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Manthos, Delis; Iftekhar, Hasan and Pantelis, Kazakis

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Manthos D. Delis
Department of Economics
University of Ioannina
45110, Ioannina, Greece
E-mail: delis@aueb.gr

Iftekhar Hasan
Rensselaer Polytechnic Institute
and Bank of Finland
110, 8th Street, Troy, NY 12180, USA
E-mail: hasan@rpi.edu

Pantelis Kazakis
Department of Economics
University of Ioannina
45110, Ioannina, Greece
E-mail: panteliskazakis@hotmail.com

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Abstract

This paper provides cross-country evidence that variations in bank regulatory policies result in differences in income distribution. In particular, market discipline (private monitoring) and activity restrictions have an unambiguously positive and significant effect on income inequality and poverty, and this effect holds regardless of the level of economic and institutional development. In contrast, more stringent bank capital regulation and enhanced official supervisory power tend to reduce income inequality. However, this latter effect fades away for countries with low levels of economic and institutional development. We contend that these findings have new implications for the effects of bank regulations besides those related to their impact on financial stability.

Keywords: Bank regulations; Income inequality; Cross-country panel data

JEL classification: G28; O15; O16

1. Introduction

Andrei Shleifer (2009) is probably right in that the liberalization policies over the last three decades have left the world with higher incomes, longer average life spans, higher-quality education, and technological advances. Yet, the recent financial crisis reminds us of a debate that goes back to Adam Smith, David Ricardo, and Karl Marx regarding who economic downturns hurt, naturally linking recession with income inequality and issues of economic convergence (Evans, 1998). In particular, this crisis has taken a heavy toll on the banking sector and spread quickly to the real economy on a global basis. Free markets unambiguously failed to safeguard themselves and the economy, but so did regulatory policies aiming to provide a safety net for lenders, borrowers, and depositors. It may be too soon to examine who this crisis primarily hurt; however, it may be worth establishing a nexus between banking regulatory policies and income inequality. This paper is, to our knowledge, the first to assess the impact of specific bank regulatory policies on income inequality at a cross-country level.

The present study is primarily motivated by the extensive literature on the relationship between finance and the distribution of income. Demirgüç-Kunt and Levine (2009) offer a thorough review of this literature, and the main argument is that improvements in financial markets, contracts, and intermediaries tend to reduce income inequality. That is, financial imperfections, such as information and transaction costs, may be especially binding on the poor who lack collateral and credit history (Beck et al., 2007). Furthermore, Galor and Moav (2004) suggest that failing to liberalize the banking sector probably leads to local monopolies, a situation that most likely hurts the poor.

Contradicting the potential negative relationship between financial liberalization and inequality are earlier important contributions, such as Greenwood and Jovanovic (1990), who suggest that banks with a profit-maximizing behavior tend to lend to richer firms and

households and avoid lending to individuals with low levels of collateral, thus further increasing inequality. Yet, the full spectrum of the literature on the finance-inequality relationship does not explicitly account for the dynamic nature of policies related to the banking sector and considers the regulatory environment fixed. Phrased differently, the literature does not give special attention to the specific features of banking regulations in different countries and their evolution as a source of income inequality. Notably, the review of Demirgüç-Kunt and Levine (2009) emphasizes that researchers have not thoroughly examined the impact of policy initiatives, such as bank regulations and securities law, on income inequality.

Beck et al. (2010) and Barth et al. (2008) further motivate this study. The former study, which is closer to our goals, assesses the impact of U.S. bank deregulation of the 1970s to the 1990s on the distribution of income and finds that deregulation significantly reduces inequality by boosting incomes in the lower part of the income distribution but has little impact on incomes above the median. This is first-hand evidence that bank regulatory policies may have a central role in shaping the distribution of income.

Barth et al. (2008) update their 2001 database on bank regulations and show that differences in bank regulations among countries and over time are notable. This holds despite the Basel Committee's recent initiatives to harmonize and benchmark regulatory frameworks. Certainly, the main goal of bank regulatory policies is to make banking and financial systems more efficient and stable; however, they also may have strong implications for the macroeconomic environment. Given all of this, a study that assesses the impact of cross-country and timely variations in bank regulations on income inequality is worthwhile and feasible.

Last but not least, the analysis of the relationship between bank regulations and income inequality is stimulated by the debate on the impact of regulatory initiatives in other

industries on the distribution of income. Fortin and Lemieux (1997), for example, show that changes in institutions and deregulation of various industries have a significant effect on wage inequality. In a similar vein, Calderón and Chong (2009) focus on how labor-market institutions affect inequality. Additionally, Quinn and Inclán (1997) suggest that the presence of financial and other restrictions influence the relative prices of the inputs of production. If the restrictions limit the ability of highly skilled domestic workers in a particular sector to offer their services to foreign would-be investors, workers' skills and education in that sector diminish, as do their wages. Similar channels may be at work in a potential relationship between bank regulations and the distribution of income. For example, activity restrictions on banks may generate more fragmented markets, and borrowers' and investors' costs may rise, rendering the marginal cost of borrowing higher, especially for the poor.

Based on these considerations, we place the spotlight on the effects banking regulations may have on the distribution of income of different countries. More specifically, this paper examines empirically whether specific forms of national banking regulation affect income inequality and poverty. The comprehensive database on bank regulatory policies developed by Barth et al. (2001, 2006, 2008)—who group regulations into four major indices pertaining to capital regulation (requirements), official supervisory power, private monitoring (market discipline), and activity restrictions on banks—make this study possible. We trace the impact of these indices on income inequality and poverty for 116 countries over 1998–2007. As an additional analysis, we examine whether the effect of banking regulation varies with countries' economic/institutional development.

The major empirical findings are that market discipline and activity restrictions have an unambiguously positive and significant effect on income inequality and poverty, and this effect holds regardless of the level of economic and institutional development. Given that these regulations aim at containing the risk-taking appetite of banks and reducing systemic

risk, it becomes apparent that a policy trade-off between short-term, financial-stability enhancement and longer-term equality exists. In contrast, more stringent bank capital requirements and enhanced official supervisory power tend to reduce income inequality and the percentage of people earning a very low income. However, this latter effect fades away for countries with low levels of economic and institutional development. Hence, we are once again reminded that institutional capacity and the initial level of economic development are prerequisites for regulations to have a constructive effect on the real economy (e.g., Laffont, 2005, and references therein).

The rest of this paper is structured as follows: Section 2 describes the data set in the empirical analysis and evaluates the potential impact of specific types of bank regulation on income inequality. Section 3 discusses the econometric methodology and presents the empirical results. Section 4 offers some policy implications and concludes the paper.

2. Data description

To examine the impact of different forms of regulation on income inequality and poverty in the international setting, we collect country-level data. The final sample includes data from 116 countries for which information on bank regulations is available over the period 1998–2007. We use five-year averages for three reasons. First, annual macroeconomic data are noisy (Roine et al., 2009); second, although most of the variables have yearly observations, the data on income inequality variables are more limited; third, the regulatory conditions do not change on a yearly basis, nor are they likely to exert an impact on income inequality in the very short term. However, we verify that our main results hold when we use three- or 10-year time spans.

