

# **FINANCIAL INNOVATIONS IN BANKING: IMPACT ON REGIONAL GROWTH**

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## ***Abstract:***

This article contributes to the literature on the relationship between finance and growth by analysing the relationships between financial intermediation and economic growth within the regions of one country, rather than different countries. The focus on regions is relevant since regional information is more homogeneous, the legal and institutional factors are similar, and the relevant financial market is more accurately defined. Our study also incorporates the effects of a set of banking innovations. The analysis is undertaken for the Spanish regions. The results show that product and service delivery innovations contribute positively to regional GDP, investment and gross savings growth. (100 words)

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## 1. INTRODUCTION

The links between financial intermediation and economic growth have concentrated a great deal of academic attention during the last fifteen years. This literature highlights the role of banks and the financial system as a key ingredient of the economic development puzzle. Most of the finance-growth studies follow a Schumpeterian view of financial intermediaries as agents that monitor, finance and foster entrepreneurship -and, hence, investment and growth- based on the grounds of the seminal contribution of Goldsmith-McKinnon-Shaw<sup>1</sup>. According to this view, the banking sector alters the path of economic development by affecting the allocation of savings although not necessarily by altering the saving rate. Thus, the Schumpeterian view of finance and development highlights the impact of banks on productivity growth and technological change. Alternatively, a number of studies on development economics argue that capital accumulation is the key factor explaining economic growth. According to this view, banks influence growth primarily by raising domestic saving rates and attracting foreign capital. In parallel, many cross-country empirical approaches have been undertaken prompted by institutions such as the World Bank<sup>2</sup> or the International Monetary Fund<sup>3</sup>. These studies show the relevance of financial intermediaries development in explaining the differences in economic growth across countries.

The geographical scope is relevant since it conditions the methodology, the empirical evidence and the subsequent policy implications of any economic or financial analysis<sup>4</sup>. The present study analyses the relationship between financial intermediation and growth from a regional perspective, rather than from a cross-country viewpoint. Our paper incorporates two major innovations with regard to the existing empirical literature in this field. First of all, the use of regions within a country implies that the institutional,

legal and cultural factors are more adequately controlled<sup>5</sup>, the availability and homogeneity of financial information is larger and the relevant (financial) market is more accurately defined than for previous cross-country research. Moreover, it has been demonstrated that the significance of the relationship between financial development and economic growth depends on the level of financial development itself while cross-country studies usually consider a set of heterogeneous countries jointly independently of their level of financial development (RIOJA and VALEV, 2004). Secondly, we consider various financial innovations that have emerged in recent years and that are likely to have affected the financial intermediation-economic growth nexus (MAYER, 1988). Specifically, the effects of the different level of business and technological developments in the regional banking sectors on regional growth are also studied.

The paper is divided in three main sections following this introduction. Section 2 establishes the theoretical and empirical grounds. In section 3, we discuss the (dynamic panel) methodology, the data and variables used and the relevance of employing regions in this context. The main empirical findings are identified in Section 4. The paper ends with the main conclusions in Section 5.

## **2. BANKING DEVELOPMENT AND ECONOMIC GROWTH. THE REGIONAL APPROACH**

### **2.1. Financial intermediation-growth nexus: theoretical background**

The financial intermediation-growth nexus has been modelled recently from two perspectives, neoclassical and endogenous growth models. Although both approaches appear to be valid in the aim of evaluating the effects of banking sector development on economic growth, the endogenous growth perspective has dominated the analysis in recent years (BENHABIB and SPIEGEL, 2000). Under the endogenous growth view,

both the demand for and supply of loanable and investment funds are assumed to be interdependent and mutually reinforcing. It is assumed that there is asymmetric information, agency problems and uncertainty so that the relationship between finance and the economy is non-neutral. These imperfections may cause misallocations of funds so that financing and equity gaps may arise and SMEs and households may find themselves at a disadvantage in accessing funds (KLAGGE AND MARTIN, 2005). According to endogenous growth models, the contribution of banks to economic growth results from their screening and monitoring functions which permit an easier, more efficient and faster access to external finance for households and firms. This role of banks is particularly relevant when capital markets are not sufficiently developed (BENCIVENGA and SMITH, 1991)<sup>6</sup>. DOW and RODRÍGUEZ FUENTES (1997) and RODRIGUEZ FUENTES (2006, pp.61-65) have also highlighted another important dimension of the financial intermediation-growth nexus, the bank's ability to extend lending based upon superior local information and knowledge. This role can become one of the factors explaining credit availability at the regional or local level. Due to regional segmentation in credit markets –and considering that banks are not constrained by prior saving or a fixed amount of reserves- local and regional banks have a special role in creating credit at this geographical level. In this context, the role of banks is extended beyond screening and monitoring by incorporating a more direct function as credit creators, although this function is frequently ignored in the literature.

Within the endogenous growth framework, some previous studies have identified three main specific contributions of financial intermediaries to economic growth (PAGANO,1993; THIEL, 2001) <sup>7</sup>. First of all, an efficient banking system reduces the leakage of resources in funneling savings to firms. Secondly, intermediation ameliorates the allocation of funds since banks discriminate among bad

and good projects, choosing those with a higher marginal productivity of capital<sup>8,9</sup>. Third, both the level and the growth rate of savings can also be affected by financial intermediation. However, these effects are ambiguous since the savings rate may increase or decrease. As bank markets develop, the availability of consumer or mortgage lending to households is higher and –if insurance markets develop in parallel– the need of precautionary savings may diminish. In any event, the net effect of intermediary development on savings depends on the risk-return properties of consumer utility function<sup>10</sup>. The risk-return combination of savers portfolios improves with bank efficiency. Nevertheless, the impact on the level of savings will depend upon the effects of the expectation of higher returns (or lower risk) and on the relationship between present and future consumption.

All in all, the fraction of savings “lost” with financial intermediation depends on several variables. Firstly, any kind of market power in the banking industry is likely to increase the amount of savings that are “lost” with intermediation (DEMIRGÜÇ-KUNT *et al.*, 2004). Secondly, efficiency at banks is also important in the sense that managerial abilities (X-efficiency, scale/scope efficiency) can also modify bank prices. Bank relationships established by certain intermediaries may then play an important role. In particular, BERGER *et al.* (2005) have shown that greater market shares and efficiency ranks of small, private, domestically-owned banks are associated with better economic performance. Similarly, the diffusion of financial innovation also affects saving rates. If banks offer non-traditional products or new technological services, consumers benefit from these innovations and allocate their savings towards these new products and services and banks diversify their sources of income so that they can afford lower interest margins.

Banks collect information allowing financial flows of investment to grow until the marginal cost of monitoring/screening equals the marginal utility of investment in physical capital. The transformation function of banks permits a significant share of financial (savings) flows that would be invested in short-term projects and these can be invested in long-term (high-yielding) projects (GREENWOOD and JOVANOVIĆ, 1990; BENCIVENGA and SMITH, 1991). Banks also increase the productivity of capital when they act as brokers, allowing savers to diversify their portfolio by investing in products such as shares, mutual and pension funds or insurance services. Therefore, regulation –allowing broad banking activities- and the diffusion of financial innovation –developing new services- are also relevant in promoting capital productivity and investment. Together with bank lending availability, an additional important dimension of the finance growth nexus is credit quality. Lending quality is a key ingredient in the efficiency of financial intermediation although it largely depends on certain institutional characteristics of the different territories such as the existence of publicly available credit bureaus (as in the case of the US) or credit registries that produce valuable information on borrower quality for local institutions. LAULAJAINEN (1999) shows the existence of important differences in the quality of bank credit rating, screening and monitoring functions across countries. LEYSHON and POLLARD (2000), however, pointed out that credit rating and screening functions by banks become more centralized as banks extend their geographical bounds, thereby losing some of the informational advantages attributed to specialized financial institutions.

