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ECONOMIC GROWTH - THE ROLE OF
HETEROGENEITY**

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*DEVELOPMENT ECONOMICS and
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PUBLIC OWNERSHIP OF BANKS AND ECONOMIC GROWTH - THE ROLE OF HETEROGENEITY

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ABSTRACT

Public Ownership of Banks and Economic Growth - The Role of Heterogeneity*

In an influential paper, La Porta, Lopez-De-Silanes and Shleifer (2002) argued that public ownership of banks is associated with lower GDP growth. We show that this relationship does not hold for all countries, but depends on a country's financial development and political institutions. Public ownership is harmful only if a country has low financial development and low institutional quality. The negative impact of public ownership on growth fades quickly as the financial and political system develops. In highly developed countries, we find no or even positive effects. Policy conclusions for individual countries are likely to be misleading if such heterogeneity is ignored.

JEL Classification: G18, G21 and O16

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1 Introduction

In an influential study, La Porta et al. (2002) documented a strong and negative relationship between public ownership of banks in 1970 and subsequent growth of real per capita GDP. According to their results, an increase in public ownership of banks by 10 percentage points reduces the annual growth rate of per capita GDP by 0.14–0.24 percentage points (see their Table V). The study by La Porta et al. (2002) shaped the way public banks are perceived by policymakers all over the world. For example, the World Bank writes in a policy research report, referring to the paper by La Porta et al. (2002), that “new research shows that, whatever its original objectives, public ownership tends to stunt financial sector development, thereby contributing to slower growth” (Caprio and Honohan, 2001).¹ In fact, the privatization of public banks has become a standard recommendation by the International Monetary Fund, both for developing and developed countries.²

However, a closer look at the paper by La Porta et al. (2002) reveals that the results are not as clear-cut as suggested by the authors and by policymakers. In a robustness check, the authors run separate regressions for different country groups, splitting their sample according to several country characteristics (initial income, financial development, and property rights protection, see their Table VIII). These regressions show an even stronger negative effect in countries with low initial income, financial development, or property rights protection, but a much smaller (and often insignificant) effect in the remaining countries. This indicates that the effect of public ownership may not be homogeneous across countries. Nevertheless, the authors’ conclusions do not contain any such qualification, stating that “negative associations [between public ownership and growth] are not weaker in the less developed countries” and “ultimately, [...] government ownership of banks is associated with slower financial and economic development, *including* in poor countries” (La Porta et al., 2002, p. 290, emphasis added).

¹There are many other examples of World Bank and IMF publications designed for policy makers and the public that refer to La Porta et al. (2002) and point out the deleterious consequences of state-owned banks for economic growth. In a blog on the World Bank website (“Crisis Talk”), a World Bank economist recently cautioned against nationalizations of private banks in the face of the financial crisis.

²One notable example is Germany where the IMF has been postulating the privatization of public banks for a long time (see International Monetary Fund, 2003, 2006). Similarly, in the December 2003 issue of the IMF magazine *Finance & Development* (“Bridging the ‘Great Divide’ ”), IMF economists recommended further privatization of state-owned banks in former Soviet countries.

In this paper, we argue that the theory underlying the nexus between public ownership in the banking system and economic growth already suggests heterogeneous effects. In particular, the prevalence and severity of agency conflicts may depend on variables such as financial development or the quality of political institutions. Therefore, an estimation ignoring the heterogeneity of countries is likely to be misspecified. Our goal is to check empirically whether and to what extent such country characteristics affect the impact of public ownership on economic growth.

Our empirical analysis shows that the impact of public ownership in the banking system on real per capita GDP growth depends strongly on a country's degree of financial development. When a country's financial system is hardly developed, there is a noticeable negative effect of public ownership of banks on economic growth. The effect is somewhat smaller than that presented by La Porta et al. (2002): an increase in public ownership of banks by 10 percentage points reduces the annual growth rate of per capita GDP by 0.12 percentage points. However, this negative impact fades as a country's financial system develops. In countries with well-developed financial systems, the effect of public ownership on growth may even be positive. Moreover, the impact of public ownership on growth depends on the quality of a country's political institutions and governance structures. In countries where political decision makers are relatively free to pursue their private objectives, we find a strong negative effect of public ownership on growth, as long as the country's financial development is not too high. Hence, financial development and political institutions appear to be substitutes regarding their mitigating effects on the impact of public ownership of banks on economic growth. In countries where the actions of potentially self-interested politicians are restricted by well-functioning control mechanisms, the degree of public ownership in the banking system does not seem to influence the growth rate of per capita GDP at all. Therefore, the empirical results suggest that public ownership in the banking system is not harmful for economic growth in all circumstances; the effect rather appears to depend on the country's financial and political environment.

Our paper has particular relevance in light of the recent nationalizations of banks in developed countries in reaction to the current financial crisis. There can be no doubt that banks should be re-privatized in due course. Our results suggest, however, that there is no necessity to rush to privatization for fear of missing out on growth, as long as the country in question exhibits high levels of financial development and institutional quality.

The paper also makes a more general point about the interpretation of cross-country

growth regressions in a policy context. In the presence of a large and significant association between some policy variable and economic growth, it is tempting to derive policy conclusions regarding growth-enhancing strategies for a particular country. Our paper shows that such conclusions may not be valid when taking country heterogeneity into account: even if the results by La Porta et al. (2002) reveal a large negative “average effect” of public ownership of banks on economic growth around the world, the heterogeneity of this effect is so large that the average is misleading in most instances and is therefore of no use for policy makers.

The paper proceeds as follows. In Section 2, we review the debate about public banks and discuss the conditions under which public ownership of banks can be expected to have an impact on long-run GDP growth. Section 3 gives a brief overview of the related empirical literature. In Section 4, we introduce our empirical model and the data. Section 5 presents the regression results and Section 6 concludes.

2 Why the Effect of Public Ownership of Banks on Economic Growth Should Be Heterogenous

There exist diverging views on public ownership in the banking system. According to the *development view* and the *social view*, public banks are beneficial and foster economic development. According to the *agency view* and the *political view*, public banks are harmful and lower social welfare. As we will see, none of these views implies that public banks are useful or harmful in all circumstances, but their effect depends on a country’s financial development and on the quality of its political institutions.

According to the *development view* formulated by Gerschenkron (1962), state-owned banks may foster economic development by substituting for private financing in an environment with weak economic and financial institutions. In line with this view, public banks were often founded to provide safe investment opportunities for the poor; thereby, they contributed to the accumulation of capital.³ Note that, according to this view, public banks replace private institutions only as long as a country is at a low stage of financial development. Hence, the development view predicts a positive effect of public banks in

³See Guinnane (2002) on the historical evolution of savings banks in Germany.

underdeveloped countries, whereas it is silent about the effect of public banks in developed countries.

According to the *social view*, public banks follow social objectives. For example, they may finance projects that generate positive externalities and that would not be financed privately, such as infrastructure projects or higher education (Hainz and Hakenes, 2007). Moreover, they may provide financial services and funds to people and in regions that are not served by private banks (Hakenes and Schnabel, 2010).⁴ Again these arguments refer especially to countries with a poor infrastructure, low levels of education, and hardly developed financial systems with a scarcity of capital. Therefore, the positive effect of public banks on economic growth should again be strongest in underdeveloped countries.

On the negative side, public banks may suffer from two principal-agent problems: first, between the politician and the bank manager, and second, between society (the taxpayer) and the politician.

Proponents of the *agency view* emphasize the conflict of interest in state-owned enterprises between the owner, i. e. the state represented by politicians, and managers (Banerjee, 1997; Hart, Shleifer and Vishny, 1997). Soft budget constraints may weaken the incentives of managers of public banks. According to Megginson (2005, p. 40), this frequently is a source of operational inefficiency in state-owned enterprises. This problem is most severe if the state bank's objective is to finance socially desirable projects. In such circumstances, it is very difficult to measure the bank manager's performance, implying that the manager of a public bank cannot easily be held accountable. Hence, even though private banks are subject to the same type of agency problem between bank managers and owners, the interests of private bank managers can be better aligned with those of the owners by contracting explicitly on measurable performance outcomes. Thus, due to differing governance structures, public banks potentially operate worse than their private counterparts, contributing less to economic growth.⁵

However, the differences between public and private banks should be less pronounced in well-developed financial systems because public banks benefit from high standards in the financial sector. Even if incentives are distorted, the manager of a public bank is

⁴Note, however, that the welfare effects of public banks are ambiguous in this context.

⁵Andrianova, Demetriades and Shortland (2009) argue, on the contrary, that there has been a particular failure of corporate governance in *private* banks, which may explain why public banks promote economic growth more than private banks.

more likely to adopt new risk management techniques if they are ready-made available at relatively low implementation costs. Likewise, in mature financial systems, public banks benefit from knowledge inflows through well-trained job-market candidates and experienced employees from private competitors. Moreover, well-developed financial systems are typically marked by better regulation and prudential supervision, which tend to eliminate quality differentials between state-owned and private banks, in particular with regard to risk management techniques. Finally, competition may be stronger in highly developed financial systems, forcing public banks to provide a higher intermediation quality. These arguments suggest that the negative effect of public ownership on economic growth may be expected to be less pronounced in highly developed financial systems.⁶

The *political view* stresses the conflict of interest between society (the taxpayer) and politicians in state-owned enterprises (see, e. g., Shleifer and Vishny, 1994; Shleifer, 1998). According to this view, self-interested politicians tend to use their influence on state-owned banks to finance projects that yield the highest returns in terms of electoral voting shares, political support, or even bribes. The problem of limited accountability applies here as well and may reinforce the abuse of public banks by politicians. Again, a highly financially developed system is helpful in limiting the distortions. Even more importantly, the scope of politicians to misuse their power clearly depends on the quality of political institutions. In an environment of high-quality political institutions where the politicians' actions are controlled by the public and their exercise of power is constrained to their political mandate, the politicians are not able to abuse state banks for their personal interest. Thus, the relationship between economic growth and public ownership in banking should also depend on the quality of a country's political institutions.

To sum up, the effect of public ownership of banks on economic growth cannot be expected to be uniform across countries. It should rather depend on country characteristics, such as the level of financial development and the quality of political institutions.