The rest of this section describes the variables in the empirical analysis and their sources and provides a theoretical discussion on why a relationship between regulations and

inequality may exist. Table 1 offers summary statistics, and Table 2 pair-wise correlations between the explanatory variables.

[INSERT TABLES 1 AND 2]

2.1. Income Inequality

The dependent variables used to proxy inequality are the Gini coefficient and the income share of people in the lower 10% or 20% of the income distribution (i.e., "the poor"). Data for both variables are from the United Nations University World Institute for Development Economics Research (UNU-WIDER) World Income Inequality Database (WIID).[1] The Gini coefficient is derived from the Lorenz curve and ranges between 0 and 1. A low Gini indicates a more equal distribution, with 0 corresponding to perfect equality; a higher Gini indicates more unequal distribution, with 1 corresponding to perfect inequality. The Gini coefficient is the most widely used measure of inequality in the relevant empirical literature (e.g., Beck et al., 2007; Dollar and Kraay, 2002). The average value in our data set is 39.62. Countries such as Brazil, Bolivia, and South Africa obtain very high values, and the Czech Republic, Slovenia, Australia, and the Scandinavian countries exhibit low inequality.

Economic policy, and thus regulations, may affect disproportionately the poor and the rich, or they may affect both groups in such a way that the total income distribution is unaffected. Because we are also interested in examining the impact of bank regulations on poverty, we use information on low income earners and, in particular, on people in the lowest income decile of the income distribution. Alternatively, we also experiment with data on the

[1] Following the directions of the WIID database, we use “household” as the income-sharing unit and “person” as the unit of analysis. The Gini coefficient is based on disposable income. We have verified that our estimation results are sufficiently robust for the use of the Gini coefficient reported in the World Bank’s World Development Indicators. Unfortunately, with this index we lose about 30 observations. Another excellent index of inequality is from the University of Texas Inequality Project; however, data on this indicator are available only up to 2002.

lowest 20% or 25% of the income distribution. Countries in our sample with substantial shares of population in the lower decile of the income distribution are the Latin American countries and South Africa. The Scandinavian countries are at the opposite end, with low shares of population in the lower decile of the income distribution.

2.2. Bank Regulations and Their Potential Impact on Income Inequality

Barth et al. (2001, 2006, 2008) thoroughly describe the regulatory conditions characterizing the banking industries of a large number of countries and offer four general indices of bank regulation (pertaining to capital regulation, official supervisory power, private monitoring, and activity restrictions on banks), which serve as the main explanatory variables of our study. Below we discuss the regulatory indices in some detail; the Appendix provides explicit information on their construction.

The capital-regulation (or capital-requirements) index shows the extent of both initial and overall capital stringency. Initial capital stringency refers to whether funds considered regulatory capital can include assets other than cash or government securities and borrowed funds, as well as whether the regulatory or supervisory authorities verify these sources. Differently phrased, overall capital stringency indicates whether banks and regulators consider risk elements and value losses when calculating regulatory capital. Theoretically, the capital-requirements index can take values between 0 and 8, with higher values indicating more stringent capital requirements. In this study, it ranges between 1.6 and 8. More stringent capital requirements usually aim at reducing systemic risk and buffering the economy from potential financial crises stemming from this risk. If crises hurt primarily the poor, and assuming that capital regulation succeeds in lowering systemic risk, then capital regulation should therefore lower income inequality.

Moreover, Repullo and Suarez (2008, 2009) highlight the procyclical effect of bank capital regulation in general and of Basel II in particular. Given that the majority of the literature on the relationship between income inequality and the business cycle seems to agree that a negative correlation exists between the two (Barlevy and Tsiddon, 2006), then a negative correlation is also expected between capital regulation and inequality. In contrast, based on the fact that capital requirements hold in both good and bad times and that capital is expensive, more stringent capital requirements may therefore raise banks' incentives to lend to "safer" individuals and firms and avoid lending to relatively poor individuals, even if they are creditworthy or will generate income with the capital. This would be especially true when the financial system and the economy are "anxious" (Fostel and Geanakoplos, 2008).

The supervisory power index reveals the power of the supervisory agencies to take specific actions, in relation to their authority, on bank managers, directors, shareholders, and auditors. This index has a maximum value of 14 and a minimum value of 0, with higher values indicating more powerful supervisors. In our data set, the supervisory power index ranges between 5 and 14. Official supervisory power corresponds to the second pillar of Basel II and reflects the ability of supervisors to enforce regulatory changes.

To this end, we expect that superior ability to enforce the regulatory initiatives of the other two pillars of Basel II would improve financial intermediation services and the screening and monitoring of projects. This, in turn, would allow banks to fund good investment ideas from individuals across the full spectrum of the income distribution, yielding a narrower income distribution and lower inequality (Beck et al., 2007). The same outcome will prevail if enhanced supervisory power guarantees a more competitive and efficient banking sector. That is, a bank's market power is usually associated with relationship lending and higher interest-rate margins, and both elements constitute barriers for individuals and firms with less collateral or poor credit. Therefore, if anything, we expect

the relationship between enhanced supervisory power and income inequality to be negative. Note, however, the implicit assumption so far that the laws giving supervisors power can be offset if public institutions are weak (e.g., government corruption is high or bureaucratic quality is low) and/or economic development has not reached an appropriate level; apparently, this is the case for developing countries that face higher absolute poverty.

We also employ a private-monitoring or market-discipline index, which reflects (i) the degree to which banks must disclose accurate information to the public (e.g., disclosure of off-balance-sheet items, risk-management procedures, etc.) and (ii) whether incentives exist to increase market discipline with policies such as subordinated debt and deposit-insurance schemes. In other words, this index measures the degree to which regulations empower, facilitate, and encourage the private sector to monitor banks. The index has a maximum value of 9 and a minimum value of 0, where higher values indicate more intense market discipline.

Finally, the fourth regulatory index considers whether securities, insurance, real estate activities, and ownership of nonfinancial firms are unrestricted, permitted, restricted, or prohibited. Theoretically, the activity restrictions index can range between 1 and 4, where higher values indicate higher restrictions. In our sample, the index takes values between 1 and 4, inclusive.

The impact of market discipline and activity restrictions on the distribution of income can theoretically go both ways. On one hand, enhanced private incentives to monitor banks and lower restrictions on bank activities encourage competition in the banking sector, lower barriers to entry, and guarantee better screening and monitoring of lending projects. In line with the discussion of the potential impact of supervisory power on inequality, this would allow individuals at the lower end of the income distribution to have easier access to lending and capital and to fund their investment ideas more efficiently and at a lower cost.