The regional perspective is increasingly important within the context of the finance-growth nexus. WILLIAMS and GARDENER (2003) indicate that the European financial system has evolved into two tiers: (i) a pan-national tier contested by large

commercial banks that provide universal banking services to customers, including corporations and high net worth individuals; and (ii) a regional tier that comprise local banking markets with banks servicing mostly retail customers like households and SMEs. Within this context, the spatial segmentation of financial systems has been shown to be correlated with higher regional GDP growth rates (MACKAY and MOLYNEUX, 1996). Households and many small and medium-size firms tend to operate in local or regional markets where specialized institutions -regional banks - establish long-term relationship with them. Specialized institutions display not only an economic commitment with local development. They also contribute to the promotion of social capital and local or regional empowerment very frequently (FULLER and JONAS, 1998). Although technology may be progressively blurring the role of geographical distance, the territorial bounds of financial activities are still relevant for households and firms (MOORE, 1998).

Although comparisons across regions of a single country appear to be more adequate than cross-country analyses in order to accurately 'hold constant' unobservable differences in monetary, legal and cultural environments, some idiosyncratic characteristics at the country level should be also recognized in this context. KLAGGE and MARTIN (2005) distinguish between two types of financial systems in order to analyse the role of banks in economic development. On the one hand, there are countries where the financial system is entirely dominated by a national 'global' centre and there are no separate regional capital markets (eg. the UK). In this type of countries, SMEs frequently face access restrictions to capital mainly due to the absence of specialized regional financial institutions. On the other hand, there are countries where both regional capital markets and financial centres exist (eg. Germany). In these countries, there are both regional banks that serve local SMEs and households

and also nationwide capital markets (for the larger financial institutions) that may still draw business away from the regional centres through internal capital markets.

Nevertheless, as noted by ZAZZARO (1997), the rationale for the existence of a banking system in the economy is that banks are able to function as financial intermediaries between those savers and borrowers who are excluded from participating in the centralized financial market. Local borrowers very often prefer to establish a lending-relationship with small banks, which own better information about the local economic conditions. As opposed to the ‘hard’ information provided by large firms (stock market valuations, ratings,...) SMEs produce ‘soft’ (non-elaborated) information. Banks need to provide the market with a steady stream of relevant information on the economic prospects of the enterprises and households (KLAGGE and MARTIN, 2005). Small regional banks have higher incentives to invest in ‘soft’ information about local firms than their larger counterparts due to their accumulated knowledge about local market conditions (PETERSEN and RAJAN, 1995). As shown by MARTIN (1999, pp. 3-28), these relationships define the role of specialized financial institutions in the space economy and their autonomy to create not only economic but also social relations. Thus, the development of retail banking in some territories is not trivial and depends on the evolutionary economic transformation of those areas –with certain banks leading financial innovation - and on the interactions between conventions in bank practices and individual bank strategies (LEYSHON and POLLARD, 2000). Information gathering by small banks is, therefore, spatially-sensitive and these institutions are more effective when performed in close proximity to borrowers. Therefore, banking structures are partially allocated across economic space so that that credit can be made available to SMEs and households (ZAZZARO, 1997; DOW and RODRÍGUEZ FUENTES, 1997). Moreover, SMEs and households appear to be aware of these advantages and this

knowledge reinforces their links with local financial institutions (MCKILLOP and BARTON, 1995).

As noted by KLAGGE and MARTIN (2005), concepts such as ‘local capital markets’, ‘spatial funding’ or ‘equity-gaps in the demand for and supply of finance’ are only possible under the non-neutrality assumption that financial markets by themselves provide an imperfect allocation of capital between firms and across the space-economy. Thus, the concentration of capital (or loan) markets in a central location will have detrimental effects on the allocation of funds to domestic business and these effects will be asymmetric depending on the financial conditions of the regions where the firm is located.

## **2.2. Empirical approaches: review and reassessment**

The empirical evidence in cross-country studies has shown, so far, a close relationship between financial intermediation and economic growth. Financial deepening and financial dependence are two key elements in this context. Financial deepening can be defined as the level of development and innovation of traditional and non-traditional financial services. Most of previous studies employed a bank credit variable as a measure of financial deepening (MACKAY and MOLYNEUX, 1996). In this context, KING and LEVINE (1993) find: i) a positive and significant correlation between bank credit development, and, ii) faster economic growth and also a positive influence of financial liberalization on bank efficiency reducing intermediation costs. Similar results have been obtained in other recent empirical studies. ROSSEAU and WACHTEL (1998) show that financial development enhances long-run economic growth in early stages of industrial development, Similarly, RIOJA and VALEV (2004)

find a positive relationship between financial development and growth although its significance is found to vary depending on the starting level of financial development.

Unobservable individual (country) effects have been taken into account as a key factor in this type of empirical research. BECK *et al.* (2000) and LEVINE *et al.* (2002) demonstrated that omitted variables, simultaneity or reverse causality do not alter the main finding of a positive correlation between intermediaries development and growth if unobservable effects are appropriately controlled. Considering these individual effects, BENHABIB and SPIEGEL (2000) estimate various growth equations under the underlying framework of both neoclassical and endogenous models showing that financial development (deepening) indicators are positively correlated with total factor productivity growth and investment.

Financial dependence is related to the extent to which households and firms rely on bank finance to undertake their investment projects. Therefore, financial dependence implies a lack of financial sources different from bank credit for a substantial proportion of private agents. RAJAN and ZINGALES (1998) analyse these relationships finding that financial intermediation reduces external finance costs of most dependent firms. CETORELLI and GAMBERA (2002) study dependence including market structure considerations. Their results are somewhat paradoxical since higher market concentration (employing a Herfindahl-Hirschman index) is found to be beneficial for bank credit-dependent industrial sectors and improves credit conditions for junior firms entering the market. CARBÓ *et al.*(2003) found that there is no evidence of causality between bank concentration and growth when regions of one country are employed and concluded that there might be other factors that might influence both variables, such as the number of bank branches.

Differences between bank-based or market-based financial systems could imply diversity in growth patterns. According to LEVINE (2002) there is evidence of positive effects of intermediary (or financial system) development in both cases. Interestingly, DERMIGÜC-KUNTZ and MAKSIMOVIC (2002) undertake a cross-country analysis employing microdata to show that the (positive) contribution of banks to growth is more likely to occur in the short-run while financial markets development effects frequently show up in the long-run.

As for bank deepening, legal and institutional factors may also contribute to explain the growth effects of financial dependence according to recent studies. Recent liberalization of bank activities (with a trend towards broad banking in most financial systems) has been shown to increase financial intermediation efficiency and enhance their contribution to economic growth (ARESTIS and DEMETRIADES, 1997; JAYARATNE and STRAHAN, 1996; LA PORTA *et al.*, 1998, 2002; CARBÓ and RODRÍGUEZ, 2004).

