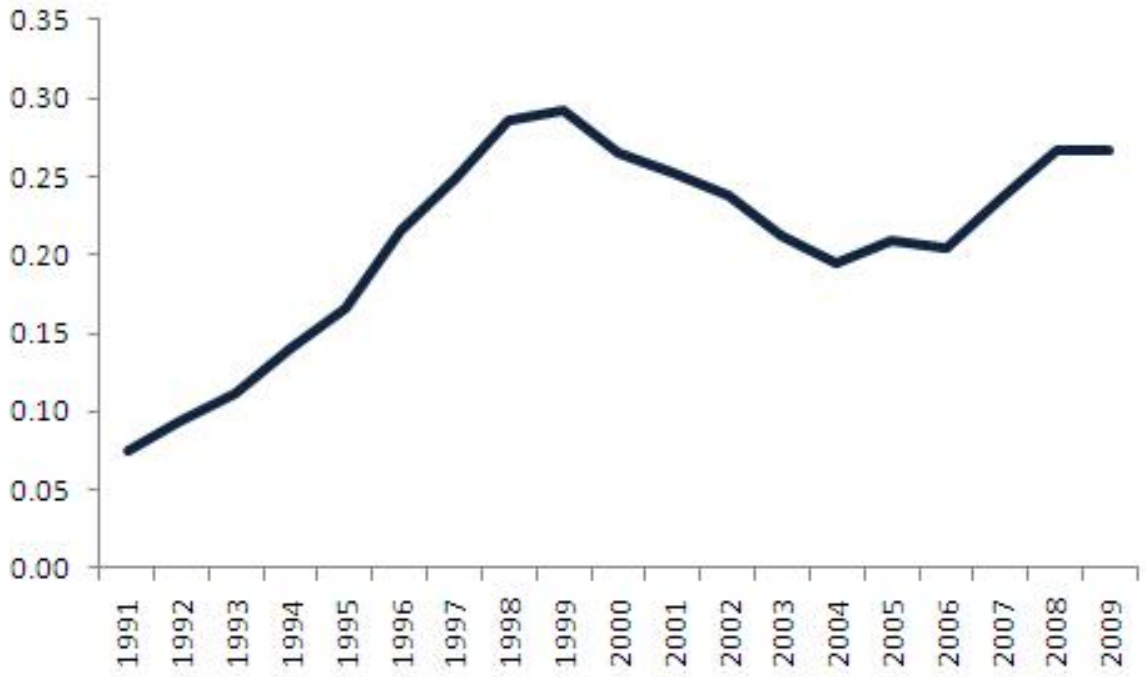
This is a fixed-effects estimation. The Reported coefficient is γ from equation 1

Table C.2: Financial efficiency effect on firm variables: total sample of surviving firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.059	-0.081
Ln of value added	0.143	-0.247
Ln of VA/Labor	0.067	-0.146