⁶Andrianova et al. (2009) turn the argument on its head: distortions at private banks may be largest in a financially highly developed country (with "high-tech banking"), yielding a larger advantage of state-owned banks in such circumstances. According to this view, we would expect a positive effect of public ownership in highly developed financial systems.

3 Related Literature

Our paper is closely related to the literature on the linkages between the structure of financial systems and economic growth. La Porta et al. (2002) were the first to systematically analyze the role of public ownership in the banking sector. They document the pervasiveness of public ownership in banking around the world, especially in underdeveloped countries, and show that public ownership had strong negative effects on subsequent financial development and economic growth. They interpret their findings as evidence for the political theories of state ownership (corresponding to the political view outlined above).

The paper by La Porta et al. (2002) also gives some first indications that the growth effect of public banks is not the same in all circumstances even though the authors do not pay much attention to this point. Their results are most striking when the sample is split according to the level of financial development. In the below-median sample, the marginal effect of public ownership is twice as large as in the pooled sample (-0.034 vs. -0.017), and it is significant at the 1% level. In contrast, in the above-median sample, the coefficient is close to zero and insignificant (see Table VIII, La Porta et al., 2002, p. 291). We argue in this paper that such heterogeneity is important, and that it is key if one wants to draw any policy implications.

In a recent working paper, Andrianova et al. (2009) argue that the study by La Porta et al. suffers from omitted variable bias; in their view, public ownership of banks captures more fundamental determinants of economic growth, such as institutional quality and the quality of governance. In fact, public ownership turns insignificant when they add indicators of institutional quality to the regression models specified by La Porta et al. (2002).⁷ For recent years, they even find positive effects of public ownership on economic growth. Hence, according to Andrianova et al. (2009), public ownership of banks is not harmful at all or even beneficial. We argue that both the negative view by La Porta et al. and the benign view by Andrianova et al. are too stark due to the assumed homogeneity of the effect of public ownership on economic growth.

Beck and Levine (2002) extend the analysis by La Porta et al. (2002), applying the methodology by Rajan and Zingales (1998) based on industry-level data. This type of

⁷It should be noted, however, that their results may suffer from an endogeneity problem as the institutional variables are measured as an average of recent years towards the end of their sample period.

analysis has the advantage that it deals more properly with the endogeneity problem that plagues cross-country regressions. Beck and Levine (2002) do not find any evidence that public ownership in the banking sector affects industry growth, neither positively, nor negatively. Even though this paper allows for heterogeneity across industries, it still assumes homogenous effects across countries.

In addition to these papers, there are a number of studies providing indirect evidence on the relationship between public ownership of banks and economic growth. Detragiache, Gupta and Tressel (2005) examine the determinants of financial-sector performance in lower income countries in a cross-country study. Given that financial sector performance has been found to be robustly linked to GDP growth in earlier studies (Levine and Zervos, 1998; Beck, Levine and Loayza, 2000), country characteristics that enhance financial-sector performance may be seen as accelerators of long-run economic growth. According to Detragiache et al. (2005), public ownership of banks leads to more efficient banking sectors and a better deposit mobilization, but to a smaller allocation of credit to the private sector.

A similar approach has been taken by Barth, Caprio and Levine (2004) who analyze the effects of banking regulation and supervision, based on a sample that includes high and low income countries. In some regressions, they find a significantly negative relationship between public ownership in the banking system and indicators of banking sector development and performance. When they add control variables measuring banking regulation, such as capital regulation and market entry, the sign of the ownership coefficient remains unchanged but its statistical significance vanishes. This points towards imperfect multicollinearity among the explanatory variables. Nevertheless, Barth et al. (2004) interpret their results as evidence for a negative association between public ownership and financial-sector performance.

Another strand of the literature analyzes bank performance on the basis of individual bank data. In these studies, outcome variables, such as performance, efficiency and loan growth, are related to the ownership status. Micco, Panizza and Yanez (2007) find that public ownership has a negative impact on bank performance in less-developed countries, but does not affect the performance in developed countries. This points towards a heterogeneous effect of public ownership of banks. Dinc (2005) finds that in less developed countries, public banks' loan growth rate is significantly higher in election years than that of private banks, indicating that the provision of loans is driven by political motives

rather than the return prospects of the projects. Again, such an effect cannot be found for developed countries. Hence, the microeconomic evidence suggests that the effect of public bank ownership differs between developing and developed countries, consistent with our theoretical considerations.

Finally, Sapienza (2004) detects significant differences in the lending behavior of private and public banks, based on individual loan data from Italy. She interprets their finding as supporting the political view of state ownership. Given that the analysis is based on only one country, it cannot provide any insights regarding the heterogeneity across countries.

Overall, the literature yields ambiguous results regarding the impact of public ownership in the banking system on economic growth. To the best of our knowledge, no study has analyzed the cross-country heterogeneity of the impact of public ownership so far. However, microeconomic studies already point towards the relevance of such heterogeneity, as predicted by theory. The goal of this paper is to systematically analyze the heterogeneity across countries by allowing the effect of public ownership to depend on the degree of financial development and the quality of political institutions.

4 Empirical Approach

4.1 Empirical Model

The goal of our empirical analysis is to check whether the effect of public ownership in the banking sector on economic growth is heterogeneous across countries. A sample split, as carried out by La Porta et al. (2002), is appropriate only if there are discrete differences between the two country groups. Given our discussion above, it is more plausible that the impact of public ownership on growth varies continuously with a country's stage of financial development or with the quality of political institutions. Moreover, from a policy perspective, we are interested in making statements about individual countries; then a sample split is clearly not sufficient.

Therefore, to model heterogeneity, we interact public ownership with financial development and later also with variables measuring the quality of political institutions. We use starting values for the ownership variable and for the financial development indicator to

deal with the problem of reverse causality.⁸ The first part of the analysis is based on cross-sectional data, as in La Porta et al. (2002), extending the time period until 2007. The explanatory variables refer to 1970. The simplest version of our regression model looks as follow:

$$g_i^{1970-2007} = \beta_0 + \beta_1 \cdot pub_i + \beta_2 \cdot fin_i + \beta_3 \cdot pub_i \cdot fin_i + \gamma' \mathbf{x}_i + \varepsilon_i, \quad (1)$$

where $g_i^{1970-2007}$ denotes average real per capita GDP growth in country i , pub_i public ownership, and fin_i financial development. The vector of control variables \mathbf{x}_i contains the initial level of real per capita GDP, a measure of a country's stock of human capital, and variables measuring the quality of political institutions. Later we introduce additional interactions between public ownership and the political indicators.

In the second part, we extend the analysis by splitting up the sample in two subperiods and employing panel methods (random and fixed effects estimation). The two time periods are 1970–1994 and 1995–2007. For each time period, we use the initial values of the respective time period for the explanatory variables. The choice of time periods is dictated by data availability, as will be explained in more detail below.

4.2 Data

Our sample of 78 countries is similar to that used by La Porta et al. (2002) in order to ensure comparability of results.⁹ According to the World Bank's classification of income groups, 30 of the sample countries are high-income countries. The remaining 48 countries are dispersed over the other income groups (10 low-income countries, 24 lower-middle income countries, and 14 upper-middle income countries). They belong to all regions of the world, with the largest number of countries being located in Latin America-Caribbean (19 countries) and in Middle East-Northern Africa (12 countries).

GDP growth rates are computed from data by the United Nations Statistics Division (2008). These data in general correspond to national-accounts data reported by individual

⁸It has been argued that political institutions, governance, and human capital accumulation may also be endogenous, see, e.g., Mauro (1995), Minier (1998), and Bils and Klenow (2000). Therefore, when available, we also use starting values of these variables.

⁹Due to data availability, our sample does not comprise Libya, Saudi Arabia, Oman, and Taiwan.

countries. In particular, they are not adjusted by international prices for the purpose of international income comparisons. Thus, we follow the recommendation of Nuxoll (1994) who argued that national-accounts data and the underlying domestic prices best reflect the trade-offs decision-making agents face.¹⁰ In addition, this data source is preferable to other frequently used sources (such as International Financial Statistics) due to a better coverage of countries in the given time period.¹¹ As can be seen from the descriptive statistics in Table 1, real GDP growth over the period 1970–2007 averaged 1.6% across all countries. Comparing the two subperiods, we find that average growth was much lower in the earlier period than in the later period (1.4 vs. 2.3%).

We use the measure of *Public ownership* in the banking system introduced by La Porta et al. (2002).¹² They consider the 10 largest commercial or development banks in each country and compute the amount of assets owned by the state, taking direct ownership and ownership via state-owned shareholders into account. They measure public ownership in the banking system as the sum of state-owned assets divided by the total assets of these 10 banks. One caveat of this measure is that it tends to overestimate public ownership in countries where public banks are large, whereas it tends to underestimate public ownership in countries where public banks are small. However, since the 10 largest banks held more than 75% of the total claims to the private sector in most countries, the potential discrepancy between the ownership measure and the actual degree of public ownership seems negligible (cf. La Porta et al., 2002, fn. 1, p. 279). As Table 1 shows, public ownership averaged of 56% (0.56) across all countries in 1970, and decreased to 40% in 1995. This reflects the privatization wave of the 1980s and 1990s. Nevertheless, the variation across countries is still large.

The indicator of financial development, *Private credit*, is defined as the value of loans of financial intermediaries to the private sector divided by GDP. It is based on IFS data and has been used widely in the finance-growth literature (see e.g., Levine and Zervos, 1998; Beck et al., 2000). *Private credit* measures financial depth and hence the extent to which an economy makes use of financial intermediation. It is commonly also interpreted as a proxy for the quality of financial intermediation. A more natural interpretation is that

¹⁰As robustness checks, we also present regression results using GDP growth rates calculated from Penn World Tables and using the data by La Porta et al. (2002), see Section 5.4.

¹¹La Porta et al. (2002) use data from the International Financial Statistics, complemented by data from Beck et al. (2000). Given that this data ends in 1995, this is not an option for our purposes.

¹²A detailed description of variables and data sources is given in the Appendix.