### **3. REGIONAL GROWTH REGRESSIONS: EMPIRICAL ESPECIFICACION**

#### **3.1. The benefits of the regional perspective: a closer look at the finance-growth nexus**

There are three major potential advantages of a regional analysis (within a country) compared with cross-country studies: (i) persistent heterogeneity across regions within a single country is lower and more easily controlled than across countries; (ii) the exogenous component of financial deepening –such as the degree of liberalisation or the quality of the legal and institutional framework- can also affect the results significantly and this component may be controlled more adequately at a regional level than in a cross-country perspective. Although the variation of GDP across

countries is usually larger than the variation across regions within a country, controlling for institutional, legal and cultural factors within regions permits us to identify more adequately the role of the financial system in the economy, as well as the impact of the different path of diffusion of financial innovations in these territories<sup>11</sup>. It has been also acknowledged that the link between intermediation and growth is the sum of multiple effects and the regional analysis may capture some effects that are hidden in cross-country comparisons<sup>12</sup>; and (iii) analysing regions within a country provides us with more information on banking system developments and, at the same time, the contractual relationships between banks and their customers are more likely to be observed on a regional than on a national basis (GUIISO, SAPIENZA and ZINGALES, 2004).

### **3.2. The regional structure of the Spanish financial sector and bank financing**

Spain has a banking-oriented financial system with a large fraction of its economic activity driven by the SMEs sector. There are almost three million small and medium enterprises (SMEs) in Spain. According to the Companies Central Directory of the Spanish Statistical Office (INE) more than the 90% of total firms in Spain are SMEs and they represent more than the 50% of total employment. Within this context, the role of financial institutions at the regional level –the territorial definition within most of the SMEs operate- appear to be crucial to define the financing conditions of these firms. Both SMEs and households generally do not enjoy many other alternatives to get funding for their projects. In the case of SMEs, they rely on bank lending as their preferred source of funding since they do not generally have access to stock markets and trade credit is not always a feasible alternative. In the case of households, more than the 80% of their financial debt corresponds to bank mortgages for home purchase obtained

from local financial institutions. It is worth noting that banks also manage most of the households' financial portfolio. Together with savings accounts they also have 're-conducted' most of the theoretically disintermediated financial flows in the last fifteen years in Spain. Together with current account, time and savings deposits they currently manage more than the 90% of mutual funds, as well as the 85% of insurance and pension funds. All these products are also likely to be negotiated with local financial institutions<sup>13</sup>.

We also illustrate the extent to which there are significant differences in terms of banking conditions and economic development across Spanish regions. Figure 1 shows both SME dependence on bank finance and GDP per capita across Spanish regions in 2001, according to the data provided by the Spanish Savings Bank Research Foundation (Funcas). We measure bank dependence as the average ratio of "bank loans/total liabilities". The average ratio for a Spanish SME is 18.49%. There are substantial differences across regions. It should be noted that a lower ratio of bank loans over total liabilities does not necessarily mean the existence of higher financing constraints. It may be also showing a lower level of bank dependence due to, *inter alia*, a higher presence of large ("less dependent") firms in the region. Having these assumptions in mind, the lowest ratio of "bank loans/total liabilities" is shown by firms in Comunidad Valenciana (13.66%), Canary Islands (14.09%) and Navarra (14.79%). The highest values, however, are observed in Castile la Mancha (24.78%), Castile and Leon (23.46%) and Madrid (21.51%). Figure 1 also reveals the existence of important differences across Spanish regions in terms of economic development. In particular, while GDP per capita is in the range of euros 10.000-15.000 in Extremadura, Murcia, Castile la Mancha or Andalusia, GDP per capita in other regions such as La Rioja, the Basque Country or the Balearic Islands is over euros 20.000. As

noted by GOERLICH and MAS (2002), differences in income inequality and economic development across Spanish regions are significant and they are only decreasing at a very slow path over time. We wonder the extent to which these differences might be enlarged or reduced due to the presence of different banking conditions. Although it is not possible to infer any source of causality from these descriptive data, it can be observed that the differences in bank dependence and economic development across Spanish regions are sizeable.

Since SMEs are expected to be particularly affected by bank financing conditions, it is important to study differences in firms' financing across firm size. Figure 2 shows the composition of the financial portfolios of Spanish firms comparing SMEs with the whole sample of non-financial firms from the Central Balance Sheet database of the Bank of Spain. The figure shows that bank funding represents the 20% of the total liabilities of an average firm and the 25% in the case of SMEs. However, the higher use of trade credit (23% for the average firm and 31% for SMEs) suggests that many firms –and, in particular, SMEs- face financing constraints from banks since creditors are a significantly more expensive source of funding than bank loans. Cross-country studies of financing choices have found different financing patterns for small and large firms, in the use of long-term financing and trade credit (Demirguc-Kunt and Maksimovic, 1999 and 2001). Large firms may usually benefit from internal capital markets and face less financing constraints while small firms use trade credit more intensively when they can not obtain as much as bank lending as they would desire. These cross-country studies thus employ a bank credit variable (such as “bank credit/total assets”, “bank credit/GDP”) as a measure of financial development. We wonder how this and other measures of bank financing may be related to economic growth across regions within a single country.

### 3.3. Empirical specification: the relationship between regional bank innovations and growth

In this section we analyse regional GDP, Gross Fixed Capital Formation and Gross Savings using a variety of explanatory variables common to established cross-country literature<sup>14</sup> and supplementing these with other variables that account for regional banking sector development and financial innovation.

The use of dynamic panel data techniques is particularly appropriate within this framework since it may help capturing persistent unobservable heterogeneity across regions. Previous empirical studies on a cross-country basis have shown the consistency and efficiency of these techniques compared to other cross-section and/or instrumental variable alternatives (LEVINE *et al.*, 2002).

As in LEVINE *et al.*, we use the Generalized-Method of Moments (GMM) estimator for dynamic panel data that was introduced by HOLTZ-EAKIN *et al.* (1990), ARELLANO and BOND (1991), and ARELLANO and BOVER (1995). The dynamic panel data is employed since the initial (lagged) values of GDP, gross fixed capital formation and gross savings may partially explain the behavior of these variables over time. Consider the following regression equation

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta'X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

where  $y$  is *GDP*, Gross Fixed Capital Formation (*GFCE*) and Gross Savings (*GS*),  $X$  is a set of explanatory variables representing both the general determinants of growth and banking sector developments,  $\eta_i$  is an unobserved regional-specific effect,  $\varepsilon$  is the error term, and the subscripts  $i$  and  $t$  represent region and time period, respectively<sup>15</sup>. We can rewrite equation (1), as:

$$y_{i,t} = \alpha y_{i,t-1} + \beta'X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (2)$$

The region-specific effect is eliminated by taking first-differences in equation (2) so that:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (3)$$

Equation (3) is estimated both with and without the bank innovation variables to test if bank innovation is significant on its own. All variables are expressed in logs so that the differences can be interpreted as growth rates.

The use of appropriate instruments is necessary to deal with the likely endogeneity of the explanatory variables, and also to deal with the fact that the new error term ( $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ ) is correlated with the lagged dependent variable ( $y_{i,t-1} - y_{i,t-2}$ ). Under the assumptions that the error term ( $\varepsilon$ ) is not serially correlated, and that the explanatory variables,  $X$ , are weakly exogenous (the explanatory variables are assumed to be uncorrelated with future realization of the error term) the GMM dynamic panel estimator uses the following moment conditions.

$$E[y_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (4)$$

$$E[X_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (5)$$

We refer to the GMM estimator based on these conditions as the ‘difference estimator’.