On the other hand, especially during periods of anxiety, intense private monitoring would tend to put more stress on banks to deliver good financial results, and banks may find it optimal not to fund potentially good but relatively risky projects (Repullo and Suarez, 2008). Intuitively, this implies that banks would make lending decisions on the basis of the ability to repay (i.e., availability of collateral) and not on the novelty and the potential of the investment project. In addition, looser activity restrictions on banks may lead to excess bank risk-taking, especially through a substantial increase in nontraditional activities, and a rise in the probability of bank failures. In particular, the recent crisis has shown that banks react to downturns by tightening their lending standards, which reduces lending to individuals with lower asset holdings and collateral. This would in fact widen the distribution of income.

In brief, for most bank regulations, theoretical arguments in favor of both a positive and a negative relationship with income inequality exist. However, as noted in the case of supervisory power, regulation reflects law, and a prerequisite for its effectiveness is that it creates a minimum level of economic and institutional development (e.g., Laffont, 2005). Apparently, identifying which effects prevail becomes fundamentally an empirical issue.

2.3. Control Variables

The control variables are from the extensive literature on the determinants of income inequality (e.g., Roine et al., 2009; Beck et al., 2007). In particular, we control for a number of macroeconomic, institutional, demographic, and economic policy elements that may affect income inequality.

First, we control for the initial level of income inequality in each country, using the level of inequality (Gini or lower decile) observed in 1997 (e.g., Deinenger and Squire, 1996;

Li et al., 1998). We expect that initial inequality is positively related to the contemporary level of inequality.[2]

Second, we use GDP per capita to control for the level of economic development, the inflation rate to control for the monetary conditions, and the population size to control for the demographics in each country. Information for these variables is from the World Development Indicators (WDI).

Third, the presence of quality institutions will probably tend to lower inequality, even though strong endogenous effects may prevail in this relationship (Chong and Gradstein, 2007). Also, quality institutions may enhance the impact of regulations on the distribution of income and weaker institutions may undermine it. To characterize the quality of institutions, we use the "Law and Order" and the "Bureaucratic Quality" indices of the International Country Risk Guide (ICRG).[3]

The literature's empirical findings concerning the impact of (i) trade openness, (ii) public policy, and (iii) general financial development on inequality are rather inconclusive. For example, trade openness increases income in standard Heckscher-Ohlin trade theory, but the extent to which it reduces inequality within countries remains questionable (Easterly, 2005). Our measure for trade openness is the sum of exports and imports as a share of GDP, and data come from the Penn World Table (PWT).

In order to account for the activity and growth of government over the period examined, we include the ratio of central government expenditure as a share of GDP (data also taken from the PWT). Higher government spending may disproportionately help the poor if used efficiently, but in cases where institutions are weak (primarily in developing countries), higher government spending may be wasteful.

[2] We also experiment with the level of inequality observed in 1990 and obtain similar results.

[3] We additionally employed variables pertaining to corruption in government, democratic accountability, property rights, etc. However, these tend to be highly correlated among themselves and with the *GDP per Capita* variable.

Finally, to purify the relationship between bank regulations and inequality from elements pertaining to the characteristics of the financial environment, we use two relevant control variables. As a proxy for the level of liquidity, we use the ratio of bank deposits to bank credit; as a proxy for the mobility of banks across countries, we use the ratio of offshore bank deposits to domestic bank deposits (both from Beck and Demirgüç-Kunt, 2009). The higher the first ratio, the higher the level of bank liquidity. A higher liquidity ratio also indicates lower dependence on the banking sector in that country, which indicates higher financial depth, and thus we expect it to relate negatively to inequality. The second variable shows how easy it is to transfer deposits across the border, with higher values reflecting high mobility of funds, higher tax evasion, etc. We expect, therefore, the latter variable to be positively associated with inequality.

3. Econometric Identification and Empirical Findings

In this section, we present the main results of the study and conduct sensitivity analyses to assess (i) potential endogeneity of the regulatory variables, (ii) the impact of outliers, and (iii) whether using a three-year or 10-year time interval alters the findings.

3.1. Bank Regulations and Income Inequality: Main Results

Here we utilize panel data estimation methods that are suitable for panels with a large cross-sectional dimension (116 countries) and a small time dimension (two five-year periods), thus excluding dynamic panel data methods at this stage (see also Roodman, 2009).[4] The empirical strategy in this section rests on the assumption that the distribution of income does not affect cross-country regulatory conditions. Theoretically, this assumption seems valid because regulators in the banking industry are generally concerned with promoting financial

[4] However, the sensitivity analysis uses dynamic panel data methods.

stability, making it unreasonable to assume that the distribution of income affects their decisions.[5] Both bank regulations and income inequality may be endogenous to other country-specific characteristics, such as the macroeconomic and/or the institutional environment. Below we explore this prospect using an instrumental variables regression method.

Panels with a large cross-sectional and small time dimension are usually prone to considerable heteroskedasticity, and a simple likelihood ratio test shows that our panel is no exception. Therefore, one may use ordinary least squares (OLS) with fixed effects or feasible generalized least squares (FGLS) with random effects, both corrected for heteroskedastic standard errors. However, the OLS fixed-effects estimator is likely to be problematic in our sample, because the regulation indices are many times constant for individual countries. Therefore, we favor the FGLS random-effects estimator (see also Roine et al., 2009) and we conduct sensitivity analyses using the OLS fixed-effects estimator proposed by Driscoll and Kraay (1998), which is suitable for panels with cross-sectional dependence.[6] Finally, because the panel includes only two time periods, it is unlikely that temporal dependence or time-specific autocorrelation are present, which we confirm using the Drukker (2003) test. We still include a time effect among the regressors.[7]

The first set of empirical results is in Table 3, where the dependent variable is the Gini coefficient. The first regression (column 1) includes the four regulatory indices and the macroeconomic and demographic variables. The rest of the regressions are enhanced with other policy, institutional, and financial-structure variables. In the third regression we include the institutional variables (*Bureaucratic quality* and *Law & order*) and *GDP per Capita* in the same equation. However, due to the high correlation among these variables, the results

[5] Beck et al. (2009) make the same assumption. A Durbin-Wu-Hausman endogeneity test also reveals that it is quite reasonable also in our sample (the p-value of the test is 0.55 with critical value 0.05).
[6] We also experiment with a differences-in-differences estimator, which yields similar results. In our context this approach has the disadvantage of having only two time periods available.
[7] The results are robust irrespective of whether time effect is included or excluded.

for the control variables are relatively inferior. The main results on the regulatory variables, with few exceptions, are consistent in all five regressions.

[INSERT TABLE 3]

Table 4 reports the estimations for the population in the lower 10% of the income distribution (columns 1 and 2) and the lower 20% of the income distribution (columns 3 and 4). Due to space constraints, Table 4 does not present all different specifications as Table 3; it does use the specifications in column 4 of Table 3 as a benchmark (i.e., the one with many controls and no multicollinearity problems). Specifications (1) and (3) are estimated using FGLS, and (2) and (4) using the OLS Driscoll and Kraay method.