Table 1: Descriptive statistics

	Mean	St. D.	Min	Max	Median	Obs.
Real GDP per capita growth 1970–2007	0.0160	0.0172	−0.0215	0.0762	0.0170	78
Real GDP per capita growth 1970–1994	0.0144	0.0215	−0.0633	0.0679	0.0172	78
Real GDP per capita growth 1995–2007	0.0231	0.0171	−0.0460	0.0805	0.0229	78
Public ownership of banks 1970	0.559	0.346	0	1	0.550	78
Public ownership of banks 1995	0.397	0.311	0	1	0.312	78
Private credit 1970	0.296	0.239	0.033	1.300	0.224	78
Private credit 1995	0.514	0.392	0.014	1.805	0.390	78
Democracy 1970	4.21	4.33	0	10	3	75
Democracy 1995	6.33	3.93	0	10	8	75
Political rights 1972	4.26	2.24	1	7	4	77
Political rights 1995	4.90	2.11	1	7	5	77
Corruption control, average 1982–1995	6.18	2.35	1.01	10	5.45	77
Corruption control, average 1996–2007	6.16	2.05	2.59	9.86	5.74	78
Bureaucracy quality, average 1982–1995	6.04	2.66	1.79	10	5.60	77
Bureaucracy quality, average 1996–2007	6.28	1.90	2.31	9.49	5.93	78
Years of schooling 1970	4.62	2.55	0.57	10.24	4.56	77
Years of schooling 1995	6.76	2.59	1.48	11.89	6.54	77
Real GDP per capita 1970	8.63	0.97	6.33	11.49	8.69	78
Real GDP per capita 1995	9.05	1.03	6.10	10.69	9.03	78

Notes: The exact definition of all variables and data sources are given in the Appendix.

it measures the maturity of a banking system. Average private credit amounted to 30% (0.30) in 1970 and rose dramatically to 51% by 1995. Hence, financial systems developed substantially between 1970 and 1995.

As measures of the quality of political institutions, we use four variables: *Democracy*, *Political rights*, *Corruption control* and *Bureaucracy quality*. All variables are defined such that a higher value indicates a higher quality of political institutions. We expect *Democracy* and *Political rights* to be highly correlated with the prevalence of control mechanisms, such as a free press, a free opposition, and a strong and independent jurisdiction, and the degree of transparency in the political process. Thus, in highly-ranked countries, politicians' scope to abuse state-owned banks is likely to be reduced substantially. However, the mere existence of control mechanisms does not automatically mean effective control of politicians' daily actions in the sphere of public banks. Likewise, the absence of democratic institutions does not necessarily mean that decision making in public banks is left to politicians' discretion. Therefore, in our analysis, we also include the indicators *Corruption control* and *Bureaucracy quality*, which reflect the actual (perceived) behavior of politicians and decision makers in a given country. In countries with a high quality of political institutions, the *political view* on public banks is less likely to apply. We see that political institutions generally improved over time, the only exception being corruption, which stayed more or less constant.

The correlations among the described variables are displayed in Table 2. *Public ownership of banks* is weakly negatively correlated with subsequent real per capita GDP growth in the first period whereas it is weakly positively correlated with growth in the second period. In both cases, the correlations are not statistically significant. In the first period, the indicator of financial development, *Private credit*, and all political institutions and governance indicators are positively and mostly significantly correlated with economic growth. In the second period, these correlations exhibit the same sign except for *Private credit*. However, none of the second-period correlations with growth is statistically significant. In both periods, *Public ownership of banks* tends to be higher in financially less developed countries and in countries with weak political institutions and poor governance. The correlations between *Democracy* and *Political rights* on the one hand, and between *Corruption control* and *Bureaucracy quality* on the other hand, are extremely high, indicating that they measure more or less the same. The remaining correlations between the political variables are lower (albeit still quite high), suggesting that democratic structures are not a sufficient condition for corruption prevention and an efficient

bureaucracy. Finally, the last column of the upper section of Table 2 displays correlations over time, i. e. the correlation of each variable from the first period with its counterpart from second period. The correlation between growth rates is quite low, indicating that growth rates do not persist over time. In contrast, for all other variables, the correlations indicate a high degree of time persistence.

5 Results

We present three sets of results. Our basic specification, given by equation (1), analyzes how financial development influences the growth effect of public banks (Section 5.1). Then, we allow for an additional interaction term with political institutions to see whether the quality of institutions matters in addition to financial development (Section 5.2). In Section 5.3, we split the sample in two subperiods and employ panel methods. Section 5.4 contains some robustness checks.

5.1 Interaction with Financial Development

Column (1) of Table 3 shows our baseline regression, including an interaction term of *Public ownership of banks* and *Private credit*. In columns (2) to (5), we add the political and governance indicators one by one as control variables in the regression equation. The model in column (6) includes all four indicators as control variables. In all regressions, the coefficient of the interaction term has a positive sign and is statistically significant, in three out of six cases at the 1% level. Note that this is true even though we control for institutional quality. Thus, there is a strong indication of heterogeneity: the impact of public ownership on growth significantly and positively depends on financial development.

Although the estimated models are very simple, the interpretation of results is illuminating. The economic importance of the interaction term is best illustrated by the plots in Figure 1. It shows the effect of *Public ownership* on GDP growth in dependence of *Private credit*. At very low levels of financial development (10% quantile of *Private credit*), the marginal effect of public ownership is -0.012 (left chart of Figure 1). Here, countries like Chile, Egypt, Poland, and Indonesia can be found. In these countries, a 10-percentage-point decrease of *Public ownership* in 1970 would result in a 0.12-percentage-point increase

Table 2: Correlations

	Panel A: Correlations in the first period										Correlations across periods	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
(1) Real GDP per capita growth 1970–2007	1											-
(2) Real GDP per capita growth 1970–1994	0.93***	1										0.24**
(3) Public ownership of banks 1970	-0.09	-0.10	1									0.81***
(4) Private credit 1970	0.31***	0.35***	-0.37***	1								0.72***
(5) Democracy 1970	0.23**	0.22*	-0.38***	0.32***	1							0.66***
(6) Political rights 1972	0.16	0.12	-0.32***	0.32***	0.86***	1						0.61***
(7) Corruption control, average	0.21*	0.20*	-0.35***	0.50***	0.55***	0.55***	1					0.87***
(8) Bureaucracy quality, average	0.29**	0.31***	-0.47***	0.47***	0.66***	0.60***	0.87***	1				0.84***
(9) Years of schooling 1970	0.26**	0.26**	-0.38***	0.38***	0.59***	0.54***	0.75***	0.69***	1			0.92***
(10) Real GDP per capita 1970	-0.15	-0.18	-0.44***	0.37***	0.44***	0.48***	0.64***	0.61***	0.65***	1		0.88***

	Panel B: Correlations in the second period									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Real GDP per capita growth 1970–2007	1									
(2) Real GDP per capita growth 1995–2007	0.41***	1								
(3) Public ownership of banks 1995	-0.10	0.18	1							
(4) Private credit 1995	0.43***	-0.02	-0.60***	1						
(5) Democracy 1995	0.22*	0.08	-0.30***	0.38***	1					
(6) Political rights 1995	0.22*	-0.01	-0.41***	0.46***	0.93***	1				
(7) Corruption control, average	0.34***	0.05	-0.48***	0.65***	0.55***	0.67***	1			
(8) Bureaucracy quality, average	0.44***	0.11	-0.52***	0.70***	0.59***	0.70***	0.98***	1		
(9) Years of schooling 1995	0.35***	0.04	-0.40***	0.55***	0.64***	0.71***	0.78***	0.79***	1	
(10) Real GDP per capita 1995	0.30***	-0.13	-0.50***	0.60***	0.50***	0.63***	0.85***	0.84***	0.81***	1

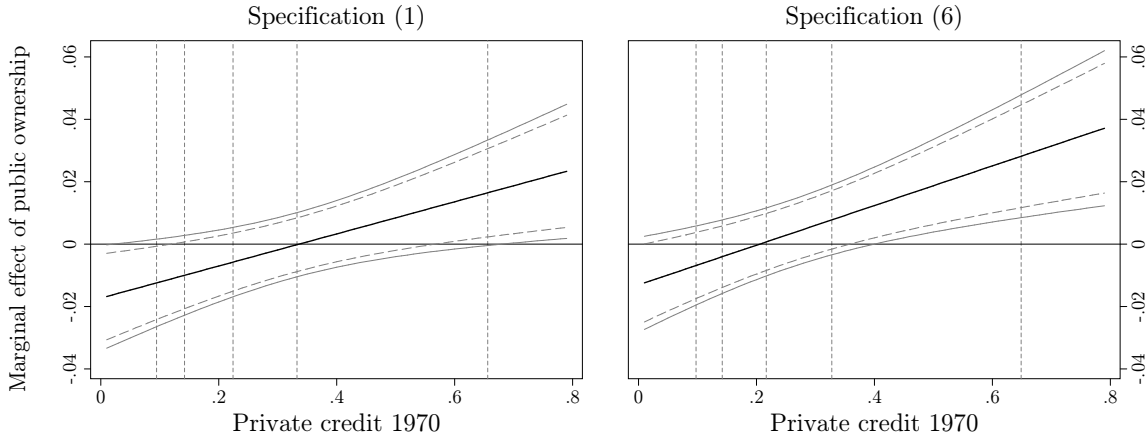
Notes: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. The column titled “Correlations across periods” displays correlations between variables from the upper panel with the respective variables from the lower panel.