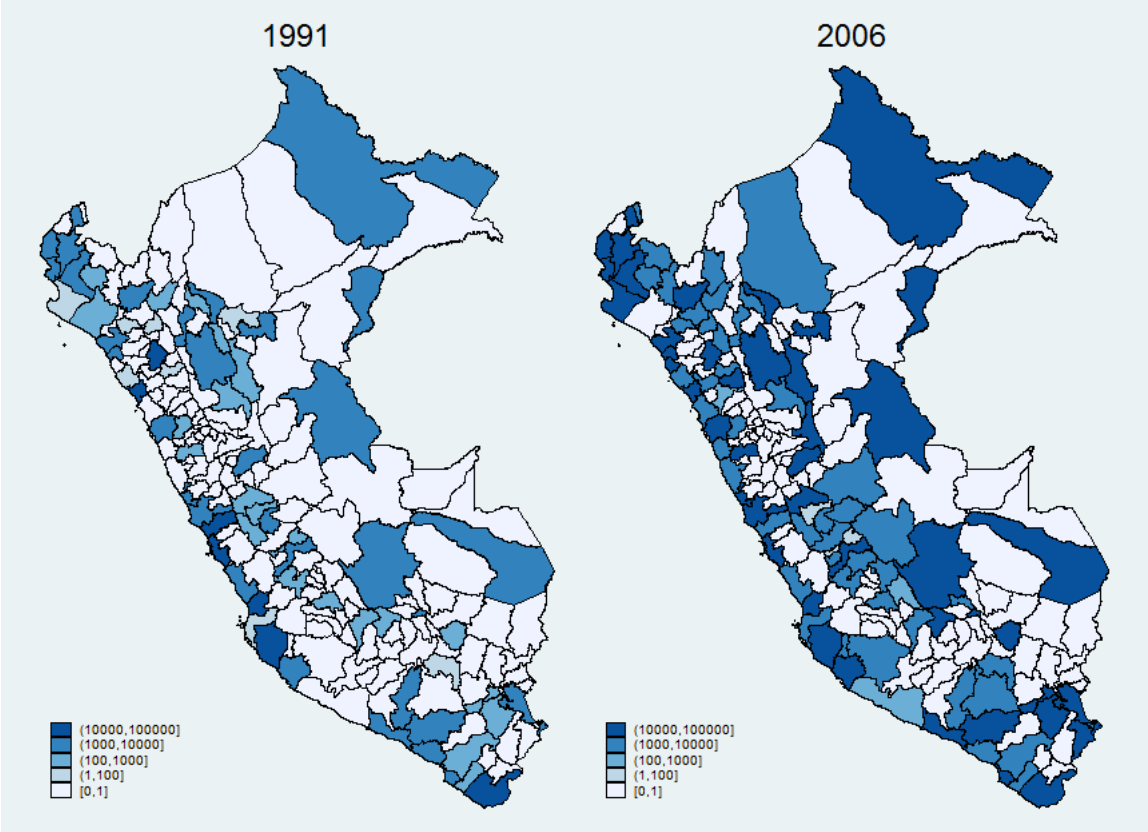
This is a fixed-effects estimation. The Reported coefficient is γ from equation 1