[INSERT TABLE 4]

More stringent capital requirements enter with a negative and significant coefficient in all equations estimated with the FGLS method (Table 3, columns 1–4), but seem to be insignificant when using the OLS estimator (column 5).[8] Given this, we favor the results from the FGLS estimator and conclude that more stringent capital requirements lead to lower inequality.

In contrast, capital regulation seems to have an insignificant impact on the percentage of individuals in the lower 10% or 20% of the distribution of income (see Table 4). This is either because capital regulation diminishes the top incomes or because the regressions in Table 4 lose about 50 observations. Unfortunately, we cannot get more insight into the former case by examining the impact of capital regulation on the top incomes, because we

[8] This has been verified for additional specifications that are not presented here but are available upon request.

have a significant number of missing observations. We investigate further to see whether outliers drive the results in Table 3.

The impact of official supervisory power on both income inequality and very low incomes (see Tables 3 and 4, respectively) is clearly negative. Because higher supervisory power is usually related to more effective supervision of financial-intermediation services, this finding is in line with the position that improved screening and monitoring of investment projects and more competition in banking markets would drive funds to the best investment projects and thus provide equal opportunities to the relatively poor. Hence, besides the obvious effect that efficient supervision of banking markets may have in promoting financial stability, efficient supervision also seems to have a substantial, real, and positive long-run effect in lessening income inequality, allowing equal opportunities in accessing credit, and sustaining economic fairness. The question remains whether this result holds irrespective of the level of institutional and economic development.

In contrast to capital requirements and supervisory power, market discipline and activity restrictions seem to exacerbate inequality (see Table 3) and increase the share of individuals with very low income (see Table 4, columns 1–2). Intense private monitoring, especially policies involving disclosure of risk-management procedures to the public and income statement accruals for nonperforming loans, increases the pressure on banks to show good short-term results and probably leads them to avoid lending to individuals with less collateral (who are more risky).

Furthermore, market discipline also involves deposit-insurance protection schemes, which exist in most developed countries but not in developing ones. In the important contribution of Diamond and Dybvig (1983) and other more recent studies (e.g., Cull et al., 2005), government provision of deposit-insurance schemes can produce superior contracts in some circumstances and prevent bank runs and crises. In our context, this implies that

deposit-insurance schemes principally protect the poor, who are the people most hurt by crises.[9] In turn, the positive relationship between activity restrictions and inequality is straightforward considering that higher restrictions tend to produce bounded and less competitive markets, which tend to reduce the quality of screening and monitoring of projects. Under these conditions, it seems very likely that relationship lending or lending to well-established firms with high levels of collateral and strong credit history prevails, constraining access to credit for the relatively poor.

Notably, the findings on the impact of the latter two variables on inequality imply something that may not have received special attention in the regulatory literature. Specifically, on one hand bank regulations may aim, successfully in many circumstances, to strengthen the financial system and absorb failures that may lead to crises. On the other hand they may have adverse effects on the real economy in the long run. Phrased differently, regulatory policies that aim at short-term financial stability probably have an adverse long-term effect on income equality. An open question remains on whether the prevailing force is the positive impact that activity restrictions and market discipline have on inequality and poverty or the negative impact that capital regulation and supervisory power have on inequality. The next section discusses this issue, as well as whether these findings hold irrespective of the level of economic development.

3.2. Bank Regulations and Income Inequality: The Role of Development

A series of important contributions (see Estache and Wren-Lewis, 2009, and references therein) view economic and institutional development as a prerequisite for regulations to have a real effect on the economy. In fact, as Bourguignon (2005) states, "Today, it is increasingly recognized that, in many circumstances, the problem [in the developing

[9] For a review of how financial crises disproportionately hurt the relatively poor, see Baldacci et al. (2002).

countries] was that reformers disregarded the functioning of regulatory institutions, assuming implicitly they would work as in developed countries." To account for this complementarity in the effect of regulations and initial level of development, we include among the regressors the product of our regulatory variables with our proxy for economic development (i.e., the *GDP per Capita* variable).[10]

An important concern in using interaction effects is that the level of the variables and the interaction effect may be highly collinear, rendering inference impossible. As the upper part of Table 5 shows, this is indeed the case in our sample, with some of the pair-wise correlations reaching values above 0.90. An easy way to deal with this issue is through "mean-centering" the variables. Mean-centering involves computing the mean of each independent variable and then replacing each value with the difference between it and the mean. As shown in the lower part of Table 5, the correlation between the products and their levels falls now to acceptable values.

[INSERT TABLE 5]

Estimation results are in Table 6. We first include the interaction of each regulatory variable with *GDP per Capita* (columns 1–4), and then we include all interaction effects simultaneously (column 5). Finally, we re-estimate the specification of column 5 with the OLS Driscoll and Kraay (1998) method. The results show that the negative impact of capital requirements and—most important—supervisory power on inequality weakens substantially for those countries with low *GDP per Capita*. In fact, the specifications with interaction terms allow us to examine whether the total effect of regulations can change sign depending on the value of *GDP per Capita*.

[10] We also experiment with the product of our regulatory variables with the institutional variables (i.e., *Bureaucratic quality* and *Law & order*). As shown, these variables are highly correlated with the *GDP per Capita* variable and indeed inference is unaltered. The results are available upon request.

[INSERT TABLE 6]

To calculate the value of *GDP per Capita* at which the impact of *Capital requirements* and *Supervisory power* turns positive, we set the derivative with respect to the two regulatory variables of the estimated equations in Table 6 equal to 0. This yields a *GDP per Capita* equal to approximately $8,622 for the specification in column 1 and $8,413 for the specification in column 5 (their average is $8,518). When we take the derivative with respect to *Supervisory power*, the values are $8,140 and $7,918 for the specifications in columns 2 and 5, respectively (their average is $8,029). Thus, at least in our sample, reaching these rough values of *GDP per Capita* (as a proxy for economic development) is a prerequisite for any negative impact of capital regulation and supervisory power to occur on inequality. Markedly, these *GDP per Capita* values are, as of 2007, close to those of Bulgaria and Jamaica. In addition, 65 countries are above the averages of these values and 51 are below them. Evidently, for a substantial number of developing countries the Gini coefficient will not decrease as a result of more stringent capital requirements or more powerful supervisors.

In contrast to these findings, the interaction effects of *GDP per Capita* with *Market discipline* and *Activity restrictions* are statistically insignificant, suggesting that higher market discipline and activity restrictions increase inequality, irrespective of the level of development. These results also hold if the two regulatory variables interact with either of the two institutional variables (*Bureaucratic quality*, *Law & order*), implying that institutional development is also irrelevant in this framework.

Overall, this analysis highlights that a clear trade-off exists between stricter banking regulation and long-term income equality, and although a consensus seems to exist that

stricter regulatory policies can promote more stable banking systems, these policies still can disproportionately hurt the poor. This finding is in fact in line with Beck et al. (2010), which shows that deregulating the banking system in the United States in the 1970s and 1980s led to increased incomes, particularly for the poor.