Table 3: Interaction of public ownership of banks with financial development

	(1)	(2)	(3)	(4)	(5)	(6)
Public ownership of banks 1970	-0.0173** (0.0086)	-0.0210** (0.0089)	-0.0212** (0.0087)	-0.0141* (0.0083)	-0.0097 (0.0078)	-0.0131* (0.0078)
Private credit 1970	0.0067 (0.0098)	-0.0064 (0.0107)	-0.0066 (0.0103)	0.0071 (0.0093)	0.0066 (0.0108)	-0.0078 (0.0103)
Public ownership × Private credit	0.0514** (0.0209)	0.0701*** (0.0218)	0.0690*** (0.0217)	0.0417** (0.0201)	0.0371* (0.0209)	0.0635*** (0.0214)
Democracy 1970		0.0007* (0.0004)				-0.0005 (0.0008)
Political rights 1972			0.0010 (0.0008)			0.0012 (0.0014)
Corruption control, av. 1982–1995				0.0010 (0.0013)		-0.0027 (0.0019)
Bureaucracy quality, av. 1982–1995					0.0022** (0.0008)	0.0041** (0.0016)
Schooling 1970	0.0037*** (0.0006)	0.0034*** (0.0008)	0.0036*** (0.0007)	0.0032*** (0.0010)	0.0026*** (0.0009)	0.0033*** (0.0010)
Real GDP per capita 1970	-0.0120*** (0.0022)	-0.0122*** (0.0022)	-0.0123*** (0.0022)	-0.0131*** (0.0024)	-0.0136*** (0.0024)	-0.0133*** (0.0023)
Constant	0.1030*** (0.0204)	0.1064*** (0.0205)	0.1057*** (0.0202)	0.1085*** (0.0208)	0.1070*** (0.0205)	0.1054*** (0.0201)
Adjusted R^2	0.35	0.36	0.35	0.36	0.40	0.42
Observations	78	75	77	77	77	74

Notes: The dependent variable is the growth rate of real GDP per capita between 1970 and 2007. Robust standard errors are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Figure 1: Marginal effects of public ownership of banks on GDP growth



Notes: The figure shows the marginal effects of public ownership in the banking system on real per capita GDP growth, depending on the level of *Private credit*. The left chart refers to specification (1) of Table 3, whereas the right chart refers to specification (6). The figure also shows the 90 and 95% confidence bands. The dashed vertical lines show 10, 25, 50, 75 and 90% quantiles of *Private credit*.

of the average annual growth rate of real per capita GDP between 1970 and 2007; the effect is statistically significant at the 10% level.

However, inspecting the marginal effects over the whole range of *Private credit*, we get a different picture for countries at higher stages of financial development. At the median, where countries like Argentina, Thailand, or Turkey can be found, the marginal effect of public ownership is much lower than at the 10% quantile, ranging from -0.006 (specification (3) in Table 3) to 0.001 (specification (6)). It is not statistically significant. At very high values of *Private credit*, the marginal effect becomes positive and large. In countries with values of *Private credit* around the 90% quantile, like China, Germany, or Norway, it ranges from 0.013 (specification (4) of Table 3) to 0.028 (specification (6)), and, in the latter case, it is even statistically significant. Thus, we can confirm the negative impact of *Public ownership* on growth documented by La Porta et al. (2002) only for hardly financially developed countries.

Overall, the results show that the impact of public ownership in the banking system on economic growth depends strongly on how well a country's financial system is developed. The effect is strongly negative and significant if financial development is small; with increasing financial development the effect vanishes and becomes insignificant. For very high levels of financial development, it may even turn positive and significant. Hence, our results appear to reject the development view. There is no indication that public banks are particularly beneficial at low stages of financial development; the opposite is

the case. The negative effect at low levels of financial development and the fading impact with increasing financial development are consistent with the agency and political views on public banks. However, the results suggest that the negative effect vanishes already at relatively low levels of financial development. It is not easy to rationalize the positive effect for high levels of financial development. It may be consistent with the social view, although it is not clear why this view should apply especially in highly developed financial systems.

An alternative interpretation is that by Andrianova et al. (2009) who argue that agency problems at *private* banks may have been even stronger than at public banks in highly developed countries, explaining the positive effect of public ownership in such countries.

5.2 Interactions with Financial Development and the Quality of Political Institutions

We now add interaction terms of public ownership with the quality of political institutions to test whether public banks' impact on long-run economic growth also depends on the ability of a political system to restrict politicians' exercise of power to their political mandate. In the regressions shown in Table 4, we include two interaction terms (one with private credit and one with political institutions) plus a double interaction of public ownership of banks with private credit and political institutions. The regression model then looks as follows:

$$\begin{aligned}
 g_i^{1970-2007} &= \beta_0 + \beta_1 \cdot pub_i + \beta_2 \cdot fin_i + \beta_3 \cdot pol_i \\
 &\quad + \beta_4 \cdot pub_i \cdot fin_i + \beta_5 \cdot pub_i \cdot pol_i + \beta_6 \cdot pub_i \cdot fin_i \cdot pol_i \\
 &\quad + \gamma' \mathbf{x}_i + \varepsilon_i,
 \end{aligned} \tag{2}$$

where pol_i denotes the quality of political institutions. The marginal effect of public ownership on economic growth can be calculated as

$$\frac{\partial g_i^{1970-2007}}{\partial pub_i} = \beta_1 + \beta_4 \cdot fin_i + \beta_5 \cdot pol_i + \beta_6 \cdot fin_i \cdot pol_i. \tag{3}$$

Hence, the effect now depends on both financial development and the quality of political institutions. The double interaction implies that we allow for a mutual reinforcement or

attenuation of the effects of these two variables. In order to check whether political institutions have an economically significant impact on the marginal effect of public ownership, one has to fix financial development at some level.

The results of these regressions are displayed in Table 4. In three out of four specifications, the coefficient estimate of the interaction term composed of public ownership and the political institutions indicator is positive and significant. In contrast, the coefficient of the double interaction is mostly negative (and partly significant), indicating that the impact of the political variables on the marginal effect of public ownership is *decreasing* in *Private credit*. This suggests that financial development and political institutions quality are *substitutes* with regard to their mitigating effects on the agency problems discussed in Section 2.

In order to assess the effects quantitatively, one has to compare the magnitude of the single and double interactions. Consider, for illustration, the results in column (2). In absolute terms, the coefficient estimate of $Public\ ownership \times Private\ credit \times Politics$ is roughly three times as large as the coefficient of $Public\ ownership \times Politics$. Hence, the impact of political institutions quality on the marginal effect of public ownership is strictly positive as long as *Private credit* does not exceed 0.33. Two graphical examples are given in Figure 2. It displays the marginal effects of public ownership, depending on *Political rights* and *Bureaucracy quality*, corresponding to columns (2) and (4) in Table 4, holding *Private credit* constant at the 10% quantile (i. e. at a value of 0.08). At low levels of both *Private credit* and political institutions quality, the impact of public banks on growth is substantially more negative than in the regressions with one interaction term only. If, for example, *Political rights* takes on the value 1, the marginal effect is below -0.022 . Similarly, at the 10% quantile of *Bureaucracy quality*, the marginal effect is -0.016 . In both cases, it is statistically significant. However, the negative effect fades quickly when the political institutions indicators take on higher values. At the median of *Political rights* and the median of *Bureaucracy quality*, it is -0.009 and -0.004 , respectively. At higher values, it gets close to zero (*Political rights*), or it becomes even positive (*Bureaucracy quality*), and in neither case, it is statistically different from zero. Hence, if the quality of political institutions is high, public ownership has no effect on economic growth even in financially little developed countries.

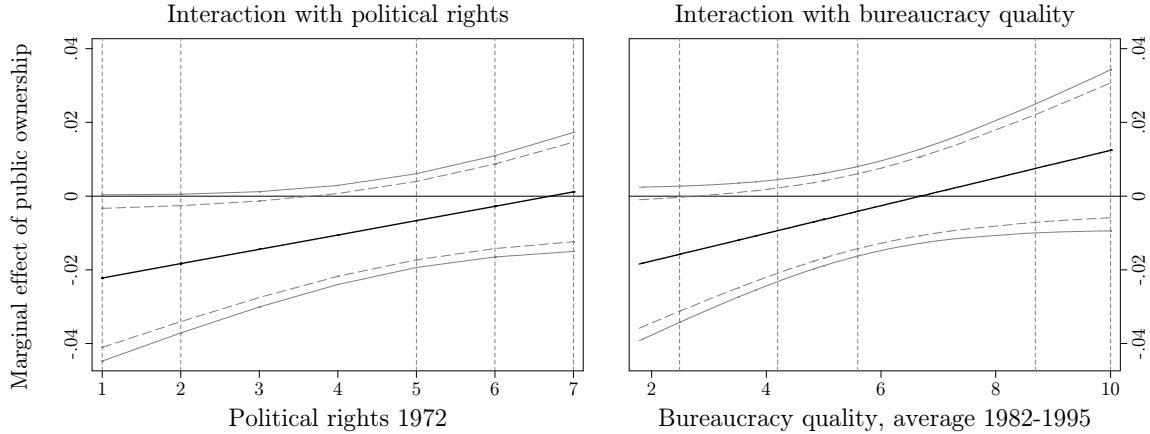
To give a complete overview of the results, Table 5 gives the ranges of the marginal effects of public ownership in the banking system for all levels of financial development

Table 4: Interaction of public ownership of banks with financial development and the quality of political institutions

	(1)	(2)	(3)	(4)
Public ownership of banks 1970	-0.0309*** (0.0109)	-0.0370** (0.0146)	-0.0058 (0.0173)	-0.0320* (0.0166)
Private credit 1970	0.0027 (0.0097)	0.0020 (0.0096)	0.0050 (0.0101)	0.0126 (0.0087)
Democracy 1970	-0.0005 (0.0010)			
Political rights 1972		-0.0002 (0.0019)		
Corruption control, av. 1982–1995			0.0016 (0.0016)	
Bureaucracy quality, av. 1982–1995				0.0010 (0.0012)
Public ownership×Private credit	0.0826*** (0.0196)	0.1160*** (0.0212)	0.0347 (0.0535)	0.0694 (0.0470)
Public ownership× <i>Politics</i>	0.0037** (0.0016)	0.0054** (0.0026)	-0.0015 (0.0025)	0.0045* (0.0026)
Public ownership×Private credit× <i>Politics</i>	-0.0080*** (0.0023)	-0.0159*** (0.0040)	0.0018 (0.0075)	-0.0077 (0.0071)
Real GDP per capita 1970	-0.0116*** (0.0020)	-0.0108*** (0.0019)	-0.0130*** (0.0025)	-0.0138*** (0.0023)
Schooling 1970	0.0040*** (0.0010)	0.0038*** (0.0008)	0.0032*** (0.0011)	0.0027*** (0.0009)
Constant	0.1026*** (0.0198)	0.0942*** (0.0209)	0.1044*** (0.0238)	0.1146*** (0.0212)
Adjusted R^2	0.40	0.39	0.34	0.41
Observations	75	77	77	77

