LISBOA SCHOOL OF ECONOMICS & MANAGEMENT

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DISSERTATION

HOW DOES BANKING INDUSTRY INFLUENCE ECONOMIC GROWTH IN LATIN AMERICA?

KONSTANTIN PETROVICH TRETYAKOV

SUPERVISOR(S):
Maria Cândida Rodrigues Ferreira

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1. Introduction

Financial sector of many Latin American countries experienced significant reforms in the early 1990s. During that time a lot of national banks were privatized, capital markets were developed by the means of creating domestic securities and exchange commissions, improving regulatory and supervisory frameworks, and enhancing market operations, such as securities clearance, custody arrangements, accounting and information disclosure. Government control over banks was highly reduced. Barriers to the entry of foreign banks were eliminated. Financial liberalization index developed by Kaminsky and Schmuckler (2003) and updated by Galindo *et al.* (2006) demonstrates a huge increase in value for Latin American countries starting from year 1988. Hermes and Nhung (2010) find strong support for the positive impact of financial liberalization programs on bank efficiency in Latin America.

The elimination of the government control and intervention aims at restoring and strengthening the price mechanism, as well as conditions for market competition (Hermes and Lensik 2005). Competitive pressure stimulates banks to become more efficient by reducing overhead costs, enhancing the level of bank management, improving risk management, and offering new financial instruments and services (Denizer *et al.* 2000). Moreover, if domestic financial markets are opened up to foreign competition, this will further increase pressures to reduce costs, whereas at the same time, new banking and risk management techniques, and new financial instruments and services may be imported (Claessens *et al.* 2001).

Financial sector that is more efficient and productive fulfils its functions better. The primary function of the financial sector is to “facilitate the allocation of resources

across space and time in a certain environment" (Levine 1997, p.691). Financial development also decreases market frictions that result from imperfect information by connecting savers with investors and by allocating resources to profitable projects (Demirgüç-Kunt 2006). Therefore, the financial sector plays a crucial role in the economy because it provides relevant information, monitors investment projects, promotes risk diversification, increases the amount of transactions, and affects any entrepreneurial and trading activity (Levine 2005).

There are many studies on the relationship between financial development and economic growth. For example Levine (2005) concludes that financial development causes economic growth. And the channels through which financial development causes economic growth are productivity and capital accumulation (Beck *et al.* 2000). Furthermore the mechanisms through which savings are channelled to productive investments do exist. These mechanisms involve both financial intermediaries (mostly banking institutions, for indirect financing) and financial markets (for the direct financing) (Maudos and Fernandez de Guevara 2006).

In this paper we are testing the importance of banking sector efficiency and profitability as well as its market concentration to economic growth of Latin American countries via an approach similar to the one of Ferreira (2012). In order to test this relationship we will consider model specifications developed by Rajan and Zingales (1998) and later contributions by Claessens and Laeven (2004, 2005).

However, in contrast to these authors we will not consider the influence of the external financial dependence, but instead we will estimate the effects on

economic growth of bank efficiency, bank market concentration and bank profitability.

The test is going to embrace various components of GDP (Gross Domestic Product): final consumption expenditure, gross fixed capital formation, exports of goods and services and imports of goods and services.

The data sample is represented by a panel of 10 Latin American countries with observations ranging from year 1998 till year 2012. This time period follows the era of financial liberalization in many Latin American countries, and thus is likely to capture the evolution of the financial sector after the reforms.

According to our knowledge, our study is unique because this is the first time a researcher seeks to explain economic growth in the Latin American region with the variables that we consider: bank efficiency, bank market concentration and bank profitability.

Our findings point at insignificant influence of the bank cost efficiency and bank market concentration on economic growth of Latin American countries. This result is obtained for GDP and all of its components in the analysis. The reason for this may be the fact that the economies in Latin America are less dependent on the banking sector (when measured by the percentage of domestic credit provided by the financial sector to GDP). However bank profitability measured by return on assets and return on equity appears to be an important factor for explaining economic growth. The evidence of statistically significant positive effects has been found for GDP itself and for all of its components.

2. Brief literature review

With the release of King and Levine's paper in 1993 a large number of studies explaining countries' output variables with financial ratios such as liquid liabilities, bank loans to private sector as percentage of GDP, monetary aggregates and stock market capitalization were born. Cross-country empirical analyses support the supply-leading hypothesis by showing that the exogenous component of financial development has a positive effect on economic growth (Beck *et al.* 2000; Benhabib and Spiegel 2000; Khan and Senhadji 2003), productivity, and capital accumulation (King and Levine 1993; Beck *et al.* 2000; Nourzad 2002; Rioja and Valev 2004a). Analyses at the firm-industry level also support the argument that financial development is conducive to growth (Rajan and Zingales 1998; Beck 2002; Love 2003; Manning 2003; Kroszner *et al.* 2007). Moreover, Beck *et al.* (2004) conclude that financial development is not only pro-growth but also pro-poor, that is, in countries with better-developed financial intermediation, income inequality declines faster.

Some authors provide evidence that financial development has no significant effect on economic growth (Shan 2005). Others argue that the effect is dependent on certain conditions (Rioja and Valev 2004a,b) and that financial development may have a negative effect in some cases, depending on the time frame considered (Loayza and Ranciere, 2006).

Although there is an extensive amount of studies showing that financial development causes economic growth, others assert that financial development is just the consequence of economic growth. As stated by Shan *et al.* (2001), the relationship between financial development and economic growth may be a ‘‘chicken and the egg’’ problem, since financial institutions are usually developed

in developed countries (DCs) and underdeveloped in less developed countries (LDCs). The theoretical explanation behind this hypothesis is that there is a virtuous cycle in developed economies, where an expansion in the real sector increases the demand for loanable funds (Greenwood and Jovanovic 1990; Berthélemy and Varoudakis1996).

Some empirical analyses show bidirectional causality between financial development and economic growth (Berthélemy and Varoudakis 1996; Demetriades and Hussein 1996; Luintel and Khan 1999; Calderón and Liu 2003).

There is also empirical evidence that the effect of financial development on economic growth is different across regions (Al-Awad and Harb 2005; Iyare *et al.* 2005; Habibullah and Eng 2006; Naceur and Ghazouani 2007; Odhiambo 2007), income levels (Jung 1986; Ram 1999; Xu 2000; Andersen and Tarp 2003; Rioja and Valev 2004a; Aghion *et al.* 2005), levels of financial development (Rioja and Valev 2004b), and institutions (De Gregorio and Guidotti 1995; Shen and Lee 2006).