There are, however, conceptual and statistical shortcomings with this difference estimator. Conceptually, we would also like to study the cross-region relationship between financial development and per capita *GDP*, *GFCF* and *GS* growth, which is eliminated by definition in the difference estimator. Statistically, ALONSO-BORREGO and ARELLANO (1996) and BLUNDELL and BOND (1997) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences and affect the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises with weak instruments. Additionally, in small samples, Monte

Carlo experiments have shown that the weakness of the instruments can produce biased coefficients. To reduce the potential biases and inaccuracy associated with the usual difference estimator, we use a new estimator that combines, in a system, the regression in differences with the regression in levels (ARELLANO and BOVER, 1995; BLUNDELL and BOND 1997)<sup>16</sup>. The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the country-specific effect in equation (2), there is no correlation between the *differences* of these variables and the country-specific effect. This assumption results from the following stationarity properties:

$$E[y_{i,t+p} \cdot \eta_i] = E[y_{i,t+q} \cdot \eta_i]$$

and

$$E[X_{i,t+p} \cdot \eta_i] = E[X_{i,t+q} \cdot \eta_i] \text{ for all } p \text{ and } q \quad (6)$$

The additional moment conditions  $p$  for the second part of the system (the regression in levels) are:

$$E[(y_{i,t-s} - y_{i,t-s-1} \cdot (\eta_i + \varepsilon_{i,t}))] = 0 \text{ for } s = 1 \quad (7)$$

and

$$E[(X_{i,t-s} - X_{i,t-s-1} \cdot (\eta_i + \varepsilon_{i,t}))] = 0 \text{ for } s = 1 \quad (8)$$

Thus, we use the moment conditions shown in equations (4), (5), (7) and (8) and employ a GMM procedure to generate consistent and efficient parameter estimates.

Consistency of the GMM estimator depends on the validity of the instruments. The Sargan test of over-identifying restrictions is then employed to test the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process<sup>17</sup>. As pointed out by ARELLANO and BOND (1991), the estimates

from the first step are more efficient, since the estimates from the second step show a considerable downward bias in the standard errors. For these reason, the coefficients and statistics reported correspond to the first step.

### 3.4. Predicting the economic impact of bank innovations on regional economic growth

An additional analysis is developed employing GMM estimations. Most of the financial innovations considered –mutual funds, loan commitments, cards, ATMs– experienced a significant growth in the second half of the sample period, mainly from 1993. Additionally, it might be possible that a structural change took place between the periods 1986-1992 and 1993-2001 both induced by financial and economic events such as the advent of the European Single Market. For this reason, a Chow test is undertaken for the growth equations with and without the diffusion of financial innovations. The F-test is defined as the difference between estimated parameters in both periods where the null hypothesis is that the structural change did take place. Considering the different impact of innovations in both periods, we aim to isolate the effect of bank innovation variables in growth patterns between 1993 and 2001 by estimating the following two set of equations:

$$Y_{i,t}^{POST} - Y_{i,t-1}^{POST} = \alpha(Y_{i,t-1}^{POST} - Y_{i,t-2}^{POST}) + \beta'(G_{i,t}^{POST} - G_{i,t-1}^{POST}) + \beta'(I_{i,t}^{POST} - I_{i,t-1}^{POST}) + \eta_i + \varepsilon_{i,t} \quad (9)$$

$$Y_{i,t}^{POST} = \alpha Y_{i,t-1}^{POST} + \beta' G_{i,t}^{POST} + \beta' I_{i,t}^{POST} + \eta_i + \varepsilon_{i,t} \quad (10)$$

$$Y_{i,t}^{POST} - Y_{i,t-1}^{POST} = \alpha(Y_{i,t-1}^{POST} - Y_{i,t-2}^{POST}) + \beta'(G_{i,t}^{POST} - G_{i,t-1}^{POST}) + \beta'(I_{i,t}^{PRE} - I_{i,t-1}^{PRE}) + \eta_i + \varepsilon_{i,t} \quad (11)$$

$$Y_{i,t}^{POST*} = \alpha Y_{i,t-1}^{POST} + \beta' G_{i,t}^{POST} + \beta' I_{i,t}^{PRE} + \eta_i + \varepsilon_{i,t} \quad (12)$$

where  $Y_{i,t}^{POST}$  is the estimated *GDP* (or *GFCF* or *GS*) in the period 1993-2001.  $G_{i,t}^{POST}$  states for the vector of the general determinants of growth in the period 1993-2001 including (as in cross-country studies) the impact of lending to private sector while  $I_{i,t}^{POST}$  is the vector of bank innovations (including mutual funds, loan commitments, cards and ATMs) in the same period. Finally,  $I_{i,t}^{PRE}$  in equations (11) and (12) is the vector of the level of bank innovations in the period 1986-1992. This way, we are virtually comparing growth patterns in the period 1993-2001 employing the true value of innovations in this period –equations (9) and (10)- and the growth patterns as if the level of innovations had never changed (kept constant) in the period (1993-2001). The average value of the ratio  $Y_{i,t}^{POST} / Y_{i,t}^{POST*}$  is an estimate of the contribution of bank innovations to *GDP*, *GFCF* and *GS*<sup>18</sup>. A separate estimation is also run for two types of innovations:

- a) Business innovations: mutual funds and loan commitments.
- b) Technological innovations: (credit and debit) cards and ATMs.

### 3.5. Data

The study covers the 17 administrative regions<sup>19</sup> of Spain over the period 1986-2001 summing up to 272 panel observations. Both short-run and long-run coefficients are estimated for each one of the dependent variables. Short-run coefficients are estimated directly employing the 272 annual observations. As in most cross-country studies, long-run coefficients are estimated employing the data averaged over four-years to abstract from business cycle influences, summing up to 68 panel observations. The Spanish regional banking markets represent a unique case study for our empirical

purposes. During this period, a wide process of liberalization, modernization and innovation in the financial system took place along with changes in growth patterns. Financial intermediation development is analysed by looking at the evolution of lending together with other business and distribution channels innovations in banking services. Two main groups of variables are defined. The summary statistics and sources of information for these variables are shown in Table 1<sup>20</sup>. Our data show sufficient variation across regional explanatory variables (including financial innovation variables) according to the values of the standard deviations of these variables<sup>21</sup>. There are three dependent variables: regional GDP; regional Gross Fixed Capital Formation; and regional Gross Savings. The first set of regional explanatory variables refers to some of the major determinants of economic growth according to most of the cross-country or regional growth empirical studies:

- Capital stock: including both private and public capital<sup>22</sup>.
- Level of schooling: defined as the percentage of population with secondary or university studies.
- Weight of the industrial sector in the economy: measured as the weight of industry and construction sector on the GDP.
- Percentage of urban population: population in territories with at least 10.000 inhabitants over total population in the region.
- Ageing rate: measured as the percentage of inhabitants over 65 years old.
- Inflation: the regional price consumption index.