Figure 1: Domestic Credit over GDP



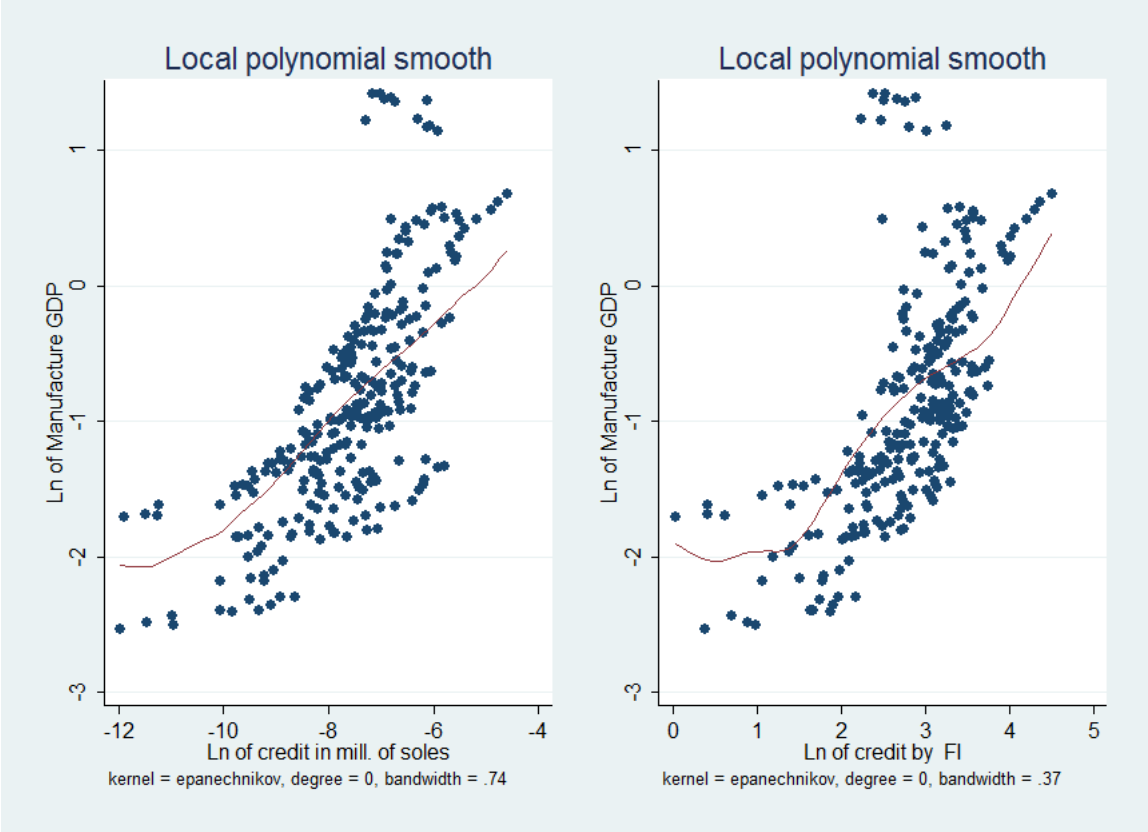
Source of the data: BCRP

Figure 2: Credit Expansion



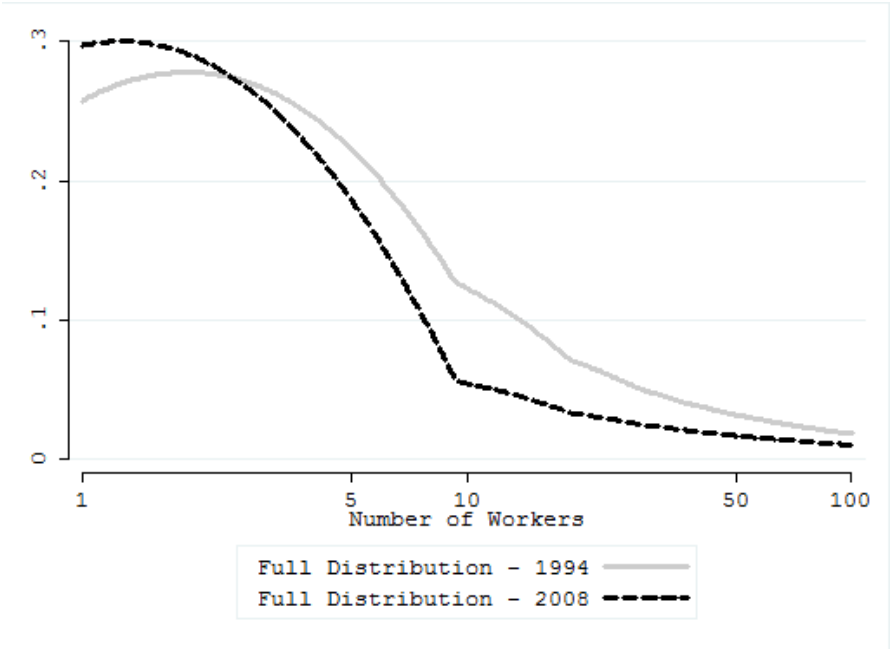
Thousand of 2006 nuevos soles oner financial institutions by province

Figure 3: Manufacture GDP and Credit Availability (2001 - 2012)



All variables in Logs. Left panel plots manufacture GDP against Millions of soles of credit at regional level for the 2001 - 2012 period. Right panel plots manufacture GDP against thousand of soles of credit per financial institution, again, at regional level for the 2001 - 2012 period.

Figure 4: Manufacture Sector FSD, 1994 and 2008



Adjusted xscale: Low frecuency categories (above 100 workers) are excluded for presentation purposes.
Source: CENEC 1994 and 2008.

Table 1: Census Data on Manufacturing Firms - whole distribution

	1994				2008			
	Firms	%	Workers	%	Firms	%	Workers	%
1 - 4	23,301	80.25	39,082	14.11	51,957	89.85	64,698	14.04
5 - 9	2,548	8.78	16,497	5.96	2,325	4.02	15,223	3.28
10 - 19	1,479	5.09	20,125	7.27	1,564	2.7	21,645	4.63
20 - 29	473	1.63	11,254	4.06	467	0.81	10,892	2.3
30 - 49	408	1.41	15,416	5.57	413	0.71	15,958	3.43
50 - 99	389	1.34	26,761	9.66	463	0.8	32,500	6.9
100 - 199	241	0.83	34,060	12.3	259	0.45	35,918	7.44
200 - 499	140	0.48	43,990	15.89	236	0.41	73,276	15.28
500 +	58	0.2	69,707	25.17	142	0.25	201,279	42.71
Total	29,037		276,892	1	57,826	1	471,389	
Avg Workers	9.54				8.15			
Avg Age	8.46				8.25			
% Informal	25.11%				31.34%			

* All calculations were made on the basis of excluding non-responding firms.
Source: CENEC 1994 and 2008.