Several studies for the relationship between financial development and economic growth have been done for Latin American countries. De Gregorio and Guidotti (1995) in a panel data set for 12 Latin American countries between 1950 and 1985 find a significant negative correlation between financial intermediation and growth. They argue that this is due to incorrect policies in the field of regulation of the financial sector.

Blanco (2009) performs a Granger causality test taking a sample of 18 Latin American countries from 1962 to 2005. She finds a unilateral relationship between financial development and economic growth. The natural logarithm of private credit issued by banks as a share of GDP is the measure of financial development

used in this paper. However, if the sample is divided according to different income levels and institutional quality, then there is two-way causality between financial development and economic growth only for the middle income group and for countries with stronger rule of law and creditor rights. A later study (Blanco 2013) for a panel of 16 Latin American countries during the 1961-2010 period shows a statistically significant positive effect of financial development on economic growth in the long-run for high-income countries but a negative significant effect for low-income countries. In this paper financial development is measured by private credit to GDP ratio as well.

Hermes and Nhung (2010) investigate the relationship between financial liberalization and bank efficiency using a data sample for 10 emerging economies in the period from 1991 till 2000. Among the countries under consideration are Argentina, Brazil, Mexico and Peru. The authors find strong support for the positive impact of financial liberalization programs on bank efficiency.

Chortareas *et al.* (2010) provide evidence of consolidation of the financial systems in Latin America as a response to changes in the regulation. More concentrated banking sector was a result of this process of consolidation. They analyze a panel data sample for 9 Latin American countries in the period between 1997 and 2005 in order to explore the effect of market structure and bank efficiency on the banking performance, which is measured by Return on Assets ratio. The conclusion is that banks' profits do not seem to be explained by market power. But in contrast, efficiency seems to be the main driving force of increased profitability for most Latin American countries.

Studies revealing the importance of bank market concentration to economic growth were performed by Cetorelli and Gambera (2001) and Ferreira (2012),

among others. They reveal negative influence of bank market concentration not only on GDP, but also on its components.

If we look at the studies on the effects of bank market concentration in Latin America we shall point out that Yeyati and Micco (2003) come up with a conclusion that changes in the market structure after the reforms of 1990's did not give rise to a less competitive industry.

Chortareas *et al.* (2012) show that bank market concentration in Latin American countries has little or no influence on interest margins, which are often considered as a proxy for bank efficiency.

3. Methodology and data

3.1 Basic model

To test the influence of bank efficiency and market concentration on economic growth we employ generalized least squares regression (GLS) approach with random effects.

We consider model specifications introduced by Rajan and Zingales (1998) and later contributions by Claessens and Laeven (2004, 2005) to construct our model for the estimation. Similar to Ferreira (2012) we will test the influence of bank efficiency, bank market concentration and bank profitability on GDP growth and on its components: final consumption, investment, exports and imports.

The equation to estimate is the following:

$$Growth_{i,t} = \alpha_0 + \alpha_1 year\ dummies + \alpha_2 country\ dummies + \alpha_3 lag1\ growth_{i,t} + \alpha_4 bank\ efficiency_{i,t} + \alpha_5 bank\ market\ concentration_{i,t} + \alpha_6 bank\ profitability_{\ i,t} \quad (1)$$

Where:

Growth = natural logarithm of the GDP, or of one of its components: final consumption, gross fixed capital formation, exports or imports of goods and services;

i = Latin American country (i = 1, ... 10);

t = year (t = 1998, ..., 2012);

lag1 growth = first lag (t-1) of the growth endogenous variable;

bank efficiency = natural logarithm of the Data Envelopment Analysis (DEA) technical efficiency score;

bank market concentration = natural logarithm of the Herfindahl-Hirschman Index (HHI);

bank profitability = return on assets (ROA) or return on equity (ROE).

All financial and bank performance variables are sourced from the Bankscope database (annual data from consolidated accounts of commercial, investment and savings banks; all in nominal values and in United States dollars).

The macroeconomic data is sourced from World Bank, and includes: Gross Domestic Product (GDP), final consumption expenditure, gross fixed capital formation, exports of goods and services and imports of goods and services[1].

The sample of Latin American countries is represented by a panel of data with yearly observations for banks of Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Haiti, Peru and Venezuela for the time period

[1] GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used. The data for GDP components is given as percentage of GDP.

from 1998 till 2012. The choice of these particular countries is explained by the data availability in the Bankscope database considering our model specifications[2]. Table I brings together the distribution of GDP weights of Latin American countries for the period from year 1998 till year 2012. The 10 selected countries are listed in bold type and represent about 60% of Latin America economy according to the historical average.

Relative dynamics of countries' GDPs can be observed in Table I. Obviously for countries with large economies, such as Argentina, Brazil and Mexico, the changes in their GDP shares will be more sensible to the year-on-year changes in GDP numbers. For example the consequences of Argentinian default in December 2001 may be noticed by the slump from 12.4% of Latin American economy in 2001 to 5.25% in 2002. Since then Argentina amplifies its share in Latin American economy up to 8.28% in 2012. Brazil experienced a sharp decline in its GDP share from 38.06% in 1998 to 29.26% which is related to its currency devaluation. Since 2002, when Luis Inácio Lula da Silva won the presidential elections, Brazil's economy is growing fast from 25.94% in 2002 up to 43.14% in 2011 with moderate decline in 2012 down to 39.23%. Mexican GDP share grows rapidly from 22.91% in 1998 to 38.61% in 2002, since then Mexico loses its position down to 20.52% in 2012. It can be explained by the considerable expansion of the Brazilian economy.

[2] Including at least Mexico in the sample would have made a great contribution into the study since this country represents a large share of Latin American economy, but unfortunately the values for personnel expenses in Mexico are not reported in the Bankscope database.

Table I. Gross Domestic Products of Latin American countries. (in percentages to their sums).