3.3. Bank Regulations and Income Inequality: Other Sensitivity Analyses

In this section, we use as a benchmark the specifications in column (4) of Table 3, column (1) of Table 4, and column (5) of Table 6 to examine the sensitivity of our results with respect to (i) the use of three- or 10-year averages of the data (instead of five-year averages), (ii) other endogeneity issues, and (iii) the impact of outliers.[11]

The results seem robust for the five-year time periods. Here we examine whether these results hold for 10- and three-year time intervals, and we report the results in the first six columns of Table 7.

[INSERT TABLE 7]

With very few exceptions, the findings are equivalent to those in previous tables. When we use three-year averages of the data, some of the results are inferior (e.g., coefficients on *Supervisory power* and *Log of population* in column 1), which may indicate that a three-year period may not be long enough to describe long-term trends in the macro variables. When using 10-year averages of the data, the coefficients on *Supervisory power* and the *Log of population* become statistically significant, as the respective specifications of Tables 3, 4, and 6 show. In fact, in the regressions on 10-year averages the coefficient on

[11] We have also verified that the rest of the specifications produce similar results. In addition, our main results carry through when using pure cross-sectional data (for the year 2008) and associated estimation techniques.

inflation becomes positive and statistically significant, which is intuitive because a prolonged period of high inflation would widen the income distribution and primarily hurt the poor through increased uncertainty and shoe-leather costs.

As discussed, there is no evidence that causality runs from inequality to bank regulations. However, the state of the macroeconomic environment may simultaneously determine both elements (see Evans, 1998). For example, when systemic risk rises, the resulting bank failures will spread to the real economy, which is likely to affect the income distribution. Another issue here is that some of the control variables are also likely to be endogenous in the income inequality equations, and this may also bias the estimates on the regulatory variables in an unknown direction and magnitude. Moreover, in many situations we could be more interested in examining whether changes in regulations yield changes in inequality. A dynamic panel estimator can address these issues (see also Beck et al., 2007).[12] We carry out the empirical analysis using a number of alternative dynamic panel data models, which yield very similar results. We report the results of the Blundell and Bond (1998) method, which extracts additional moment conditions from the differences of the variables (for a discussion of the various methods, see Arellano, 2003). All regulatory variables, as well as *GDP per Capita*, *Inflation*, *Trade openness*, and *Government expenditure* are treated as endogenous, because reverse causality with inequality may exist (see also Beck et al., 2007; Roine et al., 2009). Econometrically, this implies that the endogenous variables (say, x) are treated symmetrically with the dependent variable (say, y). In this case, the lagged values of $x_{i,t-2}$ and $y_{i,t-2}$ and longer lags will be valid instruments.[13] The estimation takes the dependent and independent variables in differences, and this lowers the number of observations to 94.

[12] The problem here is that we only have two periods in our sample, and all dynamic panel data models will somewhat lower the number of observations and thus the explanatory power of our data. Nevertheless, using this method is required to see whether dynamics and endogeneity issues prevail.

[13] For a thorough discussion of how lags can be properly used as instrumental variables under the Blundell and Bond (1998) method, see Bond (2002).

For the dependent variables (Gini coefficient and the percentage of individuals in the lower decile of the distribution of income) and all endogenous variables except *Bank regulations*, lags are available for t-2 and t-3. For bank regulations we experiment with two additional instruments. First, we use the legal origin of the countries in our sample (data are from La Porta et al., 2008). Several papers have shown that differences in legal origins are significantly related to financial sector developments, perhaps because different legal traditions emphasize different levels of the rights of property owners or because some systems are more adaptable to exogenous changes than others (see Clarke et al., 2002 and references therein).

Second, we use a measure of citizen distrust toward government. Aghion et al. (2009) show that general forms of government regulation are strongly correlated with trust, a relationship that probably stems from the fact that distrust creates public demand for regulation. Unfortunately, data from the World Values Survey on the trust variable in Aghion et al. (2009) does not cover some countries in our sample, which further lowers the number of observations to 89. Therefore, we report the regressions with the legal origins variable (the rest are available on request).

The results are in the last three columns of Table 7. The Sargan test shows no evidence of overidentifying restrictions. Even though the equations indicate that first-order (AR1) autocorrelation is present, this does not imply that the estimates are inconsistent. Inconsistency would be implied if second-order autocorrelation was present, but the test for AR2 errors (see last lines of Table 7) rejects this case. One difference in the results compared to those of Table 3 is that in column (7) the coefficient on *Capital requirements* is statistically significant only at the 10% level, which verifies that *Capital requirements* is probably the weaker determinant of inequality among our regulatory variables. This is also corroborated from the insignificant coefficient of *Capital requirements* in column (9). In the

GMM regression with distributional effects (column 8), much like with the regressions in Table 6, the negative effect of *Capital requirements* and of *Supervisory power* on inequality fades away for less developed countries. The rest of the results are also in line with the previous results. Therefore, we may conclude that endogeneity issues do not substantially affect the original findings on the regulations-inequality nexus.

As mentioned, a final potential drawback to the empirical analysis may be that outliers drive results (i.e., the inclusion of particular countries). To determine whether our results are sensitive to outliers, we perform a jackknife analysis (Efron and Tibshirani, 1993). This method involves estimating the initial equation by excluding in each replication one or more cross-sectional units (countries).

Table 8 reports the coefficients, as well as the associated t-statistics, when excluding the maximum and minimum estimated values of these coefficients. Once again, the first regression corresponds to regression (4) of Table 3, the second to regression (1) of Table 4, and the third to regression (5) of Table 6. If outliers do not have a significant impact on the regression equations, then the coefficients obtained from excluding both the minimum and the maximum values must retain their signs and statistical significance according to the respective regressions in Tables 3, 4, and 6. Comparing these coefficients with their equivalent ones, we conclude that our results are robust to the exclusion of particular observations that yield extreme estimates and hence that outliers do not substantially affect the main implications of the paper.

[INSERT TABLE 8]

4. Conclusions and Policy Considerations

Even though economists disagree on whether the distribution of income has widened or narrowed over the last decades, many assert that economic policy has an impact on it. This study links, for the first time, the full array of banking regulations with income inequality, and the findings suggest that banking regulations are quite significant in explaining inequality. In particular, higher supervisory power and to a lesser degree more stringent capital requirements decrease the Gini coefficient. In contrast, stricter market discipline and activity restrictions raise both inequality and the share of individuals in the lower deciles of the distribution of income. Note, however, that the positive effect of higher capital requirements and supervisory power on equality fades away for less developed countries, but the corresponding negative effect of stricter market discipline and activity restrictions holds irrespective of the level of development.