As for the objectives of this study, a second set of variables analysing the evolution of regional banking sectors and related financial innovations is also included:

- Lending to private sector/GDP: total value of regional loans (in real terms) over GDP.
- Branches/intermediation business: where intermediation business is the sum of regional loans and deposits. This variable proxies the physical structure needed per unit of intermediation business and it is expected to proxy intermediation costs<sup>23</sup>.
- Number of bankruptcies and suspensions of payments: as a proxy for the quality and risk conditions of bank business opportunities at a regional level.
- HHI index in the deposits market. This index is also computed regionally using the distribution of branches across regions as a weighting factor to infer the volume of deposits that each bank holds in a particular region<sup>24</sup>.
- Mutual fund business/GDP: as a proxy for product innovation<sup>25</sup>. This index was also computed regionally using the distribution of branches across regions as a weighting factor to infer the volume of mutual funds that each bank holds in a particular region.
- Loan commitments/total lending (including loan commitments): this variable reflects the extent to which regional banks develop long-run contractual relationships that improve their monitoring and screening activities. Again, the variable is computed regionally using the distribution of branches across regions as a weighting factor to infer the volume loan commitments generated by each bank in a particular region.
- ATMs/branches: as a first proxy of technical change in regional distribution channels.
- Number of cards issued: the total number of bank credit and debit cards showing technological developments in payment services<sup>26</sup>. The variable is

computed regionally using the distribution of branches across regions as a weighting factor to infer the number of cards issued by each bank in a particular region.

#### **4. THE FINANCE-GROWTH NEXUS: MAIN RESULTS FOR REGIONS**

Dynamic panel data results on the determinants of regional GDP are shown in Table 2<sup>27</sup>. The findings for both the short-run and long-run coefficients are similar<sup>28</sup>. However, since the intensity of these relationships (the level of the estimated coefficients) will be better reflected in the long-run, our conclusions rely mostly on long-run estimations. Similarly to previous empirical analyses, the initial value of GDP and inflation are significantly related to GDP growth<sup>29</sup>. As expected, the level of schooling, the weight of the industrial sector in the economy and the capital stock have a significant (positive) impact on growth, while the ageing rate is negatively related to growth.

When region-based bank structure variables are added, the variables representing lending to private sector and loan commitments are found to be positive and significant, as it happens in most previous studies<sup>30</sup>. The coefficient of the loan quality variable (number of bankruptcies and suspensions of payments) presents its expected (negative) sign showing the importance of risk conditions in channelling funds to investment. As for innovations, two of them are found to affect growth positively, namely, mutual funds and bank cards. This finding appears to show the importance of diversification opportunities in savings portfolios (mutual funds) and the beneficial effects of promoting long-run customer relationships (bank cards) to reduce transaction costs<sup>31</sup>.

The second set of results corresponds to the determinants of regional Gross Fixed Capital Formation (Table 3). These results are similar to those obtained for GDP. The initial value of investment, the weight of industrial and construction sectors and the capital stock are statistically significant variables. Importantly, there is also a significant and negative effect of the variable that proxies intermediation costs (branches/intermediation business) showing the negative effect of augmenting transformation costs on investment. Regarding the impact of bank innovations, the positive sign of loan commitments and the number of (credit and debit) cards suggest that capital monitoring and screening functions improve along with the information content of contractual agreements between lenders and borrowers. As for the variable that relates ATMs to the level of branches, its positive sign might be indicating cost savings from technological change that facilitate investment.

As for the equation where Gross Savings is the dependent variable (Table 4), the significance of capital stock and schooling variables indicates that the level of regional development favours savings. As expected, the weight of lending to private sector is negatively related to gross savings. However, bank mutual funds and cards growth appear to affect savings positively. In this case, innovations appear to ameliorate the risk/return/liquidity diversification opportunity set for savings.

Finally, the results of the predicted economic impact in *GDP*, *GFCF* and *GS* related to bank innovations –as a result of the estimation of equations (9) to (12)- are shown in Table 5. First of all, the Chow test suggests that there has been a structural change in growth patterns between the periods 1986-1992 and 1993-1999 both considering and excluding bank innovations in the estimated equations. There is a significant average economic impact of bank innovations to GDP during the period (0.17%). As theory suggests, the largest impact is found for the gross fixed capital

formation, which grows an additional 0.29% due to innovations. The net effect of these innovations on savings is lower but also positive (0.10%). Regarding the effects of the different types of innovations, business innovations are found to be significantly more important than technological innovations in all cases. Risk diversification –due to the growth of mutual funds in households portfolio- and customer relationship effect –with loan commitments and cards diffusion- are then highly significant at the regional level to define the intermediation-growth nexus.

## **5. CONCLUSIONS**

The regional perspective contributes to previous cross-country analyses since persistent heterogeneity across regions and exogenous components of growth are more easily controlled than across countries, information availability is higher and the relevant credit and deposit markets are more appropriately defined. In many countries, there are both regional banks that serve local SMEs and households and also nationwide capital markets that may still draw business away from the regional centres through internal capital markets. Several studies have recognized that information gathering by small banks is spatially-sensitive and that these institutions are more effective when performed in close proximity to borrowers. Therefore, regional banking structures in the economic space are particularly relevant to increase credit availability to SMEs and households. This study adds to previous literature by analysing the effects that credit along with other bank (product and service delivery) innovations have on regional economic development.

Following the previous literature on the financial intermediation-growth nexus, a dynamic panel data analysis is undertaken for the Spanish regions in order to show the impact of various regional banking sector developments and innovations during 1986-

2001. The results are in line with cross-country studies, in that there is a positive and significant correlation between bank financial deepening and regional growth. Nevertheless, our empirical evidence is more detailed with regard to the sources of financial intermediaries development: product and service delivery innovations contribute positively to GDP, investment and gross savings growth.

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## ENDNOTES

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<sup>1</sup> See GOLDSMITH (1967), MCKINNON (1969) and SHAW (1973).

<sup>2</sup> CLAESSENS and GLAESSNER (1997).

<sup>3</sup> LINDGREN *et al.* (2000).

<sup>4</sup> DOW and RODRÍGUEZ FUENTES (2003).

<sup>5</sup> See DEMIRGÜÇ-KUNT and MAKSIMOVIC (1998) for a survey of the implications of different legal and financial environments for economic growth.

<sup>6</sup> This view was implicit in the contribution of Goldsmith-McKinnon-Shaw. Banks reduce transaction costs when transforming savings into investment and the quantity and quality of financial services help explain differences in growth rates across countries.

<sup>7</sup> The aim of quantifying the contribution of banking to economic development requires the definition of the direction of the causality relationship between financial intermediation and growth. Two main methodologies have been employed to analyse this relationship. The first one relies upon a long-run model that suggests a double direction of causality over a time horizon. In this model, economic growth favours the expansion of financial intermediaries in their early stages of development while, later on, a mature and consolidated financial system enhances more efficient investment decisions and faster economic growth. Besides, the contribution of intermediaries in these models does not rely directly on capital accumulation but on capital productivity (GREENWOOD and JOVANOVIĆ, 1990). Secondly, causality effects have been also evaluated within the so-called bisectoral models of growth (ODEDOKUN, 1996; WANG, 1999). These models are defined in two ways. A first stage of the model assumes that the financial sector positively affects economic growth (financial-leading) while the second poses that the economic conditions stimulate financial development (real-fostering). The joint evaluation of these equations also favours the hypothesis of double causality.