Notes: The dependent variable is the growth rate of real GDP per capita between 1970 and 2007. *Politics* corresponds to *Democracy* in column (1), *Political rights* in column (2), *Corruption control* in column (3), and *Bureaucracy quality* in column (4). Robust standard errors are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Figure 2: Marginal effects of public ownership of banks on GDP growth



Notes: The figure shows the marginal effects of public ownership in the banking system on real per capita GDP growth, depending on the level of the political indicators. *Private credit* is held constant at the 10% quantile. The figure also shows the 90 and 95% confidence bands. The left chart refers to specification (2) of Table 4, the right chart to specification (4). The dashed vertical lines in the right chart show the 10, 25, 50, 75 and 90% quantiles of *Bureaucracy quality*. Given the discrete nature of *Political rights*, such quantiles would be misleading for this variable. In the left chart, the vertical lines indicate the following numbers: 10 out of 77 sample countries (13%), have a value of *Political rights* equal to 1, 24 countries (31%) have a value lower or equal to 2, 44 countries (57%) have a value lower or equal to 5, 58 countries (75%) have a value lower or equal to 6, and the remaining 19 countries have a value of 7.

and political institutions quality. The four panels of the table refer to the four political variables. We classified each country regarding its financial development and political quality, forming three categories in each dimension (high, medium, and low). This yielded nine different cells. The classification of countries is given in the lower part of each panel.¹³ For each country, we calculated the marginal effect according to equation (3). The upper part of each panel gives the range of the marginal effects for the respective country group.

When both financial development *and* the quality of political institutions are low, the effect of public ownership is strongly negative and often statistically significant (see the top left corner in each panel in Table 5). For example, the marginal effect ranges from -0.028 to -0.018 when *Democracy* is taken as measure of political institutions and is always significant. The effect is somewhat weaker for the remaining political variables. When financial development or the quality of institutions are at a medium level, the effects are smaller (in absolute terms), often still negative, but mostly insignificant. The share of countries with significant negative effects is about 25 percent of the sample when *Democracy* is used as measure of political institutions, and much smaller for the remaining political variables. We never find a significant negative impact of public ownership if *either*

¹³See Appendix for country name abbreviations.

financial development *or* political quality is high, underlining the substitutive effect of the two dimensions. On the contrary, we even find positive and statistically significant marginal effects for some countries within these groups.

The results from this section support our conclusions from the preceding section. Again, the development view is rejected. The importance of political variables strengthens the case for the political view on public banks. However, a well developed financial system or high quality institutions counteract the potential negative effects of public banks. Already with medium levels in the two dimensions, the negative effect of public ownership is basically gone. Again we find the somewhat puzzling positive results for high levels of financial development and political quality.

5.3 Panel Estimation

We now extend the analysis along the time series dimension by considering two time periods, 1970–1994 and 1995–2007. Due to data constraints, we are not able to start the latter period in an earlier year. In particular, public ownership data is provided by La Porta et al. (2002) only for 1970 and 1995. Other data sources such as the Banking Regulation and Supervision Database of the World Bank refer only to even more recent years. The starting-value approach to the problem of reverse causality thus restricts the second period to begin in 1995. Nevertheless, the two subperiods are still long enough to measure steady-state growth.

The use of panel data is helpful in two respects: first, the financial systems of many countries have experienced a privatization wave in the 1980s and 1990s. Therefore, the use of public ownership data from 1970 may not be well suited to explain economic growth for more recent years. Second, panel data allows us to control for time-invariant unobserved heterogeneity, such as differences in geographical conditions, social norms, or slowly changing institutions, by including fixed effects. We run two types of regressions: random effects and fixed effects.¹⁴

¹⁴A Hausman test rejects the null hypothesis and therefore supports the use of a fixed effects regression. However, in the presence of measurement error, which is a pervasive problem in country-level data, it is unclear whether random or fixed effects regressions are preferable. We therefore present the results of both types of regressions.

Table 5: Marginal effects of public ownership of banks on GDP growth

		Private credit		
		Low	Medium	High
Democracy	Low	$[-0.028^{***}, -0.018^*]$	$[-0.017^*, -0.008]$	$[-0.008, 0.030^{**}]$
	Medium	$[-0.012^*, -0.005]$	$[-0.008, 0.001]$	$[0.002, 0.012]$
	High	$[-0.001, 0.006]$	$[0.002, 0.007]$	$[0.005, 0.009]$
	Low	AFG ARE BHR DOM EGY GRC HUN IDN IRQ KEN KWT NGA PER POL SEN SYR TZA	ARG BOL CIV HND JOR MAR NIC PAN PRY ROM	BRA CHN DZA ESP IRN MEX PRT SGP TUN
Medium	CHL ECU GTM	COL MYS PHL THA ZWE	CYP KOR SLV ZAF	
High	BGD IND LKA NZL URY	AUS BEL CRI DNK GBR ISR PAK TTO TUR VEN	AUT CAN CHE FIN FRA IRL ITA JPN NLD NOR SWE USA	
Political rights	Low	$[-0.023^{**}, -0.013]$	$[-0.014, -0.003]$	$[-0.003, 0.034^{***}]$
	Medium	$[-0.014^*, -0.006]$	$[-0.010, -0.002]$	$[-0.001, 0.029^{***}]$
	High	$[-0.004, 0.001]$	$[-0.001, 0.002]$	$[0.002, 0.013]$
	Low	ARE BGD BHR ECU EGY GRC GTM HUN IND IRQ LKA NGA PER POL SEN	ARG CIV COL DZA HND ISR JOR MYS PAN ROM THA TTO VEN ZWE	CHN CYP FIN JPN SLV TUN ZAF
Medium	AFG DOM IDN KEN KWT URY	BOL MAR NIC PAK PHL PRY TUR	BRA ESP IRN KOR MEX PRT SGP	
High	CHL NZL	AUS BEL CRI DNK GBR	AUT CAN CHE DEU FRA IRL ISL ITA NLD NOR SWE USA	
Corruption control	Low	$[-0.009, -0.005]$	$[-0.005, 0.000]$	$[0.000, 0.005]$
	Medium	$[-0.014^*, -0.006]$	$[-0.007, -0.002]$	$[-0.002, 0.016]$
	High	$[-0.015, -0.009]$	$[-0.010, -0.005]$	$[-0.005, 0.046^*]$
	Low	ARE BGD EGY GTM IDN IND IRQ KEN KWT NGA PER SYR	BOL HND MAR PAK PAN PHL PRY ROM TTO VEN	MEX SLV
Medium	BHR CHL DOM ECU GRC LKA POL SEN TZA URY ZWE	ARG CIV COL DZA JOR THA TUR	BRA CHN CYP IRN ITA KOR TUN	
High	HUN NZL	AUS BEL CRI DNK GBR IRL ISR MYS NIC	AUT CAN CHE DEU ESP FIN FRA HKG ISL JPN NLD NOR PRT PRT SGP SWE USA ZAF	
Bureaucracy quality	Low	$[-0.021^*, -0.006]$	$[-0.012, -0.004]$	$[-0.003, -0.001]$
	Medium	$[-0.008, 0.001]$	$[-0.005, 0.002]$	$[0.000, 0.011]$
	High	0.012	$[0.003, 0.012]$	$[0.005, 0.020]$
	Low	ARE BGD EGY GTM IDN IRQ KWT NGA PER SYR TZA URY	BOL DZA HND NIC PAK PAN PHL PRY ROM	IRN SLV
Medium	BHR CHL DOM ECU GRC HUN IND KEN LKA POL SEN ZWE	ARG CIV COL CRI JOR MAR MYS TTO TUR VEN	BRA CHN ESP MEX PRT TUN	
High	NZL	AUS BEL DNK GBR IRL ISR THA	AUT CAN CHE CYP DEU FIN FRA HKG ISL ITA JPN KOR NLD NOR SGP SWE USA ZAF	

Notes: The table shows marginal effects of public ownership in the banking system on real per capita GDP growth as implied by the results given in Table 4. The first panel refers to specification (1) of Table 4, the second to specification (2), the third to specification (3), and the fourth to specification (4). The assignment of countries to cells is done as follows: Countries in the left column have a value of *Private credit* lower than the 33.3% quantile, countries in the middle column have a value between the 33.3% quantile and the 66.6% quantile, and countries in the right column have a value higher than the 66.6% quantile. *Democracy*: low (0 to 2), medium (3 to 7), high (8 to 10). *Political rights*: low (1 or 2), medium (3 to 5), high (6 or 7). *Corruption control* and *Bureaucracy quality*: low (below 33.3% quantile), medium (between 33.3% quantile and 66.6% quantile), high (above 66.6% quantile). The intervals contain the lowest and the highest marginal effect within each country cell. *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Country codes are given in the Appendix.

5.3.1 Random Effects Estimation

The random effects estimation results are displayed in Table 6. We find that the coefficient of the interaction term with financial development continues to be positive, large and highly statistically significant. The coefficient estimate ranges from 0.0352 to 0.0628, an order of magnitude similar to the cross-sectional results in Table 3. In contrast, the interaction between public ownership and the quality of political institutions proved to be neither economically, nor statistically significant. Therefore, we excluded it from the regression equation. Hence, the effect of financial development appears to be more robust than that of the quality of political institutions.

Figure 3 shows the marginal effects of public ownership of banks, depending on *Private credit*. As *Private credit* in 1970 differs substantially from *Private credit* in 1995 in distribution and size, the marginal-effect graph is plotted twice. The dashed vertical lines in the first row show the quantiles of *Private credit* in 1970, those in the second row show the quantiles in 1995. The first column of Figure 3 refers to the specification without any political indicators on the right-hand side (specification (1) in Table 6), whereas the second column refers to the specification including all indicators (specification (6)). For the first period, the marginal effects of public ownership are very similar to those found in the cross-sectional analysis. At the 10% quantile of *Private credit*, the effect is -0.015 (top left chart of Figure 3) and -0.004 (top right chart of Figure 3), respectively. At the median, it is -0.007 (0.002), and at the 90% quantile, it is 0.017 (0.021). For the second period, the marginal effects at the respective quantiles are larger. This is due to the fact that countries have become more financially developed. As a consequence, for the first period, the regression results of specification (1) in Table 6 imply statistically significant negative marginal effects in almost one half of the sample countries, whereas for the second period, this applies to less than 25 percent of the sample countries (see charts in the left column of Figure 3).