Table 2: 14-Horizon Transition Matrix - whole distribution

	1 - 4	**5 - 9**	**10 - 19**	**20 - 29**	**30 - 49**	**50 - 99**	**100 - 199**	**200 - 499**	**500 +**
1 - 4	94.1	3.51	2.4						
	(0.034)	(0.045)	(0.051)						
5 - 9	48.28	19.54	22.13	4.89		5.17			
	(0.065)	(0.076)	(0.074)	(0.113)		(0.111)			
10 - 19	19.29	16.07	30.71	10.71	11.43	11.79			
	(0.085)	(0.089)	(0.077)	(0.099)	(0.097)	(0.096)			
20 - 29		13.1	23.81	17.86	14.29	19.05	11.9		
		(0.168)	(0.145)	(0.155)	(0.164)	(0.152)	(0.173)		
30 - 49		8.99	10.11	19.1	23.6	26.97	11.24		
		(0.181)	(0.175)	(0.147)	(0.139)	(0.135)	(0.169)		
50 - 99	9.2			9.2	10.34	29.89	26.44	14.94	
	(0.182)			(0.182)	(0.176)	(0.134)	(0.138)	(0.158)	
100 - 199						25	31.82	43.18	
						(0.189)	(0.179)	(0.17)	
200 - 499							15.15	45.45	39.39
							(0.251)	(0.198)	(0.202)
500 +								23.81	76.19
								(0.283)	(0.25)

Source: Seminario (2012).

Table 3: Rajan-Zingales Financial Dependence (FD) Index

Industry	**Description**	**Financial Dependence**
15	Manufacture of food products and beverages	-2.221
17	Manufacture of textiles	-1.564
18	Manufacture of wearing apparel; dressing and dyeing of fur	-2.518
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	-2.966
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-0.660
22	Publishing, printing and reproduction of recorded media	-4.304
24	Manufacture of chemicals and chemical products	-1.913
25	Manufacture of rubber and plastics products	-0.370
26	Manufacture of other non-metallic mineral products	-0.123
27	Manufacture of basic metals	-0.539
28	Manufacture of fabricated metal products, except machinery and equipment	-1.430
29	Manufacture of machinery and equipment n.e.c.	-1.615
36	Manufacture of furniture; manufacturing n.e.c.	-1.855

Source: Estimated using data of the S&P 1500 Index from Bloomberg. The financial dependence index is the ratio between the sum of external finance over 2002 to 2006 and the sum of capital expenditures in the same period collapsed to the industry level median.

Table 4: Financial expansion effect on firm variables

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.039***	0.080***	0.064**	0.029
Ln of value added	0.125***	0.244**	0.167**	0.053
Ln of VA/Labor	0.080**	0.158	0.087	0.024

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1 Controls omitted for presenting purposes.

Table 5: Financial expansion effect on firm variables - groups of small firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.028	0.067***	0.067	0.023
Ln of value added	0.087**	0.221**	0.028	0.007
Ln of VA/Labor	0.059**	0.157	-0.045	-0.013

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Controls omitted for presenting purposes. Small firms refers to firms that in 1994 had no more 2 workers.

Table 6: Financial expansion effect on firm variables - groups of medium firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.127***	0.226***	0.239***	0.148***
Ln of value added	0.179***	0.212	0.453***	0.163
Ln of VA/Labor	0.050	-0.027	0.193***	0.019

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Medium firms refers to firms that in 1994 had between 3 and 10 workers

Table 7: Financial expansion effect on firm variables - groups of large firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.048	0.196	-0.113	-0.055
Ln of value added	0.263***	0.210	0.302	0.223**
Ln of VA/Labor	0.157**	0.019	0.327***	0.245***

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Large firms refers to firms that in 1994 had more than 10 workers

Table 8: Financial efficiency and Firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.008	0.018**
Ln of value added	0.010	0.042
Ln of VA/Labor	0.005	0.024

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1

Table 9: Financial efficiency effect on firm variables - groups of small firms

	Credit over FI)	Credit over adults
Ln of number of workers	-0.003	0.004
Ln of value added	-0.005	0.016
Ln of VA/Labor	-0.002	0.009

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Controls omitted for presenting purposes. Small firms refers to firms that in 1994 had no more 2 workers.