Bank regulations and associated reforms aim at enhancing the creditworthiness of banks and at improving the stability of the financial sector. Several studies over the last decade show that regulations do matter in shaping bank risk (e.g., Laeven and Levine, 2009; Agoraki et al., 2009) or in affecting bank efficiency in particular (Barth et al., 2010) and the probability of banking crises in general (e.g., Barth et al., 2008). Yet, what if bank regulations have other real effects on the economy besides those associated with banking stability? And, more important, what if these real effects counteract the intended stabilizing effects?

Two issues should be considered in answering these questions. First, the literature on the relationship between bank regulations and financial stability is inconclusive. In fact, different types of regulation may have opposing effects on financial stability, according to the existing research. Second, even if we assume that bank regulations like more stringent market discipline requirements lower banks' risk-taking appetite and enhance stability (Barth

et al., 2008), the empirical findings here suggest that stricter market discipline and activity restrictions have some negative association with the earnings of the relatively lower income population. That is, banks pass the increased cost of higher transparency (i.e., higher market discipline) and their lower ability to diversify (i.e., stricter activity restrictions) on to the relatively lower-income population that lacks good credit and collateral. In other words a tradeoff between banking stability and inequality may be present. Given the contemporary discussion surrounding (i) the rebirth of Glass-Steagall-type regulatory reforms and (ii) the need to increase the level of private monitoring and discipline in banking markets, there may be more to think about before taking those steps.

We certainly do not suggest that improving transparency in banking markets or raising activity restrictions is bound to affect the economic system adversely. More research is necessary to reach this conclusion, and at least five more years of data are needed so that empirical analysts can have a broader picture of the recent financial crisis and richer data sets that encompass its consequences.

However, three clear suggestions emerge from this paper and are also consistent with the findings of Beck et al. (2010). First, the liberalization of banking markets, primarily through abolition of activity restrictions, helps the poor get easier access to credit. This in turn allows them to escape the poverty trap and substantially raise their incomes. Second, appropriate regulation should provide less costly incentives to banks and firms to increase market discipline without hurting the relatively poor. Information technologies that would lower the cost of transparency and more effective onsite supervision that would enhance the trust in the banking system may help achieve this goal. Finally, economies first need strong and independent institutions to see any positive effect of capital regulation and supervisory power on equality. Though deregulation had a negative impact on inequality in the United States, this may not be true for countries with weak institutions in which the socioeconomic

elites directly affect the decisions and policies of supervisors. Clearly, these economies need to take further steps to enhance central bank independence, create higher transparency among regulators, and monitor the level of capital requirements more closely.

Clearly, more research is needed on this issue. An interesting extension of this paper concerns the potential impact of bank regulations on macroeconomic convergence (Evans and Karras, 1996) or the speed of convergence (Evans, 1997). In addition, the interplay between regulations and their actual implementation may have more to say about credit availability and income inequality. Finally, more detailed datasets from both developed and developing countries could highlight the channels that may affect the bank regulations-income inequality nexus. We leave these ideas for future research.

Appendix - Information on Regulatory Variables

Variable	Description
Capital requirements	This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, and the opposite occurs for questions 7 and 8 (i.e., yes=0, no=1). The questions are: (1) Is the minimum required capital asset ratio (risk-weighted) in line with Basel guidelines? (2) Does the ratio vary with market risk? (3-5) Before determining minimum capital adequacy, are any of the following are deducted from the book value of capital? (a) market value of loan losses not realized on the financial statements (b) unrealized losses on securities portfolios (c) unrealized foreign exchange losses. (6) Have regulatory/supervisory authorities verified the sources of funds to be used as capital? (7) Can assets other than cash or government securities provide the initial or subsequent injections of capital? (8) Can borrowed funds provide the initial disbursement of capital?
Supervisory power	This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each of the following 14 questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors legally required to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Does the institution disclose off-balance-sheet items to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend directors' decisions to distribute dividends? (8) Can the supervisory agency suspend directors' decisions to distribute bonuses? (9) Can the supervisory agency suspend directors' decisions to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare the bank insolvent? (11) Does banking law allow a supervisory agency or any other government agency (other than a court) to suspend some or all ownership rights at a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) supersede shareholder rights? (13) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace management? (14) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace directors?
Market discipline	This variable is determined by adding 1 if the answer is yes to questions 1-7 and 0 otherwise, and the opposite occurs for questions 8 and 9 (i.e., yes=0, no=1). (1) Is subordinated debt allowed (or required) capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any nonbank financial subsidiaries? (3) Are off-balance-sheet items disclosed to the public? (4) Must banks disclose their risk-management procedures? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by certified/licensed auditor mandatory for banks? (8) Does accrued, unpaid interest/principal on nonperforming loans appear on the income statement? (9) Is there an explicit deposit-insurance protection system?
Activity restrictions	The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of nonfinancial firms. These activities can be unrestricted, permitted, restricted, or prohibited and receive values of 1, 2, 3, or 4, respectively. We create an overall index by calculating the average value of the four categories.

Note: The individual questions and answers are from the World Bank database developed by Barth, et al. (2001, 2006, 2008).

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Table 1

Summary Statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Gini coefficient	218	39.62	10.24	22.18	62.50
Lower 10%	123	31.96	7.99	18.97	49.02
Lower 20%	84	47.93	9.56	33.34	63.63
Capital requirements	232	5.08	1.48	1.60	8.00
Supervisory power	232	11.08	2.14	5.00	14.00
Market discipline	228	6.36	1.03	3.00	9.00
Activity restrictions	230	2.56	0.58	1.00	4.00
Log of population	398	16.00	1.75	11.23	20.99
GDP per capita	399	10744.09	11296.18	154.22	73568.63
Inflation	233	29.03	347.23	-2.83	5304.78
Trade openness	393	83.78	52.15	1.91	434.39
Government expenditure	393	17.11	7.98	3.79	69.49
Bureaucratic quality	340	2.30	1.12	0.00	4.00
Law & order	340	4.02	1.32	0.93	6.00
Bank liquidity	389	0.89	0.41	0.11	3.03
Mobility of funds	385	1.69	18.55	0.00	303.59

The table reports the number of observations and summary statistics (mean, standard deviation, minimum, and maximum) for the variables in the empirical analysis. Gini coefficient is the measure of inequality obtained from the Lorenz curve. *Lower 10%* and *Lower 20%* are the percentages of population included in the lower 10% and 20% of the income distribution. *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bureaucratic quality* and *Law & order* are the institutional-quality indicators from the International Country Risk Guide. *Bank liquidity* is defined as the ratio of bank deposits to bank credit, and *Mobility of funds* is the ratio of offshore bank deposits to domestic bank deposits.