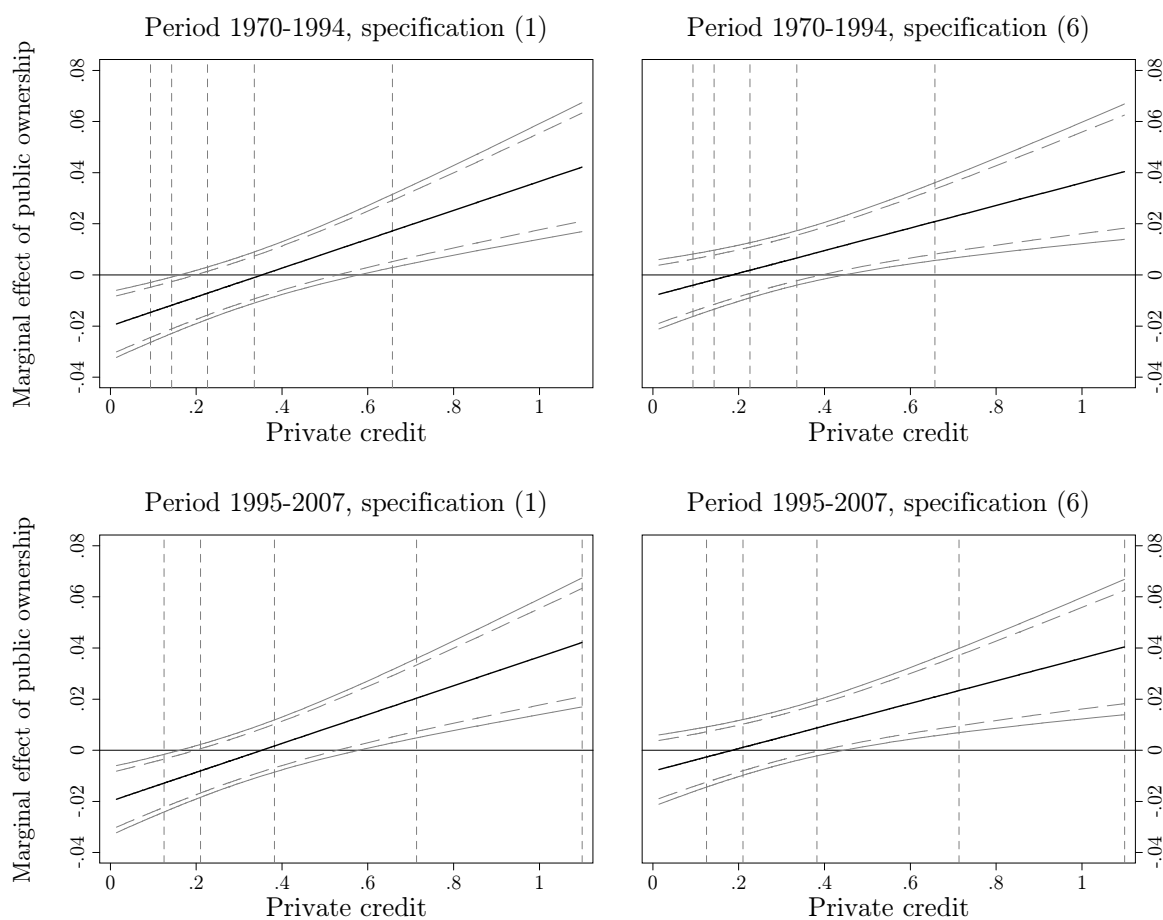
However, the most important insight from Figure 3 is that there are again remarkable differences between the marginal effects at low and high levels of financial development in both periods. In the first period, the marginal effects at the 10% quantile of *Private credit* and the 90% quantile differ by 0.032 (top left chart of Figure 3) and 0.025 (top right chart of Figure 3). In the second period, the difference is 0.055 (bottom left chart of Figure 3) and 0.043 (bottom right chart of Figure 3). Therefore, any attempt to analyze the relationship between public ownership in the banking system and economic growth

Table 6: Interaction of public ownership of banks with financial development – Random effects estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Public ownership of banks 1970, 1995	−0.0199*** (0.0068)	−0.0201*** (0.0073)	−0.0197*** (0.0069)	−0.0151** (0.0073)	−0.0081 (0.0068)	−0.0082 (0.0071)
Private credit 1970, 1995	−0.0018 (0.0056)	−0.0067 (0.0045)	−0.0062 (0.0042)	−0.0022 (0.0052)	0.0001 (0.0055)	−0.0036 (0.0043)
Public ownership×Private credit	0.0565*** (0.0149)	0.0619*** (0.0161)	0.0628*** (0.0144)	0.0430** (0.0170)	0.0352** (0.0156)	0.0442*** (0.0154)
Democracy 1970, 1995		0.0009** (0.0005)				0.0004 (0.0008)
Political rights 1972, 1995			0.0008 (0.0008)			−0.0006 (0.0015)
Corruption control, period averages				0.0030** (0.0014)		−0.0021 (0.0019)
Bureaucracy quality, period averages					0.0045*** (0.0009)	0.0056*** (0.0016)
Period 1	−0.0029 (0.0028)	−0.0034 (0.0026)	−0.0044* (0.0026)	−0.0067** (0.0029)	−0.0076*** (0.0027)	−0.0065** (0.0030)
Initial schooling	0.0046*** (0.0007)	0.0040*** (0.0008)	0.0044*** (0.0008)	0.0035*** (0.0009)	0.0028*** (0.0008)	0.0030*** (0.0008)
Initial real GDP per capita	−0.0161*** (0.0024)	−0.0157*** (0.0024)	−0.0159*** (0.0024)	−0.0184*** (0.0024)	−0.0186*** (0.0020)	−0.0163*** (0.0023)
Constant	0.1387*** (0.0203)	0.1346*** (0.0198)	0.1357*** (0.0199)	0.1484*** (0.0191)	0.1429*** (0.0175)	0.1263*** (0.0187)
R^2	0.29	0.31	0.30	0.32	0.38	0.41
Observations	154	148	152	153	153	147

Notes: The dependent variable is the growth rate of real GDP per capita between 1970 and 1994, and the growth rate between 1995 and 2007, respectively. *Period 1* is a dummy variable that takes the value 1 if an observation belongs to the first period. Standard errors clustered at the country level are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Figure 3: Marginal effects of public ownership of banks on GDP growth – Random effects estimation



Notes: The figure shows the marginal effects of public ownership in the banking system on real per capita GDP growth, depending on the level of *Private credit*. The graphs on the left hand side refer to specification (1) of Table 6, whereas the graphs on the right hand side refer to specification (6). The figure also shows the 90 and 95% confidence bands. The dashed vertical lines show 10, 25, 50, 75 and 90% quantiles of *Private credit* in 1970 (top) and in 1995 (bottom).

Table 7: Interaction of public ownership of banks with financial development – Fixed effects estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Public ownership of banks 1970, 1995	−0.0184 (0.0122)	−0.0140 (0.0124)	−0.0176 (0.0132)	−0.0195 (0.0120)	−0.0168 (0.0119)	−0.0155 (0.0129)
Private credit 1970, 1995	−0.0094 (0.0069)	−0.0083 (0.0074)	−0.0099 (0.0071)	−0.0088 (0.0070)	−0.0035 (0.0077)	−0.0024 (0.0070)
Public ownership×Private credit	0.0422** (0.0168)	0.0428** (0.0164)	0.0419** (0.0166)	0.0389** (0.0194)	0.0309* (0.0181)	0.0365** (0.0181)
Democracy 1970, 1995		0.0009 (0.0007)				0.0008 (0.0017)
Political rights 1972, 1995			0.0001 (0.0009)			−0.0012 (0.0022)
Corruption control, period averages				0.0002 (0.0022)		−0.0023 (0.0026)
Bureaucracy quality, period averages					0.0027** (0.0014)	0.0032* (0.0018)
Period 1	−0.0224*** (0.0047)	−0.0187*** (0.0044)	−0.0225*** (0.0047)	−0.0198*** (0.0044)	−0.0192*** (0.0043)	−0.0168*** (0.0052)
Initial schooling	0.0001 (0.0016)	0.0008 (0.0013)	0.0001 (0.0015)	0.0006 (0.0016)	0.0003 (0.0014)	0.0010 (0.0013)
Initial real GDP per capita	−0.0348*** (0.0059)	−0.0328*** (0.0062)	−0.0343*** (0.0062)	−0.0332*** (0.0060)	−0.0337*** (0.0059)	−0.0329*** (0.0060)
Constant	0.3434*** (0.0500)	0.3120*** (0.0533)	0.3377*** (0.0532)	0.3251*** (0.0474)	0.3129*** (0.0505)	0.3100*** (0.0485)
R^2 within	0.58	0.56	0.58	0.55	0.57	0.58
Observations	154	148	152	153	153	147

Notes: The dependent variable is the growth rate of real GDP per capita between 1970 and 1994, and the growth rate between 1995 and 2007, respectively. *Period 1* is a dummy variable that takes the value 1 if an observation belongs to the first period. Standard errors clustered at the country level are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

ignoring the heterogeneity of countries with regard to financial development will not yield meaningful parameter estimates. In particular, drawing policy conclusions based on these estimates will be misleading for a wide range of countries.