<sup>8</sup> KING and LEVINE (1993) note that the productivity of capital may increase in two ways: (i) banks collect information on borrowers that permit them to discriminate among alternative investment projects; and (ii) banks induce individuals to invest in riskier but more productive technologies enhancing risk sharing.

<sup>9</sup> Many of the improvements in the monitoring and screening functions of financial intermediaries are related to the costs of financial innovation. Innovation increases efficiency and reduces risk, so that monitoring costs decrease and investment productivity rises for any given equilibrium growth rate. Financial innovation improves the efficiency of the screening and monitoring functions in evaluating specialized firm investment projects. Endogenous financial intermediation also avoids the duplication of monitoring and risk control of investment when entrepreneurs do not have incentives to develop these functions in the presence of transaction costs. The optimal level of monitoring depends on input prices and increases with capital accumulation. Similarly, improvements in monitoring ameliorate the risk properties of corporate loan contracts and foster firms' innovations (DE LA FUENTE and MARÍN, 1996).

<sup>10</sup> On the other hand, overlapping generations models, such as JAPPELLI and PAGANO (1992), show that binding liquidity constraints may also increase savings since present consumption of certain type of consumers (as young households) is limited by current resources (not permanent income).

<sup>11</sup> This study deals mainly with the effects of efficiency and innovations improvements in the banking sector. There are also important welfare implications from the regional perspective such as the effects of banking sector developments on financial exclusion. See CHAKRAVARTY (2005) as a comprehensive reference on the effects of regional banking sectors on financial exclusion.

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<sup>12</sup> This is the view, for instance, that prevails in the joint project of the ECB and the Center for Financial Studies “ECB-CFS Research Network on Capital Markets and Integration in Europe. A Road Map” where there is claim for regional studies of this nature.

<sup>13</sup> All this information has been taken from the Central Balance Sheet (*Central de Balances*) database of the Bank of Spain.

<sup>14</sup> See BARRO AND SALA-I-MARTIN (1998); and SALA-I-MARTIN (2002) for a detailed discussion on the main determinants of economic growth across countries.

<sup>15</sup> Additionally, we include time dummies in the regression, since business cycles are different enough across Spanish regions and over time.

<sup>16</sup> In dynamic panel data models where the observations are highly autoregressive and the number of time series is small, the standard GMM estimator has been found to have large finite sample bias and poor precision in simulation studies (ARELLANO, 1999) The poor performance of the Standard GMM panel data estimator is also frequent in relatively short panels with highly persistent data. The GMM system estimator improves the performance of the GMM estimator in the dynamic panel data context. Additionally, the GMM system estimator produces substantial asymptotic efficiency gains relative to this nonlinear GMM estimator, and these are reflected in their finite sample properties (BLUNDELL, BOND and WINDMEIJER, 2000).

<sup>17</sup> In addition, we used the "difference-Sargan test," presented in BLUNDELL and BOND (1997), to examine the null hypothesis that the lagged differences of the explanatory variables are uncorrelated with the residuals (which are the additional restrictions imposed in the system estimator with respect to the difference estimator). This null hypothesis cannot be rejected which gives further support to the system estimator.

<sup>18</sup> All sets of equations are estimated following the aforementioned GMM procedure.

<sup>19</sup> These regions are called “Comunidades Autónomas”.

<sup>20</sup> The larger homogeneity on the institutional, legal and cultural factors across regions does not necessarily imply that there are no differences in the levels of the variables behind economic growth across regions (i.e. level of schooling, capital stock and financial variables). In our analysis, variability across regions is observed by simply looking at regional information (these data are publicly available).

<sup>21</sup> Studies such as LEONIDA and MONTOLIO (2004) have shown the existence of important structural differences in the determinants of economic growth and income distribution across Spanish regions.

<sup>22</sup> The results remain very similar when including private or public capital separately.

<sup>23</sup> There is no regional information on bank operating costs or bank margins. For this reason, we need to proxy operating costs by using one of the main sources of operating costs (branches).

<sup>24</sup> Similar results are obtained when computing the HHI employing total loans and, alternatively, total assets.

<sup>25</sup> Mutual funds in Spain have experienced a dramatic expansion during the 1990s –being the largest bank brokerage product innovation in recent years- and banks manage approximately the 90% of their distribution.

<sup>26</sup> Alternatively, the number of EFTPOS (electronic fund transfers at point of sale) was also employed and the results were very similar.

<sup>27</sup> The instruments employed seem to be appropriate in all cases according to the values of the Sargan test.

<sup>28</sup> This is explained by the fact that the main contribution of banks to economic growth usually appears in the short-run but its effects are likely to remain over time (DERMIGÜC-KUNTZ and MAKSIMOVIC, 2002).

<sup>29</sup> The positive sign of the GDP coefficient, tentatively, suggests the absence of GDP  $\beta$ - convergence across Spanish regions This result is in line with recent studies that have developed different empirical procedures to estimate  $\beta$ - convergence across Spanish regions (LAMO, 2000; and LEONIDA and MONTOLIO, 2004).

<sup>30</sup> The variable “loan commitments/total lending” was also included in the empirical equation with one and two lags since the benefits from these relationships usually do not show up in the same period. The short-run coefficient of this variable was also significant in these cases.

<sup>31</sup> With the aim of studying a likely impact of the change in monetary policy regimes on the inflation levels of the Spanish regions with the advent of the euro in 1999, equation (2) was also re-estimated using a dummy variable that takes the value 0 until 1999 and 1 onwards (not shown). This dummy was not found to be statistically significant and it did not either improve the econometric goodness of fit of the regression model.

**TABLE 1. Summary Statistics**

	<i>Mean</i>	<i>Standard deviation</i>
<i>GDP*</i>	23559.15	21771.20
<i>Gross Fixed Capital Formation*</i>	4058.93	4140.04
<i>Gross Savings*</i>	6297.46	7310.94
<i>Level of schooling*</i>	0.01792	0.00648
<i>Relative weight of the industrial sector in the economy*</i>	0.30332	0.07253
<i>Capital stock*</i>	41518.35	36658.67
<i>Percentage of urban population*</i>	0.50999	0.55990
<i>Ageing rate*</i>	0.05869	0.04655
<i>Inflation*</i>	106.4995	21.1672
<i>Lending to private sector/GDP*</i>	0.61882	0.29166
<i>Branches/intermediation business* (x1000)</i>	0.5503	0.0829
<i>Number of bankruptcies and suspensions of payments*</i>	5.8368	7.4650
<i>HHI index in the deposits market*</i>	0.11688	0.03925
<i>Mutual fund business/GDP<sup>⊗</sup></i>	0.89345	0.51613
<i>Loan commitments/total lending (including loan commitments) *</i>	0.22416	0.02693
<i>ATMs/branches<sup>⊗</sup></i>	0.89202	0.37523
<i>Number of cards issued<sup>⊗</sup></i>	24173600	17181000

Data sources:

\* National Statistical Office (INE). [<http://www.ine.es>]

\* Instituto Valenciano de Investigaciones Económicas, Ivie [<http://www.ivie.es>]

\* Spanish Savings Banks Foundation (FUNCAS) [<http://www.funcas.ceca.es>]

\* Bank of Spain [<http://www.bde.es>]

\* Spanish Bank Association (AEB) [<http://www.aebanca.org>] and Spanish Savings Banks Confederation (CECA) [<http://www.ceca.es>].