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Argentina	**13.49**	**14.14**	**12.80**	**12.40**	**5.25**	**6.49**	**6.69**	**6.62**	**6.61**	**6.85**	**7.39**	**7.38**	**7.19**	**7.77**	**8.28**
Bolivia	**0.38**	**0.41**	**0.38**	**0.38**	**0.41**	**0.40**	**0.38**	**0.35**	**0.35**	**0.34**	**0.38**	**0.42**	**0.38**	**0.42**	**0.47**
Brazil	**38.06**	**29.26**	**29.03**	**25.54**	**25.94**	**27.67**	**29.00**	**31.87**	**33.64**	**35.92**	**37.44**	**38.95**	**41.77**	**43.14**	**39.23**
Chile	3.58	3.64	3.57	3.34	3.65	3.90	4.40	4.49	4.78	4.55	4.07	4.13	4.24	4.38	4.70
Colombia	**4.44**	**4.30**	**4.50**	**4.53**	**5.04**	**4.74**	**5.11**	**5.29**	**5.03**	**5.45**	**5.53**	**5.63**	**5.59**	**5.86**	**6.44**
Costa Rica	**0.64**	**0.79**	**0.72**	**0.76**	**0.87**	**0.88**	**0.81**	**0.72**	**0.70**	**0.69**	**0.68**	**0.71**	**0.71**	**0.71**	**0.79**
Cuba	1.16	1.41	1.38	1.46	1.73	1.80	1.67	1.54	1.63	1.54	1.38	1.49	1.25	1.19	1.26
Dominican republic	**0.96**	**1.08**	**1.08**	**1.15**	**1.37**	**1.07**	**0.97**	**1.23**	**1.11**	**1.09**	**1.04**	**1.12**	**1.01**	**0.97**	**1.03**
Ecuador	1.18	0.95	0.83	1.13	1.47	1.62	1.60	1.50	1.45	1.34	1.40	1.50	1.32	1.34	1.46
El Salvador	**0.54**	**0.62**	**0.59**	**0.64**	**0.74**	**0.75**	**0.69**	**0.62**	**0.57**	**0.53**	**0.49**	**0.50**	**0.42**	**0.40**	**0.42**
Guatemala	0.87	0.91	0.87	0.86	1.07	1.10	1.05	0.98	0.93	0.90	0.89	0.91	0.81	0.83	0.87
Haiti	**0.17**	**0.20**	**0.17**	**0.16**	**0.17**	**0.14**	**0.16**	**0.15**	**0.15**	**0.16**	**0.15**	**0.16**	**0.13**	**0.13**	**0.14**
Honduras	0.23	0.27	0.32	0.35	0.40	0.41	0.38	0.35	0.33	0.32	0.31	0.35	0.31	0.31	0.32
Mexico	22.91	29.25	31.17	33.84	38.61	36.17	33.85	31.44	29.85	27.42	24.89	21.52	20.41	20.20	20.52
Nicaragua	0.21	0.24	0.23	0.25	0.27	0.27	0.25	0.23	0.21	0.20	0.19	0.20	0.17	0.17	0.18
Panama	0.49	0.57	0.52	0.54	0.63	0.65	0.62	0.56	0.53	0.52	0.52	0.58	0.52	0.55	0.63
Paraguay	0.41	0.42	0.37	0.35	0.33	0.33	0.35	0.32	0.33	0.36	0.42	0.38	0.39	0.45	0.44
Peru	**2.56**	**2.57**	**2.40**	**2.49**	**2.92**	**3.07**	**3.05**	**2.87**	**2.86**	**2.82**	**2.93**	**3.13**	**3.07**	**3.15**	**3.55**
Puerto Rico	2.44	2.88	2.78	3.19	3.68	3.75	3.46	2.99	2.66	2.32	2.10	2.29	1.89	1.72	1.77
Uruguay	1.15	1.20	1.03	0.96	0.70	0.60	0.60	0.63	0.60	0.62	0.69	0.73	0.76	0.81	0.87
Venezuela	**4.12**	**4.88**	**5.28**	**5.67**	**4.78**	**4.19**	**4.91**	**5.26**	**5.67**	**6.05**	**7.15**	**7.92**	**7.68**	**5.51**	**6.64**
SUM ALL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
SAMPLE %	65.36	58.25	56.94	53.71	47.47	49.41	51.78	54.97	56.69	59.91	63.16	65.91	67.94	68.07	66.97
AVERAGE SAMPLE %	59.10														

Source: author's calculations based on data from World Bank

3.2 Bank efficiency

Techniques based on estimation of efficiency frontiers allow for solving such an optimization problem as finding the best bank to operate in the market. The frontiers are calculated from the given inputs and outputs of the production process. Each unit's efficiency is measured by the distance from the frontier.

Two types of methods are applied in most of empirical studies for measuring bank efficiency: parametric and non-parametric. Stochastic Frontier Analysis (SFA) is usually used for studies based on parametric method. Data Envelopment Analysis (DEA) is mostly adopted as non-parametric method of drawing an efficiency frontier. The DEA frontier is formed by the "best-practice observations" yielding a convex production possibility set. Since our focus lies on the cost side of banking operations, we employ an input-oriented, constant-returns-to-scale (CRS) model and the variable that is computed is technical efficiency (TE). Technical efficiency can be defined as deviation from the efficient cost frontier due to inefficient input utilization. In order to obtain the DEA input-orientated CRS efficiency scores the following optimisation problem is solved:

$$min_{\theta,\lambda}\theta \tag{2}$$

subject to:

$$-y_i + Y\lambda \geq 0 \tag{3}$$

$$\theta x_i - X\lambda \geq 0 \tag{4}$$

$$\lambda \geq 0 \tag{5}$$

Here θ is a scalar and λ is a vector of constants. y_i is the output vector for the DMU_i (Decision Making Unit) and Y is the matrix of outputs of the other DMUs. x_i is the vector of inputs of the DMU_i and X is the matrix of inputs of the other DMUs. In our case DMUs are represented by consolidated bank accounts on the national level. The number of DMUs ranges from i=1…n according to the number of countries in the sample. For more specifications on the DEA model see Coelli *et. al.* (2005) and Thanassoulis *et al.* (2008).