Table 2
Correlation Matrix

	Initial Gini	Capital requir.	Superv. power	Market discipl.	Activity restrict.	Log of popul.	GDP per cap.	Inflation	Trade open.	Gov. expend.	Bur. quality	Law & order	Dep. on banks	Mob. of funds
Initial Gini	1.000													
Capital requirements	0.066	1.000												
Supervisory power	0.172	0.149	1.000											
Market discipline	0.110	-0.005	0.060	1.000										
Activity restrictions	0.363	0.094	0.219	-0.030	1.000									
Log of population	0.064	0.000	0.108	-0.037	0.054	1.000								
GDP per capita	-0.463	0.011	-0.233	0.063	-0.465	-0.222	1.000							
Inflation	0.210	0.052	0.008	-0.154	0.220	0.007	-0.340	1.000						
Trade openness	-0.056	0.003	0.054	0.091	-0.197	-0.440	0.404	-0.146	1.000					
Government expenditure	-0.029	0.085	-0.027	-0.235	0.138	0.057	-0.397	0.151	-0.232	1.000				
Bureaucratic quality	-0.424	0.059	-0.202	0.093	-0.411	-0.127	0.797	-0.371	0.256	-0.359	1.000			
Law & order	-0.582	-0.014	-0.220	0.020	-0.384	-0.207	0.685	-0.305	0.235	-0.146	0.543	1.000		
Bank liquidity	-0.202	0.034	-0.318	0.126	-0.176	-0.154	0.406	-0.215	-0.043	-0.060	0.404	0.399	1.000	
Mobility of funds	0.289	-0.053	0.077	0.045	0.069	-0.240	-0.085	0.104	0.136	-0.054	-0.148	-0.169	-0.053	1.000

The table reports the correlation coefficients between the explanatory variables in the empirical analysis. *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bureaucratic quality* and *Law & order* are the institutional-quality indicators from the International Country Risk Guide. *Bank liquidity* is the ratio of bank deposits to bank credit, and *Mobility of funds* is the ratio of offshore bank deposits to domestic bank deposits.

Table 3
Bank Regulations and Income Inequality: Gini Coefficient Regressions

	(1)	(2)	(3)	(4)	(5)
Initial Gini	0.813***	0.811***	0.786***	0.800***	0.756***
	(54.97)	(55.39)	(65.59)	(47.71)	(39.95)
Capital requirements	-0.133***	-0.142***	-0.126*	-0.167***	-0.139
	(-2.73)	(-2.81)	(-1.69)	(-3.38)	(-1.23)
Supervisory power	-0.127***	-0.177***	-0.189***	-0.190***	-0.133***
	(-2.70)	(-3.30)	(-3.31)	(-3.41)	(-5.47)
Market discipline	0.268***	0.234**	0.548***	0.231**	0.215**
	(2.78)	(2.35)	(5.58)	(2.57)	(2.28)
Activity restrictions	0.901***	0.977***	0.839***	0.969***	0.838***
	(5.49)	(5.35)	(3.79)	(5.38)	(8.25)
Log of population	0.267***	0.215***	0.156*	0.256***	0.390***
	(3.77)	(3.08)	(1.75)	(3.67)	(3.41)
GDP per capita	-0.000***	-0.000***	0.000	-0.000***	-0.000***
	(-5.12)	(-4.78)	(0.17)	(-4.91)	(-2.99)
Inflation	0.033**	0.028*	0.009	0.020	0.031*
	(2.04)	(1.81)	(0.38)	(1.29)	(1.82)
Time effect	-0.241	-0.088	-0.222	-0.025	-0.129
	(-1.24)	(-0.40)	(-1.15)	(-0.12)	(-1.60)
Trade openness		-0.005**	-0.002	-0.005**	-0.003**
		(-2.32)	(-0.74)	(-2.22)	(-2.25)
Government expenditure		-0.021	-0.024	-0.020	-0.012
		(-1.44)	(-1.45)	(-1.33)	(-0.52)
Bureaucratic quality			-0.966***		
			(-4.44)		
Law & order			-0.471***		
			(-3.87)		
Bank liquidity				0.186	-0.317
				(0.63)	(-0.64)
Mobility of funds				1.041***	1.628***
				(2.61)	(11.29)
Constant term	2.186	4.435**	8.507***	4.371**	3.747***
	(1.32)	(2.26)	(3.24)	(2.53)	(4.97)
Observations	156	156	148	156	156
Wald test	12728.82	12127.74	14406.71	25443.33	
P-value	0.000	0.000	0.000	0.000	
R-square					0.853

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable is the Gini coefficient. Regressions (1)-(4) are estimated by feasible generalized least squares (FGLS) with heteroskedastic errors and regression (5) with the fixed-effects Driscoll and Kraay (1998) method. *Initial Gini* is the Gini coefficient in the year before our sample period begins. *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bureaucratic quality* and *Law & order* are the institutional-quality indicators from the International Country Risk Guide. *Bank liquidity* is the ratio of bank deposits to bank credit, and *Mobility of funds* as the ratio of offshore bank deposits to domestic bank deposits. The Wald's test and its associated p-value show the goodness of fit of the FGLS regressions and the R-square the goodness of fit of the fixed-effects regression. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

Table 4
Bank Regulations and Income Inequality: Top and Lower Decile Regressions

	Lower 10%		Lower 20%	
	(1)	(2)	(3)	(4)
Initial Gini	0.606***	0.576***	0.605***	0.550***
	(31.75)	(68.02)	(30.84)	(63.60)
Capital requirements	0.038	-0.047	0.15	0.092
	(0.50)	(-0.40)	(1.15)	(1.61)
Supervisory power	-0.173***	-0.078***	-0.023	0.018
	(-3.46)	(-2.83)	(-0.44)	(0.36)
Market discipline	0.368***	0.370***	0.086	-0.059
	(3.60)	(4.38)	(0.70)	(-0.16)
Activity restrictions	1.113***	1.143***	0.763***	0.782*
	(4.60)	(5.00)	(3.37)	(1.94)
Log of population	0.273***	0.379***	0.097	0.036
	(3.03)	(4.56)	(1.14)	(0.24)
GDP per capita	-0.000***	-0.000***	-0.000***	-0.000***
	(-3.66)	(-2.94)	(-6.14)	(-11.86)
Inflation	-0.029**	-0.010**	-0.009	-0.019**
	(-1.99)	(-2.08)	(-0.48)	(-2.11)
Trade openness	-0.005	-0.000	-0.004	-0.013*
	(-1.37)	(-0.14)	(-0.93)	(-1.68)
Government expenditure	-0.017	-0.027*	-0.177***	-0.248***
	(-0.99)	(-1.75)	(-4.87)	(-7.33)
Bank liquidity	0.424**	0.616***	0.210	0.034
	(2.33)	(3.32)	(0.66)	(0.21)
Mobility of funds	0.417*	0.641***	0.658**	0.893***
	(1.81)	(2.84)	(2.60)	(3.20)
Time effect	-0.526**	-0.167***	0.251	0.608
	(-1.98)	(-4.43)	(0.94)	(1.66)
Constant term	0.409	-1.198	23.799***	30.370***
	(0.17)	(-1.24)	(8.57)	(6.69)
Observations	109	109	75	75
Wald test	50022.51		25677.34	
P-value	0.000		0.000	
R-square		0.837		0.894