⊗ Spanish Stock Markets Commission (CNMV) [<http://www.cnmv.es>]

⊗ ECB Blue Book on Payment Systems [<http://www.ecb.int>], Bank of Spain [<http://www.bde.es>], Spanish Bank Association (AEB) [<http://www.aebanca.org>], Spanish Savings Banks Confederation (CECA) [<http://www.ceca.es>] and UNACC [<http://www.unacc.com>].

**TABLE 2. Banking sector developments and regional GDP growth (1986-2001)***Dynamic Panel Regressions, System Estimator**Variables in logs**Observations = 272 (short-run coefficients) and 68 (long-run coefficients)**t-statistics in parenthesis (White heteroskedastic-robust standard errors)*

	(1) (SHORT-RUN COEFF.)	(1) (LONG-RUN COEFF.)	(2) (SHORT-RUN COEFF.)	(2) (LONG-RUN COEFF.)	
<i>Initial GDP</i>	0.01741* (1.78)	0.027597* (1.81)	0.01420* (1.84)	0.160283 (1.60)	
<i>Level of schooling</i>	0.08159 (0.43)	-0.07371 (-0.95)	0.05783* (1.82)	0.02002 (0.27)	
<i>Relative weight of the industrial sector in the economy</i>	0.13222** (2.12)	0.151818* (1.77)	0.31683* (1.83)	0.06802* (1.73)	
<i>Capital stock</i>	0.78485*** (23.30)	0.93757*** (10.34)	0.64517*** (8.52)	0.515344*** (3.81)	
<i>Percentage of urban population</i>	0.08957 (0.96)	0.04466 (1.20)	0.01824 (1.61)	-0.05296 (-0.84)	
<i>Ageing rate</i>	-0.18804* (-1.88)	0.005658 (-0.93)	-0.04687 (-0.85)	-0.56494*** (-5.34)	
<i>Inflation</i>	-0.85591*** (-7.60)	-0.56662*** (-3.81)	-1.13095*** (-5.24)	-1.80772*** (-4.10)	
<i>Lending to private sector/GDP</i>	0.31531*** (7.59)	0.185626** (2.02)	0.32075*** (-6.65)	0.11793** (2.22)	
<i>Branches/intermediation business (x1000)</i>	-0.01243 (-0.79)	-0.15279** (-2.37)	-0.03598 (-1.62)	-0.04499** (2.27)	
<i>Number of bankruptcies and suspensions of payments</i>	-0.08834 (-1.36)	-0.06098*** (-2.93)	-0.01127* (-1.76)	-0.02171 (-0.80)	
<i>HHI index in the deposits market</i>	-0.03298 (-0.15)	-0.04132 (-0.40)	0.03457 (0.11)	0.23268 (1.30)	
<i>Mutual fund business/GDP</i>	-	-	0.06369*** (3.13)	0.07831*** (3.42)	
<i>Loan commitments/total lending (including loan commitments)</i>	-	-	0.03255 (0.35)	0.05484* (1.85)	
<i>ATMs/branches</i>	-	-	0.06183 (1.24)	0.02958*** (2.82)	
<i>Number of cards issued</i>	-	-	0.11565*** (2.70)	0.39649*** (5.23)	
	Sargan Test (p-value)	0.117	0.123	0.168	0.153
	Overall equation significance – F-test (p-value)	0.033	0.021	0.017	0.020

\*, \*\*, \*\*\*: statistically significant at 10%, 5% and 1% level, respectively.

**TABLE 3. Banking sector developments and regional Gross Fixed Capital Formation growth (1986-2001)**

*Dynamic Panel Regressions, System Estimator*

*Variables in logs*

*Observations = 272 (short-run coefficients) and 68 (long-run coefficients)*

*t-statistics in parenthesis (White heteroskedastic-robust standard errors)*

	(1) (SHORT-RUN COEFF.)	(1) (LONG-RUN COEFF.)	(2) (SHORT-RUN COEFF.)	(2) (LONG-RUN COEFF.)
<i>Initial GFCF</i>	0.03678** (2.23)	0.01443** (2.42)	0.05556*** (3.53)	0.04687** (2.31)
<i>Level of schooling</i>	0.06551 (0.18)	0.22405 (0.95)	0.34711 (1.24)	0.21374 (0.91)
<i>Relative weight of the industrial sector in the economy</i>	0.38154*** (3.44)	0.30953*** (3.51)	0.4904*** (2.64)	-0.09392** (-2.44)
<i>Capital stock</i>	0.52207** (1.99)	0.98080*** (4.89)	1.4061*** (5.29)	1.32300*** (4.81)
<i>Percentage of urban population</i>	-0.03970 (-0.16)	-0.18334* (-1.89)	-0.04304 (-0.15)	-0.09180 (-1.16)
<i>Ageing rate</i>	-0.40537*** (-6.18)	-0.04606*** (-3.43)	-0.42523*** (-3.89)	-0.28742*** (-3.06)
<i>Inflation</i>	-1.83830*** (-6.34)	-0.58473*** (-2.90)	-0.30801* (-1.88)	-2.40640** (-2.44)
<i>Lending to private sector/GDP</i>	0.63990*** (3.17)	0.44423*** (3.20)	0.74945*** (3.63)	0.56852*** (4.23)
<i>Branches/intermediation business (x1000)</i>	-0.45205*** (-4.21)	-0.77445** (-2.34)	-1.31953*** (-3.89)	-0.73058** (-2.53)
<i>Number of bankruptcies and suspensions of payments</i>	-0.06132** (-2.32)	-0.10556* (-1.86)	-0.06483*** (-3.07)	-0.18551*** (-4.46)
<i>HHI index in the deposits market</i>	-0.09634* (-1.74)	0.15105 (0.87)	-0.03109*** (-4.69)	0.08199 (0.47)
<i>Mutual fund business/GDP</i>	-	-	0.07766 (1.56)	0.05842* (1.82)
<i>Loan commitments/total lending (including loan commitments)</i>	-	-	0.491007*** (2.62)	0.78247** (2.29)
<i>ATMs/branches</i>	-	-	0.645306*** (3.34)	0.47186** (2.36)
<i>Number of cards issued</i>	-	-	0.550342*** (4.23)	0.20165* (1.82)
	Sargan Test (p-value)	0.107	0.124	0.122
	Overall equation significance – F-test (p-value)	0.009	0.016	0.010

\*, \*\*, \*\*\*: statistically significant at 10%, 5% and 1% level, respectively.