In this paper the following inputs are considered:

1. Price of borrowed funds = natural logarithm of the ratio Interest Expenses on Customer Deposits over Total Deposits.

2. Price of physical capital = natural logarithm of the ratio Non-Interest Expenses over Fixed Assets

3. Price of labor = natural logarithm of the ratio Personnel Expenses over Total Assets[3].

The outputs are:

1. Loans = natural logarithm of Total Loans.

2. Securities = natural logarithm of Total Securities.

3. Other earning assets = natural logarithm of the difference between Total Earning assets and Total Loans.

Efficiency scores for the sample of ten Latin American countries are presented in Table II. Throughout the time period considered bank efficiency mainly increased across the countries. The only countries where efficiency decreased are Costa Rica and Dominican Republic. Haitian and Bolivian banks appear to be the most

[3] Due to the absence of the Number of Employees variable for some countries, the ratio Personnel Expenses over Total Assets is used as a proxy for labour prices. This approach is also followed by Weill (2004) among others.

efficient across time in this dataset. However we should keep in mind that these countries are relatively small in terms of their economies, and therefore economies of scale should be taken into consideration when one is comparing these results to the other countries' efficiency scores.

It is remarkable that in Table II Brazil stays on the efficient frontier 11 times out of 15 despite the fact that its net interest rate margins[4] are the highest in Latin American region (Chortareas *et al.* 2012). So, we argue that Brazilian banks' high interest rate margins are not a very inefficient issue.

In the most recent years (2010-2012) Argentina and Brazil appear on the efficient frontier. It can be interpreted as an indicator of improving financial markets in Latin America generally, since its leading economies succeeded in establishing efficient banking sectors.

[4] Net Interest Rate Margin (NIM) = $\frac{Interest\ Income - Interest\ Expenses}{Total\ Earning\ Assets}$. NIM is a measure of interest rate spreads of commercial banks, and is widely used as a proxy for bank efficiency (e.g. Herrero *et al.* 2002).

Table II. Data Envelopment Analysis cost efficiency measures.

	2012	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**
Argentina	1.000	1.000	0.915	0.883	0.831	0.736	0.751	0.760	0.783	0.826	0.712	0.890	0.890	0.887	0.745
Bolivia	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.931	0.894
Brazil	1.000	1.000	1.000	0.988	0.761	0.909	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.736
Colombia	0.928	0.940	0.949	1.000	1.000	1.000	0.917	0.821	0.830	0.865	0.809	0.820	0.820	0.786	0.654
Costa Rica	0.841	0.854	0.845	0.843	0.850	0.790	0.836	0.944	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Dominican Republic	0.827	0.858	0.851	0.878	0.868	0.887	0.918	0.905	0.997	1.000	1.000	1.000	1.000	1.000	1.000
El Salvador	0.948	0.943	0.986	0.996	0.984	0.929	0.884	0.917	0.975	1.000	0.936	0.961	0.961	0.807	0.811
Haiti	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Peru	0.901	0.925	0.951	0.896	0.906	0.836	0.847	0.831	0.927	0.943	0.863	0.864	0.864	0.832	0.824
Venezuela	0.913	1.000	1.000	0.947	0.980	0.879	1.000	0.964	1.000	1.000	0.810	1.000	1.000	1.000	0.864

Source: author's calculations. Deap 2.1 software program was used to obtain the scores.

3.3 Bank market concentration

There are various ways to measure bank market concentration. In this study we opt to use Herfindahl-Hirschman Index (HHI). It is calculated as sum of squared market shares (MS) of firms competing in a market:

$$HHI = \sum_{i=1}^{N} MS_i^2 \quad (6)$$

Market shares are measured by the percent of total assets that a firm holds in the market. Concentration measures for Argentinian, Bolivian, Brazilian, Colombian, Costa Rican, Dominic Republican, El Salvadorian, Haitian, Peruvian and Venezuelan investment, savings and commercial banks markets are presented in Table III. In this table we can see a significant decrease in bank market concentration for some countries from the sample (Costa Rica, Colombia, Dominican Republic), and smaller decrease for the other countries. It is explained by the bank markets development whereas new banks start to operate and gain larger market shares. Argentinian bank market appears to be the least concentrated with lowest HHI values throughout the 1998-2012 period.

A market with an HHI value of less than 1,500 is considered to be unconcentrated; with an HHI between 1,500 and 2,500 to be moderately concentrated; and with an HHI value of 2,500 or greater - highly concentrated[5].

In our sample in 2012 seven countries out of ten have unconcentrated bank industries; Peru and Dominican Republic have moderately concentrated bank industries, and Haitian bank market is highly concentrated. In contrast, in 1998 eight countries out of ten have highly concentrated bank industries; Brazilian bank market is moderately concentrated at that time, and Argentinian – unconcentrated.

[5] Article 5.3 of *Horizontal Merger Guidelines* by the U.S. Department of Justice and Federal Trade Commission, August 19, 2010.

Table III. Herfindahl-Hirschman Index (*100%^2).