Table 10: Financial efficiency effect on firm variables - groups of medium firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.035	0.066***
Ln of value added	0.040	0.086**
Ln of VA/Labor	0.008	0.023

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Medium firms refers to firms that in 1994 had between 3 and 10 workers

Table 11: Financial efficiency effect on firm variables - groups of large firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.049**	0.056***
Ln of value added	0.018	0.056
Ln of VA/Labor	0.006	0.031

This is a fixed-effects estimation. The Reported coefficient is γ from equation 1. Large firms refers to firms that in 1994 had more than 10 workers

Table 12: Financial expansion - results at activity level

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Share of small firms	-0.000	-0.021*	0.002	0.005
Share of new firms	0.009**	0.027**	0.002	0.007
VA absortion	-0.001	-0.000	0.014**	0.003
Labor absortion	-0.002	-0.003	0.012**	0.003

This is a fixed-effects estimation. The Reported coefficient is γ from equation 2

Table 13: Financial efficiency - results at activity level

	Credit over FI)	Credit over adults
Share of small firms	0.001	0.005*
Share of new firms	0.002	-0.001
VA absortion	0.001	0.001
Labor absortion	0.000	0.001

This is a fixed-effects estimation. The Reported coefficient is γ from equation 2

Table 14: Financial expansion effect on firm variables - Cross section estimation using only 2008 firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	-0.000	0.012**	0.001*	0.001*
Ln of value added	-0.001	0.036**	0.002	0.002
Ln of VA/Labor	-0.001	0.019**	0.000	0.000

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes.

Table 15: Financial efficiency and Firms - Cross section estimation using only 2008 firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.001	0.008**
Ln of value added	0.003**	0.019**
Ln of VA/Labor	0.002**	0.010**

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes.

Table 16: Financial expansion effect on firm variables - Growth regression for the group of small firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	-0.001	-0.008	0.014	0.000
Ln of value added	-0.014	-0.019	-0.021	0.009
Ln of VA/Labor	-0.012	-0.011	-0.030	0.010

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Small firms refers to firms that in 1994 had no more 2 workers.

Table 17: Financial expansion effect on firm variables - Growth regression for the group of medium firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.039**	0.058	0.112**	0.101**
Ln of value added	0.045**	0.051	0.197**	0.063
Ln of VA/Labor	0.016	0.003	0.140**	0.048

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Medium firms refers to firms that in 1994 had between 3 and 10 workers

Table 18: Financial expansion effect on firm variables - Growth regression for the group of large firms

	Ln(IFI by adults)	At least one FI	Ln(Fin. workers by adults	Ln(Fin. salaried workers by adults
Ln of number of workers	0.001	-0.025	-0.060	-0.008
Ln of value added	0.010	-0.081	0.128	0.167**
Ln of VA/Labor	0.012	-0.028	0.004	0.069

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Large firms refers to firms that in 1994 had more than 10 workers

Table 19: Financial efficiency effect on firm variables - Growth regression for the group of small firms

	Credit over FI)	Credit over adults
Ln of number of workers	-0.002	-0.001
Ln of value added	0.005	0.004
Ln of VA/Labor	0.002	0.001

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Small firms refers to firms that in 1994 had no more 2 workers.

Table 20: Financial efficiency effect on firm variables - Growth regression for the group of medium firms

	Credit over FI)	Credit over adults
Ln of number of workers	0.025*	0.033**
Ln of value added	0.022	0.028
Ln of VA/Labor	0.003	0.003

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Medium firms refers to firms that in 1994 had between 3 and 10 workers

Table 21: Financial efficiency effect on firm variables - Growth regression for the group of large firms

	Credit over FI)	Credit over adults
Ln of number of workers	-0.016	-0.009
Ln of value added	-0.007	-0.006
Ln of VA/Labor	0.008	0.010

This is a cross-section estimation using only data of the 2008 census. Controls included: age of the firm and its square and an informality dummy (0 if the firm had RUC and 1 otherwise). The reported coefficient if the impact of financial development. Controls omitted for presenting purposes. Large firms refers to firms that in 1994 had more than 10 workers