**TABLE 4. Banking sector developments and regional Gross Savings growth (1986-2001)***Dynamic Panel Regressions, System Estimator**Variables in logs**Observations = 272 (short-run coefficients) and 68 (long-run coefficients)**t-statistics in parenthesis (White heteroskedastic-robust standard errors)*

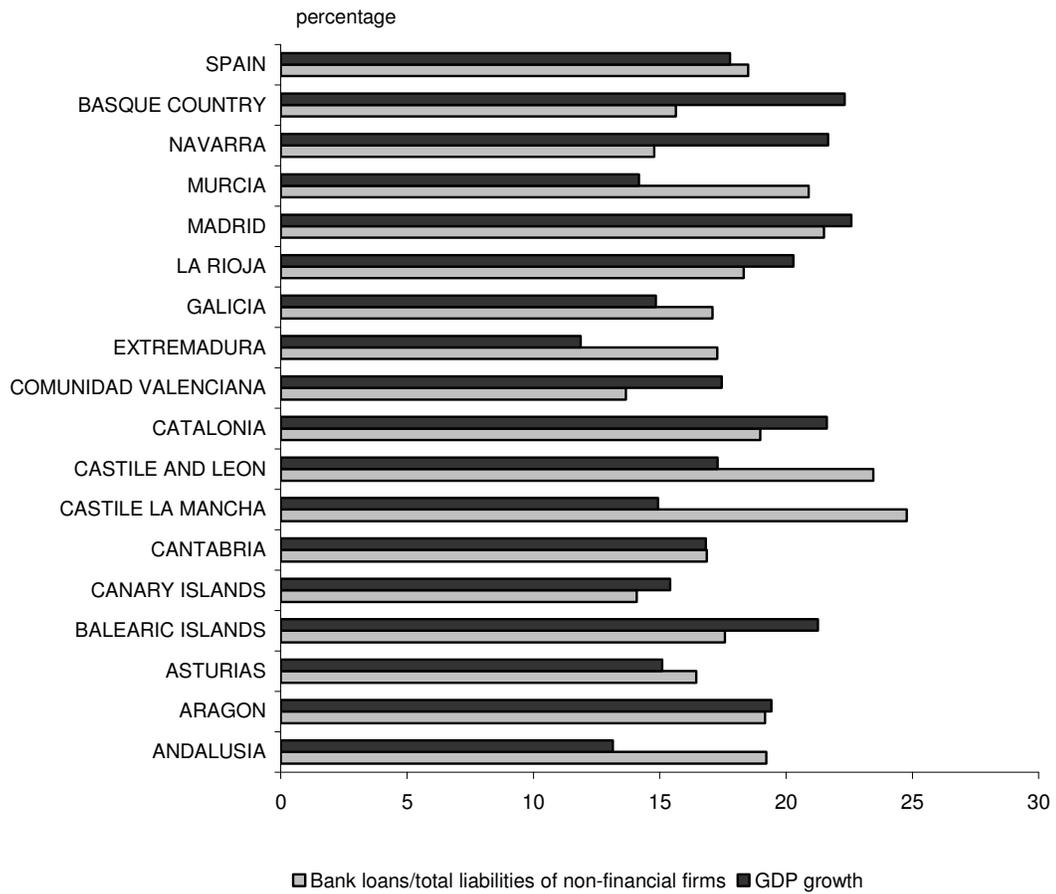
	(1) (SHORT-RUN COEFF.)	(1) (LONG-RUN COEFF.)	(2) (SHORT-RUN COEFF.)	(2) (LONG-RUN COEFF.)
<i>Initial GSG</i>	0.04584** (2.52)	0.02501** (2.28)	0.03358 (1.28)	0.02545* (1.85)
<i>Level of schooling</i>	1.44897*** (3.73)	0.53112** (2.30)	1.16166** (2.25)	0.88920** (2.17)
<i>Relative weight of the industrial sector in the economy</i>	0.98908*** (3.38)	0.84862*** (3.12)	1.12226*** (4.24)	0.76972** (2.10)
<i>Capital stock</i>	1.54157*** (3.70)	1.37669*** (3.90)	1.77591*** (4.44)	1.55136*** (6.36)
<i>Percentage of urban population</i>	-0.06401 (-0.21)	-0.05502 (-0.63)	-0.08226 (-0.32)	-0.05935 (-0.55)
<i>Ageing rate</i>	-0.55946** (-2.23)	-0.25864** (-2.20)	-0.29941 (-0.78)	-0.27398*** (-2.71)
<i>Inflation</i>	-2.90374*** (-5.95)	-1.27509*** (-2.69)	-2.14354*** (-3.78)	-2.12554*** (-3.73)
<i>Lending to private sector/GDP</i>	-0.20781* (-1.77)	-0.46303** (-2.13)	-0.37317* (-1.79)	-0.134255* (-1.78)
<i>Branches/intermediation business (x1000)</i>	0.48327 (0.75)	0.04235 (0.23)	0.23507 (0.37)	0.07769 (0.21)
<i>Number of bankruptcies and suspensions of payments</i>	-0.03826* (-1.85)	-0.02495 (-1.62)	0.01553 (0.07)	-0.15958** (2.46)
<i>HHI index in the deposits market</i>	0.15022 (1.39)	-0.05100 (0.82)	0.02677 (0.18)	-0.05320 (-0.13)
<i>Mutual fund business/GDP</i>	-	-	0.08348** (2.39)	1.57567*** (3.58)
<i>Loan commitments/total lending (including loan commitments)</i>	-	-	-0.65156 (-1.57)	0.93190*** (3.15)
<i>ATMs/branches</i>	-	-	0.08304 (1.55)	0.079092 (0.10)
<i>Number of cards issued</i>	-	-	0.22473* (1.78)	0.76272*** (3.58)
	Sargan Test (p-value)	0.107	0.182	0.195
	Overall equation significance – F-test (p-value)	0.015	0.013	0.014

\*, \*\*, \*\*\*: statistically significant at 10%, 5% and 1% level, respectively.

**TABLE 5. PREDICTED ECONOMIC IMPACT OF BANK INNOVATIONS ON REGIONAL GROWTH (GDP), GROSS FIXED CAPITAL FORMATION (GFCF) AND SAVINGS (GS) DURING THE PERIOD 1993-2001.**

<b>Percentage (average yearly economic impact)</b>			
	<i>Economic Impact on GDP</i>	<i>Economic Impact on GFCF</i>	<i>Economic Impact on GS</i>
<i>Banking system innovations</i>	0.176	0.291	0.109
<i>a) Business innovations</i>	0.159	0.241	0.096
<i>b) Technological innovations</i>	0.017	0.050	0.012
<i>Chow test for structural change (model without innovations )(p-value)</i>	0.01	0.01	0.01
<i>Chow test for structural change (model with innovations )(p-value)</i>	0.01	0.01	0.01

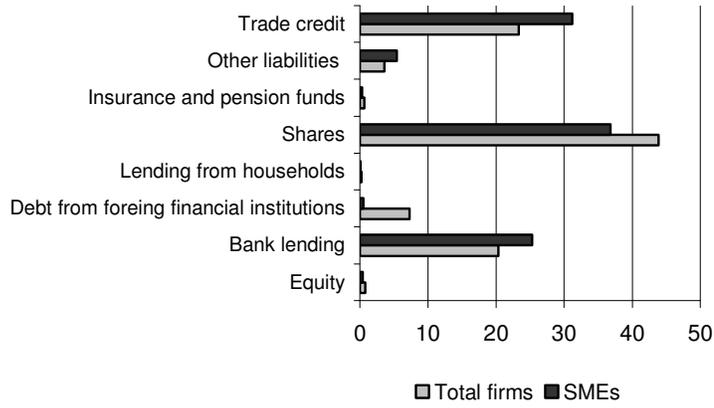
**Figure 1. Bank dependence and growth across Spanish regions (2001)**



Source: Spanish Savings Bank Foundation (Funcas)

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**Figure 2. Financial structure of Spanish non-financial firms (2001)**  
(percentage of total liabilities)



Source: Bank of Spain, Central Balance Sheet database.