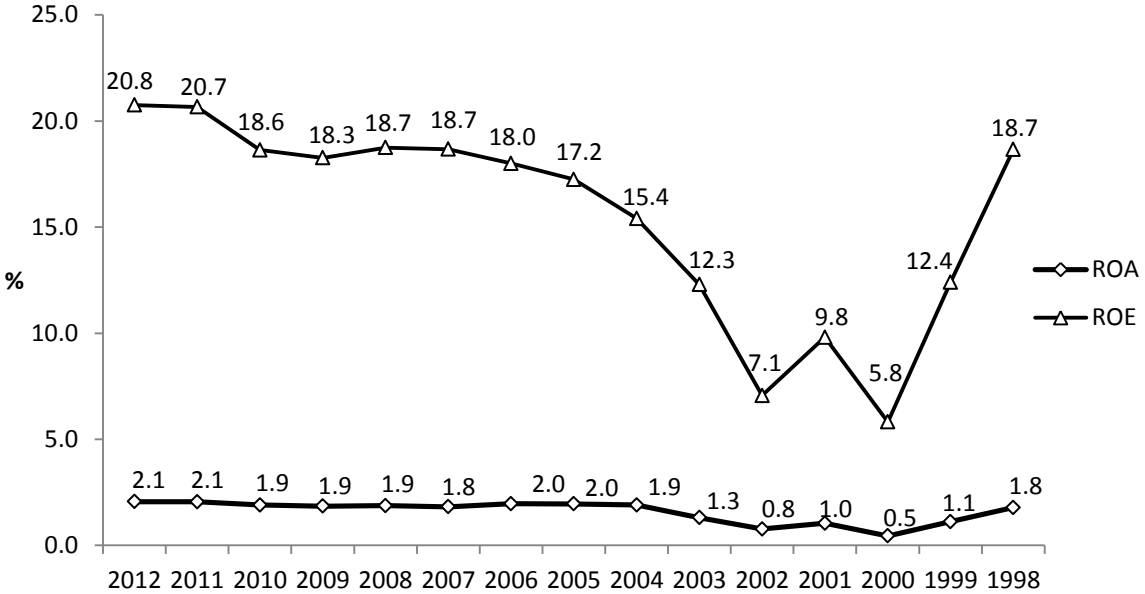
	1998-2012 change	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
Argentina	-383	963	1,050	821	793	815	848	1,004	884	782	796	925	924	1,143	1,315	1,346
Bolivia	-1,067	1,416	1,963	2,568	2,664	2,894	2,672	2,328	2,167	2,111	2,121	2,202	2,356	2,376	2,373	2,483
Brazil	-778	1,311	1,341	1,723	1,808	1,204	1,040	687	820	1,033	1,585	1,292	1,288	1,830	2,117	2,089
Colombia	-4,392	1,170	1,250	1,206	1,260	1,709	2,292	2,817	2,985	4,211	4,199	3,746	3,666	4,916	5,602	6,102
Costa Rica	-8,602	1,398	1,499	1,431	1,457	1,593	1,817	1,814	2,134	1,775	1,802	1,813	1,918	3,091	6,003	10,000
Dominican Republic	-3,527	1,863	2,677	2,602	2,968	4,500	4,554	4,643	4,924	2,941	2,292	2,439	2,733	5,071	5,360	5,390
El Salvador	-2,395	1,457	1,542	1,646	1,657	1,659	1,713	2,240	2,572	2,628	2,624	2,893	3,410	3,544	3,517	3,852
Haiti	-2,271	2,973	3,381	3,098	4,380	4,373	4,424	4,306	4,360	4,221	4,536	5,045	5,072	5,318	5,206	5,244
Peru	-1,770	2,123	2,349	2,224	2,249	2,360	2,336	2,432	2,224	2,439	2,538	2,390	2,529	3,232	3,317	3,893
Venezuela	-1,750	938	998	981	974	934	988	1,084	1,124	1,091	986	1,394	1,600	1,804	1,820	2,688

Source: author's calculations based on data from Bankscope.

3.4 Bank profitability

In this study we will also investigate the influence of the ratios Return on Assets (ROA) and Return on Equity (ROE) on the countries' GDPs and their components. Return on assets is the ratio of net income to total assets. It is an indicator of how profitable a company is relative to its total assets. ROA gives an idea of how efficient management is at using its assets to generate earnings. Return on equity is the amount of net income returned as a percentage of shareholders equity. ROE measures a corporation's profitability by revealing how much profit a company generates with the money that shareholders have invested. Tables IV and V present ROA and ROE ratios for Latin American banks. Figure 1 shows average values for the ratios.

Figure 1. Average values for ROA and ROE for banks in 10 Latin American countries (percentage).



Source: Bankscope

On the edge of the 20th century the world economic climate was shaky. Asian financial markets crisis, Russian and Argentinian sovereign debt defaults, Long Term Capital Management crash and the dot-com bubble burst in the USA

brought negative sentiment into the world economy. Looking at Figure 1 we can see that profitability of Latin American banks falls sharply at that juncture. Banks of Argentina, Bolivia and Colombia see their return on equity and return on assets ratios falling below zero then (Tables IV and V). Since 2002 the average ROA and ROE values for the bank industries in our sample grow steadily as the economies improve.

The world financial crisis of 2008 hit the most Brazilian banks which experienced a fall in their return on assets ratio from 2.61% in 2007 to 0.54% in 2008. The recovery was quick as already in 2009 ROA was 1.92%. Among the other countries from our sample, the crisis drove the banks' return on assets ratios of Costa Rica, Dominican Republic and El Salvador down by 66, 91 and 63 basis points respectively according to 2009 year-on-year change values. In general the crisis's impact was not very dramatic for the banks' profits, as we can see from the Figure 1 that the sag in the ROE line after year 2008 is relatively small.

When looking at the whole period of 1998-2012 we see that Venezuelan banks appear to be the most profitable. Their ROE geometric mean for annual returns is 26.34%. Argentinian banks are the least profitable with ROE geometric mean of 3.76%.

Table IV. Return on Assets (*100%).

	g.m.*	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
Argentina	0.47	2.50	2.55	2.72	2.14	1.40	1.14	1.42	0.65	-0.46	-3.50	-4.53	-0.04	0.15	0.61	0.64
Bolivia	0.71	1.45	1.64	1.64	1.85	1.87	1.70	1.31	0.44	-0.25	0.04	-0.33	-1.04	-1.44	0.59	1.27
Brazil	1.64	1.04	1.45	1.93	1.92	0.54	2.61	2.34	2.15	1.72	1.83	1.56	1.61	1.37	1.84	0.68
Colombia	0.87	1.90	2.15	2.14	2.31	2.27	0.90	1.87	3.48	2.65	2.33	0.73	-0.64	-5.38	-3.37	0.18
Costa Rica	1.63	1.49	1.28	1.21	1.07	1.73	1.66	2.31	2.39	1.95	2.31	1.64	2.51	1.23	1.09	0.63
Dominican Republic	2.77	2.11	1.86	2.47	1.75	2.66	2.06	1.98	2.27	4.70	1.76	3.05	2.68	3.14	4.77	4.37
El Salvador	1.34	1.91	2.20	1.27	0.55	1.18	1.32	1.81	1.21	1.05	0.83	0.91	1.10	1.14	1.14	2.56
Haiti	1.26	1.80	1.68	1.38	1.33	1.49	1.71	1.61	1.04	0.51	1.38	0.53	1.24	0.94	0.90	1.34
Peru	1.63	2.25	2.35	2.40	2.28	2.66	2.45	2.21	2.47	1.67	1.03	0.68	0.43	0.27	0.58	0.84
Venezuela	3.51	4.19	3.38	1.87	3.31	2.94	2.63	2.80	3.49	5.52	5.08	3.49	2.57	3.10	3.03	5.30

Source: Bankscope. *geometric mean for the 1998-2012 period.