5.3.2 Fixed Effects Estimation

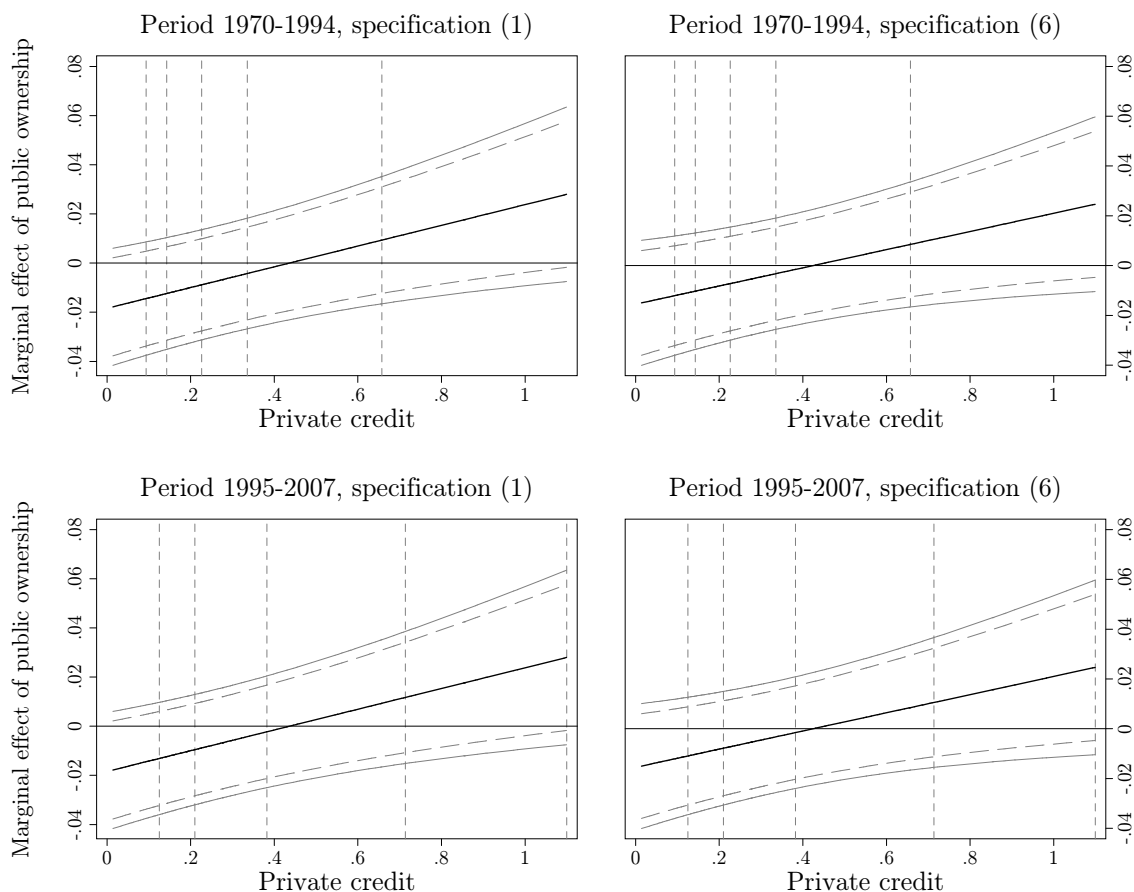
We then estimate a fixed effects regression model in order to account for unobserved country-specific characteristics that do not change over time. While this approach may mitigate concerns about endogeneity or confounding factors, it is likely to yield higher standard errors, especially in light of the high persistence of public ownership over time (see Table 2). In spite of these limitations, the fixed effects estimation confirms the results from the random effects regression. As before, the coefficients of the interaction term with private credit are positive and statistically significant in all specifications (see Table 7). However, the estimated coefficients of the interaction term are somewhat smaller than in the random effects regressions, and the estimated standard errors are larger, as expected, such that the significance level drops to 5%. Moreover, the high standard errors blow up confidence bands and lead to insignificant marginal effects at all quantiles of private credit (see Figure 4).

Summing up, the results from the panel regressions confirm the heterogeneity of the effect of public ownership in the banking system on economic growth. Even when relying on within-country variation, there is strong evidence of heterogeneity depending on financial development. The marginal effects tend to be negative at low levels of financial development, and positive at high levels. There is no evidence of heterogeneity depending on the quality of political institutions in the panel regressions.

5.4 Robustness

In the panel estimation, we used two subperiods of different length (25 vs. 13 years). Since growth rates over such unequally long time periods might capture different aspects of the growth process, we repeat the panel analysis using growth rates computed over equally long time periods, i. e. from 1960 to 1983, and from 1984 to 2007. Overall, the results do

Figure 4: Marginal effects of public ownership of banks on GDP growth – Fixed effects estimation



Notes: The figure shows the marginal effects of public ownership in the banking system on real per capita GDP growth, depending on the level of *Private credit*. The graphs on the left hand side refer to specification (1) of Table 7, whereas the graphs on the right hand side refer to specification (6). The figure also shows the 90 and 95% confidence bands. The dashed vertical lines show 10, 25, 50, 75 and 90% quantiles of *Private credit* in 1970 (top) and in 1995 (bottom).

not change: the coefficient of the interaction term is still positive, large, and statistically significant (see Table 8, columns (1) to (4)).¹⁵

Furthermore, to check whether the interaction effect is stable over time, we ran regressions for both time periods separately. The coefficient of the interaction term is larger in the second time period than in the first (although not significantly so); it is significant only in the second time period (columns (5) to (8) of Table 8).

Finally, we evaluate the sensitivity of our results with regard to the choice of data sources. In particular, Hanousek, Hajkova and Filer (2008) make the point that results of growth regressions are sensitive to the choice of the data source for the dependent variable. Therefore, we repeat the entire analysis with growth rates calculated on the basis of Penn World Tables (Heston, Summers and Aten (2009)).¹⁶ The results (not displayed) are virtually unchanged.

In addition, we reran our basic cross-sectional regression, using the dataset by La Porta et al. (2002), which is available on the authors' website.¹⁷ As can be seen from Table 9, the coefficient of the interaction term coefficient is even larger than in our analysis, and it is statistically significant at the 1% level in all specifications. The estimates imply that the responses in growth rates of financially hardly developed countries and highly financially developed countries to a 10 percentage point change in public ownership differ by up to 0.47 percentage points. Again, this confirms the enormous importance of the heterogeneity of countries.

Hence, the robustness checks confirm that our main results are not driven by the choice of time periods or data sources, and provide further support for the heterogeneous effect of public ownership on economic growth.

¹⁵Note that we could not introduce *Corruption control* and *Bureaucracy quality* in these regressions due to a lack of data for the respective years.

¹⁶For the regressions shown in Table 8, Heston et al. (2009) data has to be used anyhow since our preferred data source reaches back to 1970 only.

¹⁷La Porta et al. (2002) provide data for all variables except *Democracy* and *Political rights*, which are taken from our dataset.

Table 8: Interaction of public ownership of banks with financial development – Growth rates based on equally long time periods

	Random effects		Fixed effects		OLS 1 st period		OLS 2 nd period	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public ownership of banks 1970, 1995	-0.0153** (0.0066)	-0.0138** (0.0063)	-0.0089 (0.0142)	-0.0065 (0.0112)	-0.0103 (0.0102)	-0.0153 (0.0103)	-0.0137 (0.0099)	-0.0110 (0.0090)
Private credit 1970, 1995	0.0063 (0.0052)	0.0050 (0.0049)	0.0108 (0.0068)	0.0113 (0.0072)	0.0156 (0.0113)	0.0036 (0.0125)	0.0034 (0.0066)	0.0043 (0.0067)
Public ownership×Private credit	0.0499*** (0.0125)	0.0489*** (0.0117)	0.0374* (0.0196)	0.0355* (0.0194)	0.0349 (0.0287)	0.0487 (0.0299)	0.0573** (0.0229)	0.0554** (0.0223)
Democracy 1970, 1995		0.0006 (0.0008)		0.0011 (0.0014)		0.0000 (0.0008)		0.0009 (0.0015)
Political rights 1972, 1995		-0.0023 (0.0014)		-0.0035* (0.0019)		-0.0013 (0.0016)		-0.0016 (0.0028)
Period 1	0.0124*** (0.0025)	0.0119*** (0.0024)	0.0022 (0.0053)	0.0039 (0.0055)				
Initial schooling	0.0034*** (0.0008)	0.0036*** (0.0008)	0.0035* (0.0019)	0.0039** (0.0019)	0.0030** (0.0013)	0.0033** (0.0014)	0.0025** (0.0010)	0.0023** (0.0010)
Initial real GDP per capita	-0.0108*** (0.0027)	-0.0098*** (0.0027)	-0.0271*** (0.0053)	-0.0247*** (0.0057)	-0.0115*** (0.0043)	-0.0097** (0.0044)	-0.0053* (0.0028)	-0.0054* (0.0030)
Constant	0.0912*** (0.0210)	0.0892*** (0.0209)	0.2314*** (0.0425)	0.2172*** (0.0478)	0.1069*** (0.0327)	0.1010*** (0.0328)	0.0467** (0.0223)	0.0506** (0.0232)
[Adjusted] R^2 (within)	0.30	0.29	(0.47)	(0.49)	[0.20]	[0.17]	[0.20]	[0.17]
Observations	147	142	147	142	70	68	77	74

Notes: The dependent variable is the growth rate of real GDP per capita between 1960 and 1983, and the growth rate between 1984 and 2007, respectively. *Period 1* is a dummy variable that takes the value 1 if an observation belongs to the first period. Standard errors clustered at the bank level (panel regressions) or robust standard errors (OLS regressions) are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Table 9: Interaction of public ownership of banks with financial development – Cross section results using La Porta et al. (2002) dataset