Table V. Return on Equity (*100%).

	g.m.*	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
Argentina	3.76	24.8	24.6	24.9	19.3	12.8	10.2	12.8	6.2	-4.5	-29.6	-35.7	-0.4	1.6	7.3	7.4
Bolivia	7.69	17.9	19.6	19.6	21.0	21.0	18.2	12.9	4.2	-2.4	0.4	-3.3	-10.5	-15.0	6.5	15.5
Brazil	17.33	12.3	16.4	21.2	20.4	5.6	27.3	22.2	20.7	17.1	19.7	16.2	17.1	15.2	21.5	8.9
Colombia	7.37	14.9	17.0	17.3	20.2	22.3	19.6	17.4	30.6	23.7	20.8	6.3	-5.4	-42.0	-22.3	1.1
Costa Rica	13.82	10.4	9.0	8.8	8.1	13.6	13.5	19.0	20.2	15.5	17.5	13.8	20.7	15.2	14.0	9.4
Dominican Republic	23.81	20.6	18.9	25.8	18.0	26.4	18.5	17.0	19.7	39.8	13.5	21.7	19.4	26.7	37.7	36.9
El Salvador	12.96	12.6	14.9	9.1	4.2	9.5	11.1	16.2	12.1	11.1	9.3	10.6	12.9	13.7	15.0	34.7
Haiti	19.03	22.3	24.3	19.3	18.8	21.4	23.2	23.1	18.0	10.1	25.1	8.9	20.3	16.0	14.2	21.9
Peru	17.02	22.8	23.3	23.6	24.4	31.5	26.6	23.2	25.0	16.1	11.2	7.5	4.8	3.1	7.0	10.3
Venezuela	26.34	48.9	38.8	16.9	28.2	23.3	18.5	16.1	15.7	27.6	35.1	24.7	19.2	23.7	23.2	40.4

Source: Bankscope. *geometric mean for the 1998-2012 period.

4. Empirical Results

The purpose of our estimations is to investigate how bank efficiency, bank market concentration and bank profitability affect economic growth in Latin America. We have got a panel dataset for 10 Latin American countries for the time period from year 1998 till year 2012. Bank efficiency is estimated via data envelopment analysis technique; bank market concentration is measured by Herfindahl-Hirschman Index; ROA and ROE ratios are included in the dataset as measures of bank profitability. Dependent variables to represent economic growth are GDP, gross fixed capital formation, household final consumption expenditure, and imports and exports of goods and services.

We perform Levin-Lin-Chu panel unit root test for our panel data. The test assumes that each individual unit in the panel shares the same first order autoregressive (AR(1)) coefficient, but allows for individual effects, time effects and a time trend. The null hypothesis proposes the existence of non-stationarity. The test results are presented in Table V. The null hypothesis is rejected for all the tested variables.

Table V. Levin-Lin-Chu panel unit root test.

Variables	coefficient	t-star	P > t
First difference of the natural logarithm of the GDP	-1.1096	-11.3930	0.0000
First difference of the natural logarithm of the household final consumption expenditure	-1.0285	-9.8463	0.0000
First difference of the natural logarithm of the gross fixed capital formation	-1.0307	-10.7212	0.0000
First difference of the natural logarithm of the exports	-1.0980	-9.3566	0.0000
First difference of the natural logarithm of the imports	-0.9685	-7.9337	0.0000
Natural logarithm of DEA bank cost efficiency	-0.3105	-3.6661	0.0001
Natural logarithm of DEA bank market concentration measure (HHI)	-0.4587	-4.8435	0.0000
Return on assets ratio (ROA)	-0.4489	-3.4503	0.0003
Return on equity ratio (ROE)	-0.4122	-3.1867	0.0007

Source: author's calculations in Stata 11 software program.

There are two common assumptions made about the individual specific effects in a panel dataset: the random effects assumption and the fixed effects assumption. The random effects assumption (made in a random effects model) implies that the individual specific effects are uncorrelated with the independent variables. The fixed effect assumption implies that the individual specific effects are correlated with the independent variables. Hausman test is used to differentiate between fixed effects model and random effects model in panel data. In this test random effects model is preferred under the null hypothesis due to higher efficiency, while under the alternative fixed effects model is at least consistent and thus preferred. Hausman test applied to all the dependent variables in our dataset favours the random effects model as the test's null hypothesis is not rejected.

The Breusch and Pagan Lagrangian multiplier (LM) test helps us to decide between a random effects regression and a simple ordinary least squares (OLS) regression. The null hypothesis in the LM test states that variances across units are zero. That is, no significant difference across countries does exist (i.e. no panel effect). The null hypothesis of the LM test is rejected for our dataset, and it justifies the selection of random effects model.

Fortunately, this method allows us to carry out research for dataset with relatively few observations[6]. Totally we estimate 10 regressions in this paper. The results can be found in Appendix A (Tables from A1 to A5). There are 5 dependent variables that were tested: gross domestic product, gross fixed capital formation, household final consumption expenditure, exports and imports of goods and services. For each dependent variable there are 2 regressions that have a common set of independent variables (lag1 of the independent variable, DEA bank

[6] For example we have 150 observations for each of the response variables by bringing together values for 10 countries during the 15 years period.

cost efficiency, HHI), and they differ by the presence of either ROA or ROE in the dependent variables list.

Relatively high values of squared residuals allow us to accept the validity of the estimation results. Tables from VI to X list the effects of the explanatory variables and their statistical significance.

Table VI. Summary of the estimation results for Gross Domestic Product.

Regression 1		**Regression 2**	
Explanatory Variables	**Effect**	**Explanatory Variables**	**Effect**
Lag1 GDP	+ ***	Lag1 GDP	+ ***
Bank cost efficiency	-	Bank cost efficiency	-
Bank market concentration measure (HHI)	-	Bank market concentration measure (HHI)	-
Return on Assets ratio (ROA)	+ *	Return on Equity ratio (ROE)	+ ***
Constant	+	Constant	+

*+Positive effect; - Negative effect. * Statistically significant at 10%; ** statistically significant at 5%; *** statistically significant at 1%.*

Source: Estimation results of equation (1) reported in Table A1 of Appendix A.

Table VII. Summary of the estimation results for Gross Fixed Capital Formation.