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Public ownership of banks 1970	−0.0171** (0.0072)	−0.0398*** (0.0096)	−0.0421*** (0.0098)	−0.0430*** (0.0098)	−0.0379*** (0.0101)	−0.0290*** (0.0095)	−0.0309*** (0.0097)
Private credit 1960	0.0302*** (0.0103)	0.0013 (0.0104)	−0.0124 (0.0151)	−0.0132 (0.0149)	−0.0007 (0.0107)	−0.0015 (0.0125)	−0.0191 (0.0144)
Public ownership×Private credit		0.0816*** (0.0216)	0.0959*** (0.0249)	0.1004*** (0.0241)	0.0762*** (0.0224)	0.0663*** (0.0203)	0.0976*** (0.0226)
Democracy 1970			0.0009* (0.0005)				−0.0006 (0.0008)
Political rights 1972				0.0016 (0.0010)			0.0012 (0.0015)
Corruption control, av. 1982–1995					0.0014 (0.0017)		−0.0047** (0.0022)
Bureaucracy quality, av. 1982–1995						0.0037*** (0.0010)	0.0069*** (0.0018)
Schooling, av. 1960–1990	0.0055*** (0.0012)	0.0059*** (0.0012)	0.0053*** (0.0013)	0.0055*** (0.0013)	0.0052*** (0.0016)	0.0041*** (0.0012)	0.0051*** (0.0013)
Real GDP per capita 1960	−0.0175*** (0.0030)	−0.0192*** (0.0028)	−0.0194*** (0.0028)	−0.0196*** (0.0030)	−0.0199*** (0.0028)	−0.0206*** (0.0026)	−0.0189*** (0.0027)
Constant	0.0942*** (0.0163)	0.1123*** (0.0159)	0.1154*** (0.0158)	0.1124*** (0.0162)	0.1113*** (0.0158)	0.1031*** (0.0144)	0.0968*** (0.0144)
Adjusted R^2	0.39	0.46	0.46	0.45	0.46	0.53	0.54
Observations	82	82	79	81	81	81	78

Notes: The dependent variable is the growth rate of real GDP per capita between 1960 and 1995. Robust standard errors are given in parentheses. *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

6 Conclusion

We have shown that the impact of public ownership in the banking system on subsequent per capita GDP growth depends strongly on a country's stage of financial development and on the quality of its political institutions. In hardly developed countries with low financial development and poor political institutions, the impact of public ownership of banks on economic growth is strongly negative. However, in an environment typically observed in highly developed countries, public ownership in the banking system has no negative impact on growth at all. In several specifications, we even find a statistically significant *positive* effect of public ownership. These results are in line with empirical studies at the individual bank level (Micco et al., 2007; Dinc, 2005), which detect differences in the behavior and performance of private and state-owned banks in less developed countries, but not in developed countries.

When splitting the sample in two subperiods and employing panel methods, the estimated effect of public ownership becomes more positive in the recent period because countries have become financially more developed over time. However, there is again strong evidence of a heterogeneous effect, at least with regard to financial development. Even when controlling for unobserved heterogeneity of countries in a fixed effects framework, the interaction of financial development and public ownership remains significant. This is remarkable, given that such regressions rely on within-country variation only.

Hence, the evidence rejects the *development view* on public banks. There is no indication that public banks are beneficial at low states of development. The opposite is true: public ownership of banks is particularly harmful when financial development and the quality of political institutions are low. This yields some support for the *political* and *agency views* on public banks. However, the picture is not quite as bleak as that painted by La Porta et al. (2002). The negative effect of public ownership vanishes already at relatively low levels of financial development and institutional quality. Hence, the two factors seem to effectively counteract the distortions caused by agency problems within public banks. Well-developed financial systems appear to mitigate the principal-agent problem between politicians and bank managers because state-owned banks can benefit from high financial standards; good political institutions mitigate the agency problem between society and politicians, making the abuse of public banks by politicians less likely.

For high levels of financial development and institutional quality, we even find positive

effects of public ownership. This may yield support for the *social view*, although it is unclear why this view should apply especially at high levels of development. An alternative interpretation is that it is not public banks that promote growth better at higher stages of financial development, but private banks that do worse, shifting the balance towards public banks. Indeed, Andrianova et al. (2009) have argued that agency problems in private banks may be exacerbated in times of “high-tech banking.”

Our analysis calls into question the broad policy implications that have been drawn from the results by La Porta et al. (2002). When policymakers want to draw policy conclusions for individual countries, it is crucial to take into account country heterogeneity. Given the attention that public ownership of banks has regained recently due to the nationalization of banks in response to the financial crisis, such considerations are of great importance for today’s policymakers. Although there can be no doubt that nationalized banks should be re-privatized in due course, our results suggest that it is unnecessary to rush to privatization for fear of missing out on growth, as long as the country in question exhibits high levels of financial development and institutional quality. More generally, policymakers considering a privatization, or – in the context of a financial crisis – a nationalization of banks should be aware of the importance of the economic and political environment for the benefits and costs of such policies.

Appendix

Variable Description

Real per capita GDP growth. Annual growth rate of real GDP per capita between initial year and end year. For each country, the logarithm of the real GDP per capita is regressed on a constant and a time trend. The growth rate corresponds to the estimated coefficient of the time trend. *Source:* United Nations Statistics Division (2008, for cross-country regressions and panel regressions beginning in 1970), Heston et al. (2009, for panel regressions beginning in 1960, see Table 8).

Public ownership of banks. State-owned assets of the ten largest commercial and development banks, divided by the sum of their total assets. *Source:* La Porta et al. (2002).

Private credit. Value of loans of financial intermediaries to the private sector (IFS lines 22d and 42d) divided by GDP (IFS line 99b). If data for 1970 are not available (15 sample countries), we use the year closest to 1970, the latest year being 1985. To create annual values, the end-of-year value and the end-of-year value of the previous year, both deflated using the CPI (IFS line 64), are averaged. GDP is also deflated using the CPI. *Source:* International Monetary Fund (2008).

Democracy. The indicator assesses the degree of institutionalized democracy. Democracy is defined by three essential elements: institutions through which preferences about alternative policies and political leaders can be expressed, institutionalized constraints on the executive's power, and the guarantee of civil liberties. The indicator ranges from 0 to 10, with higher values corresponding to higher levels of democracy. *Source:* Polity IV Database (Gurr, Jagers and Marshall, 2007).

Political rights. The indicator reflects assessments of Freedom House analysts based on a checklist of questions about the election process, the prevalence of political competition, and the functioning of the government. Countries where free and fair elections are guaranteed, opposition in form of alternative parties or organizations exists and can be built up, and where the government is free from corruption and accountable for its actions receive the highest scores. The indicator ranges from 1 to 7. Originally, the indicator is the lower, the stronger the political rights. To prevent confusion the indicator is reversed: $Political\ rights = Original\ index \cdot (-1) + 8$. *Source:* Freedom House (2007).

Bureaucracy quality. Early values (before 1995) are taken from Political Risk Services' (PRS) bureaucracy assessments. PRS analysts give high ratings to bureaucracies that provide constant access to governmental services, tend to be “somewhat autonomous from political pressure,” and “have established mechanisms for recruitment and training.” The indicator ranges from 1 to 10. Since it reaches back to 1982, averages over the period 1982 to 1995 are used.

More recent values (after 1995) are taken from the Worldwide Governance Indicators (WGI) by Kaufmann, Kraay and Mastruzzi (2008). Their government effectiveness indicator measures “perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies”. It ranges continuously from -2.5 to 2.5 and assigns higher values to better governance outcomes. Averages over the period 1996 to 2007 are used. To facilitate the panel analysis the two indicators are made comparable by rescaling the WGI indicator in the following way: $Bureaucracy\ quality = Original\ index \cdot \frac{9}{5} + \frac{11}{2}$. *Source:* Political Risk Services (1996), Worldwide Governance Indicators (Kaufmann et al., 2008).

Corruption control. Early values (before 1995) correspond to the PRS corruption indicator. The PRS definition of corruption comprises “demands for special payments and bribes” in exchange for governmental services and support, but emphasizes “actual or potential corruption in the form of excessive patronage, nepotism, job reservations, ‘favor-for-favors’, secret party funding, and suspiciously close ties between politics and business”. On a ten-point scale from 1 to 10 PRS analysts give higher ratings to countries where corruption is less prevalent. Since the indicator reaches back to 1982, averages over the period 1982 to 1995 are used.

More recent values (after 1995) are taken from the Worldwide Governance Indicators by Kaufmann et al. (2008). Their corruption control indicator measures “perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests.” It ranges continuously from -2.5 to 2.5 and assigns higher values to lower levels of corruption. Averages over the period 1996 to 2007 are used. To facilitate the panel analysis the two indicators are made comparable by rescaling the WGI indicator in the following way: $Corruption\ control = Original\ index \cdot \frac{9}{5} + \frac{11}{2}$. *Source:* Political Risk Services (1996), Worldwide Governance Indicators (Kaufmann et al., 2008).

Schooling. Average years of schooling in the population aged 15 or older. *Source:* Barro and Lee (2000). When no information from Barro and Lee (2000) is available data from Cohen and Soto (2007) is used. Depending on the specification, this applies to at most six sample countries.

Real GDP per capita. Ln of real GDP per capita. *Source:* Heston et al. (2009).

Sample Countries

AFG Afghanistan ARE United Arab Emirates ARG Argentina AUS Australia
AUT Austria BEL Belgium BGD Bangladesh BHR Bahrain BOL Bolivia BRA
Brazil CAN Canada CHE Switzerland CHL Chile CHN China CIV Ivory Coast
COL Colombia CRI Costa rica CYP Cyprus DEU Germany DNK Denmark
DOM Dominican Republic DZA Algeria ECU Ecuador EGY Egypt ESP Spain
FIN Finland FRA France GBR United Kingdom GRC Greece GTM Guatemala
HKG Hong Kong HND Honduras HUN Hungary IDN Indonesia IND India IRL
Ireland IRN Iran IRQ Iraq ISL Iceland ISR Israel ITA Italy JOR Jordan JPN
Japan KEN Kenya KOR Korea KWT Kuwait LKA Sri Lanka MAR Morocco
MEX Mexico MYS Malaysia NGA Nigeria NIC Nicaragua NLD Netherlands
NOR Norway NZL New Zealand PAK Pakistan PAN Panama PER Peru PHL
Philippines POL Poland PRT Portugal PRY Paraguay ROM Romania SEN
Senegal SGP Singapore SLV El Salvador SWE Sweden SYR Syria THA Thailand
TTO Trinidad and Tobago TUN Tunisia TUR Turkey TZA Tanzania URY Uruguay
USA United States VEN Venezuela ZAF South Africa ZWE Zimbabwe

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