Regression 3		**Regression 4**	
Explanatory Variables	**Effect**	**Explanatory Variables**	**Effect**
Lag1 Gross fixed capital formation	+ ***	Lag1 Gross fixed capital formation	+ ***
Bank cost efficiency	-	Bank cost efficiency	-
Bank market concentration measure (HHI)	-	Bank market concentration measure (HHI)	-
Return on Assets ratio (ROA)	+ ***	Return on Equity ratio (ROE)	+ ***
Constant	+	Constant	+

*+Positive effect; - Negative effect. * Statistically significant at 10%; ** statistically significant at 5%; *** statistically significant at 1%.*

Source: Estimation results of equation (1) reported in Table A2 of Appendix A.

Table VIII. Summary of the estimation results for Household Final Consumption Expenditure.

Regression 5		Regression 6	
Explanatory Variables	**Effect**	**Explanatory Variables**	**Effect**
Lag 1 Household Final Consumption	+ ***	Lag 1 Household Final Consumption	+ ***
Bank cost efficiency	-	Bank cost efficiency	-
Bank market concentration measure (HHI)	- *	Bank market concentration measure (HHI)	-
Return on Assets ratio (ROA)	+	Return on Equity ratio (ROE)	+ ***
Constant	+	Constant	+

*+Positive effect; - Negative effect. * Statistically significant at 10%; ** statistically significant at 5%; *** statistically significant at 1%.*

Source: Estimation results of equation (1) reported in Table A3 of Appendix A.

Table IX. Summary of the estimation results for Exports of Goods and Services.

Regression 7		Regression 8	
Explanatory Variables	**Effect**	**Explanatory Variables**	**Effect**
Lag1 Exports	+ ***	Lag1 Exports	+ ***
Bank cost efficiency	-	Bank cost efficiency	-
Bank market concentration measure (HHI)	-	Bank market concentration measure (HHI)	-
Return on Assets ratio (ROA)	+ ***	Return on Equity ratio (ROE)	+ ***
Constant	+	Constant	+

*+Positive effect; - Negative effect. * Statistically significant at 10%; ** statistically significant at 5%; *** statistically significant at 1%.*

Source: Estimation results of equation (1) reported in Table A4 of Appendix A.

Table X. Summary of the estimation results for Imports of Goods and Services.

Regression 9		Regression 10	
Explanatory Variables	**Effect**	**Explanatory Variables**	**Effect**
Lag1 Imports	+ ***	Lag1 Imports	+ ***
Bank cost efficiency	-	Bank cost efficiency	-
Bank market concentration measure (HHI)	-	Bank market concentration measure (HHI)	-
Return on Assets ratio (ROA)	+ ***	Return on Equity ratio (ROE)	+ **
Constant	+	Constant	+

*+Positive effect; - Negative effect. * Statistically significant at 10%; ** statistically significant at 5%; *** statistically significant at 1%.*

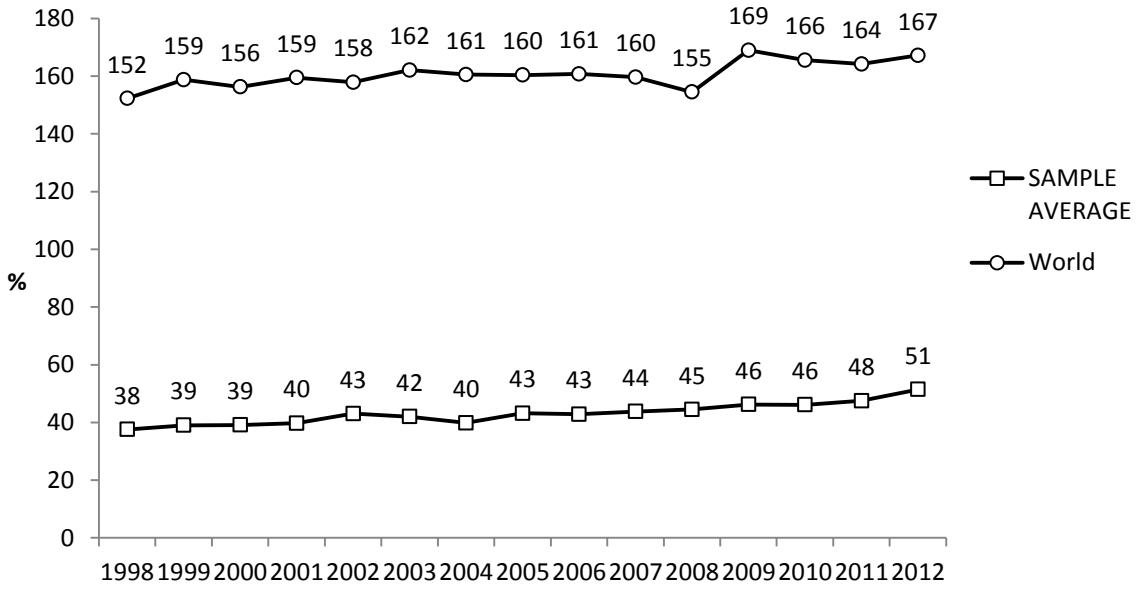
Source: Estimation results of equation (1) reported in Table A5 of Appendix A.

When comparing the estimated models we see that the effects of the explanatory variables across the regressions are equal in terms of their sign and slightly different in terms of their statistical significance.

In all the cases the first lags of the response variables positively contribute to their variation.

Bank cost efficiency appears to be statistically insignificant in all the regressions. One of the reasons for this can be relatively small contribution of the financial sector of these countries to economic growth. In Figure 2 we can see that the economies in the Latin American countries are not very 'credit-driven' when compared to the world economy. The average value for domestic credit provided by financial sector as a percentage of GDP for the 10 Latin American countries which we look at in this paper is 43% throughout the 1998-2012 period. In contrast the same value for the world economy is 161%.

Figure 2. Domestic credit provided by financial sector as a percentage of GDP.



Source: World Bank.

Bank market concentration mainly is also not statistically significant in our tests. There is a hypothesis that in a less concentrated market competition compels banks to be more efficient and as a consequence to contribute more to economic growth. However the study by Chortareas *et al.* (2012) shows that market concentration has no influence on bank efficiency in Latin American countries. Hence we consider that this argument explains the absence of statistically significant evidence of correlation between bank market concentration and economic growth.

ROE and ROA ratios positively influence all the dependent variables and are statistically significant in almost all the cases. This evidence tells us that bank profitability goes in line with economic growth.

We also apply the same model for a sample that excludes Brazil. Brazil is the largest economy among Latin American countries. Its share in the economy of Latin American region averages around 30%, and around 60% in our sample of 10 selected countries. We come up with the same results as described above: no statistically significant effect of bank efficiency and bank market concentration on GDP and its components. Bank profitability ratios still have statistically significant positive effects on economic growth of the countries.

5. Summary and Conclusions

In contrast to the academic studies which investigate relationship between indicators of financial development such as credit to GDP ratios, monetary aggregates, stock exchange market capitalization *et cetera*, and economic growth, our paper examines the effects of bank efficiency, bank market concentration and bank profitability on GDP and its components. We focus on the economic

performance of 10 Latin American countries between year 1998 and year 2012, that is to say, time that follows the financial liberalization period of early 1990s and covers 2 recession periods for the world economy.

Bank cost efficiency is estimated by Data Envelopment Analysis and bank market concentration is measured by Herfindahl-Hirschman Index. These variables along with the return on assets and return on equity ratios are used to perform panel data regression analysis where Gross Domestic Product and its components are dependent variables.

The dataset is represented by a panel that covers consolidated accounts of commercial, savings and investment banks of 10 Latin American countries: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Haiti, Peru and Venezuela.

Our results show that in the framework of our model the influence of bank efficiency and bank market concentration on economic growth is not significant. The same results are obtained when Brazil is excluded out of the sample. However the bank performance variables represented by ROA and ROE ratios confirm that bank returns are in line with changes in economic growth both for whole sample regressions and for the ‘without Brazil’ sample regressions.

Further research on this topic can involve other techniques for measuring bank cost efficiency and bank market concentration in order to use them as variables to explain economic growth in Latin American countries. Analysis that considers the countries on the individual level or on the industry level can be executed as well.

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Appendix A. Estimation results.

Table A1. Regressions for Gross Domestic Product.

Regression 1					Regression 2				
logGDP	**coef**	**std err**	**Z**	**P>|z|**	**logGDP**	**Coef**	**Std Err**	**Z**	**P>|z|**
lag1logGDP	0.994	0.010	96.91	0.000	lag1logGDP	0.992411	0.010457	94.9	0.000
logTE	-0.015	0.029	-0.51	0.610	logTE	-0.03052	0.029799	-1.02	0.306
logHHI	-0.068	0.153	-0.44	0.658	logHHI	-0.07484	0.156736	-0.48	0.633
ROA	0.033	0.009	3.67	0.000	ROE	0.00367	0.001081	3.4	0.001
constant	0.268	0.431	0.62	0.535	constant	0.432016	0.437599	0.99	0.324
R-squared	0.9924				R-squared	0.9923			
Number of observations	140				Number of observations	140			

Table A2. Regressions for Gross Fixed Capital Formation.

Regression 3					Regression 4				
logGFCF	**Coef**	**Std Err**	**Z**	**P>|z|**	**logGFCF**	**Coef**	**Std Err**	**Z**	**P>|z|**
lag1logGFCF	0.9924	0.0105	94.90	0.000	lag1logGFCF	0.9859	0.0147	66.91	0.000
logTE	-0.0305	0.0298	-1.02	0.306	logTE	-0.0289	0.0420	-0.69	0.490
logHHI	-0.0748	0.1567	-0.48	0.633	logHHI	-0.3314	0.2221	-1.49	0.136
ROA	0.0037	0.0011	3.40	0.001	ROE	0.0479	0.0130	3.69	0.000
constant	0.4320	0.4376	0.99	0.324	constant	0.5165	0.5906	0.87	0.382
R-squared	0.9841				R-squared	0.9842			
Number of observations	140				Number of observations	140			

Table A3. Regressions for Household Final Consumption Expenditure.

Regression 5					Regression 6				
logHFCE	**Coef**	**Std Err**	**Z**	**P>|z|**	**logHFCE**	**Coef**	**Std Err**	**Z**	**P>|z|**
lag1logHFCE	0.9810	0.0150	65.50	0.000	lag1logHFCE	0.9926	0.0115	86.48	0.000
logTE	-0.0545	0.0423	-1.29	0.197	logTE	-0.0102	0.0306	-0.33	0.739
logHHI	-0.3752	0.2253	-1.67	0.096	logHHI	-0.0736	0.1632	-0.45	0.652
ROA	0.0060	0.0016	3.79	0.000	ROE	0.0344	0.0095	3.64	0.000
constant	0.8067	0.5978	1.35	0.177	constant	0.2694	0.4599	0.59	0.558
R-squared	0.9900				R-squared	0.9900			
Number of observations	140				Number of observations	140			

Table A4. Regressions for Exports of Goods and Services.

Regression 7					Regression 8				
logEXP	**Coef**	**Std Err**	**Z**	**P>|z|**	**logEXP**	**Coef**	**Std Err**	**Z**	**P>|z|**
lag1logEXP	0.9894	0.0116	85.01	0.000	lag1logEXP	0.9715	0.0164	59.27	0.000
logTE	-0.0275	0.0308	-0.89	0.371	logTE	-0.0466	0.0431	-1.08	0.280
logHHI	-0.0950	0.1660	-0.57	0.567	logHHI	-0.2767	0.2168	-1.28	0.202
ROA	0.0041	0.0011	3.59	0.000	ROE	0.0364	0.0123	2.97	0.003
constant	0.4681	0.4641	1.01	0.313	constant	0.9919	0.6482	1.53	0.126
R-squared	0.9841				R-squared	0.9836			
Number of observations	140				Number of observations	140			

Table A5. Regressions for Imports of Goods and Services.

Regression 9					Regression 10				
logIMP	**Coef**	**Std Err**	**Z**	**P>|z|**	**logIMP**	**Coef**	**Std Err**	**Z**	**P>|z|**
lag1logIMP	0.9742	0.0167	58.44	0.000	lag1logIMP	0.9822	0.0142	68.96	0.000
logTE	-0.0552	0.0441	-1.25	0.211	logTE	-0.0321	0.0371	-0.87	0.386
logHHI	-0.2154	0.2223	-0.97	0.333	logHHI	-0.1369	0.1913	-0.72	0.474
ROA	0.0031	0.0015	2.08	0.038	ROE	0.0333	0.0110	3.04	0.002
constant	1.0091	0.6624	1.52	0.128	constant	0.6582	0.5562	1.18	0.237
R-squared	0.9871				R-squared	0.9867			
Number of observations	140				Number of observations	140			