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable in regressions (1) and (2) is the share of the population in the lower 10% of the income distribution; in regressions (3) and (4) the dependent variable is the share of the population in the lower 20% of the income distribution. Regressions (1) and (3) are estimated using the feasible generalized least squares (FGLS) method with heteroskedastic errors, and regressions (2) and (4) use the fixed-effects Driscoll and Kraay (1998) method. *Initial Gini* is the Gini coefficient in the year before our sample period begins. *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bank liquidity* is the ratio of bank deposits to bank credit, and *Mobility of funds* is the ratio of offshore bank deposits to domestic bank deposits. The Wald's test and its associated p-value show the goodness of fit of the FGLS regressions, and the R-square shows the goodness of fit of the fixed-effects regression. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

Table 5
Correlations of Variables before and after Mean-Centering

Before mean-centering	(1)	(2)	(3)	(4)	(5)	(1)*(2)	(1)*(3)	(1)*(4)	(1)*(5)
GDP per capita (1)	1.000								
Capital requirements (2)	0.048	1.000							
Supervisory power (3)	-0.167	0.150	1.000						
Market discipline (4)	0.167	0.082	0.092	1.000					
Activity restrictions (5)	-0.442	0.057	0.158	-0.030	1.000				
(1)*(2)	0.933	0.303	-0.088	0.183	-0.390	1.000			
(1)*(3)	0.963	0.093	0.043	0.205	-0.395	0.927	1.000		
(1)*(4)	0.977	0.063	-0.124	0.306	-0.424	0.918	0.957	1.000	
(1)*(5)	0.939	0.063	-0.133	0.169	-0.205	0.891	0.917	0.912	1.000

After mean-centering	(1)	(2)	(3)	(4)	(5)	(1)*(2)	(1)*(3)	(1)*(4)	(1)*(5)
GDP per capita (1)	1.000								
Capital requirements (2)	0.048	1.000							
Supervisory power (3)	-0.167	0.150	1.000						
Market discipline (4)	0.167	0.082	0.092	1.000					
Activity restrictions (5)	-0.442	0.057	0.158	-0.030	1.000				
(1)*(2)	0.111	0.158	0.112	0.064	-0.028	1.000			
(1)*(3)	-0.089	0.118	0.262	0.125	0.135	0.258	1.000		
(1)*(4)	0.235	0.057	0.108	0.167	-0.085	0.042	0.201	1.000	
(1)*(5)	-0.546	-0.024	0.105	-0.082	0.327	0.070	0.147	-0.282	1.000

The table reports the correlation coefficients between *GDP per Capita*, the four bank-regulation indices, and the product of *GDP per Capita* and each and every one of the regulation indices. The upper part of the table reports the correlation coefficients of the original data set, and the lower part of the table after mean-centering has been applied.

Table 6
Bank Regulations and Income Inequality: Distributional Effects Due to Economic Development

	(1)	(2)	(3)	(4)	(5)	(6)
Initial Gini	0.804***	0.770***	0.797***	0.802***	0.774***	0.748***
	(48.47)	(57.15)	(45.69)	(44.29)	(53.45)	(40.60)
Capital requirements	-0.243***	-0.0949**	-0.179***	-0.163***	-0.122**	-0.176
	(-3.76)	(-2.22)	(-3.59)	(-3.26)	(-2.08)	(-1.35)
Supervisory power	-0.151***	-0.302***	-0.202***	-0.187***	-0.289***	-0.214***
	(-2.73)	(-5.83)	(-3.57)	(-3.28)	(-5.45)	(-16.89)
Market discipline	0.296***	0.219***	0.341***	0.231**	0.214**	0.176**
	(2.64)	(2.74)	(2.83)	(2.52)	(2.52)	(2.07)
Activity restrictions	0.933***	1.025***	1.106***	0.937***	0.991***	0.776***
	(4.45)	(7.19)	(5.80)	(4.70)	(5.65)	(13.46)
Log of population	0.265***	0.479***	0.284***	0.253***	0.491***	0.469***
	(3.30)	(7.89)	(3.41)	(3.54)	(6.26)	(3.58)
GDP per capita	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(-4.17)	(-8.18)	(-4.43)	(-4.32)	(-6.55)	(-3.32)
Inflation	0.030*	0.011	0.020	0.020	0.012	0.028
	(1.87)	(0.90)	(1.23)	(1.34)	(0.87)	(1.48)
Trade openness	-0.007**	-0.007***	-0.004	-0.006**	-0.007**	-0.004***
	(-2.42)	(-3.42)	(-1.14)	(-2.23)	(-2.48)	(-15.45)
Government expenditure	-0.002	-0.029***	-0.015	-0.019	-0.028**	-0.019
	(-0.16)	(-2.59)	(-1.06)	(-1.26)	(-2.27)	(-0.72)
Bank liquidity	0.024	0.920***	0.135	0.220	0.882***	0.413
	(0.09)	(3.22)	(0.42)	(0.70)	(2.66)	(0.69)
Mobility of funds	1.093***	1.400***	0.961**	1.053***	1.488***	1.645***
	(2.62)	(4.05)	(2.34)	(2.61)	(4.08)	(16.12)
Time effect	-0.027	0.065	-0.139	-0.029	0.258	0.120***
	(-0.12)	(0.36)	(-0.62)	(-0.13)	(1.32)	(3.75)
GDP per capita * Capital requirements	0.000*				0.000**	0.000*
	(1.80)				(2.32)	(1.84)
GDP per capita * Supervisory power		0.000***			0.000***	0.000***
		(7.67)			(7.02)	(13.28)
GDP per capita * Market discipline			0.000		0.000	0.000
			(0.51)		(1.37)	(1.41)
GDP per capita * Activity restrictions				0.000	-0.000	-0.000
				(0.37)	(-0.38)	(-0.28)
Constant term	4.087***	1.675	3.987***	4.407***	1.231	2.505*
	(2.87)	(1.47)	(2.58)	(3.55)	(0.82)	(1.81)
Observations	156	156	156	156	156	156
Wald test	9915.51	23337.44	11291.91	20084.7	23303.89	
P-value	0.000	0.000	0.000	0.000	0.000	
R squared						0.8585

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable is the Gini coefficient. Regressions (1)-(5) are estimated using the feasible generalized least squares (FGLS) method with heteroskedastic errors, and regression (6) uses the fixed-effects Driscoll and Kraay (1998) method. *Initial Gini* is the Gini coefficient in the year before our sample period begins. *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bank liquidity* is the ratio of bank deposits to bank credit, and *Mobility of funds* is the ratio of offshore bank deposits to domestic bank deposits. The Wald's test and its associated p-value show the goodness of fit of the FGLS regressions, and the R-square shows the goodness of fit of the fixed-effects regression. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

Table 7
Other Sensitivity Analysis

	3-year averages			10-year averages			GMM regressions		
	(1) Gini	(2) Gini	(3) Lower 10%	(4) Gini	(5) Gini	(6) Lower 10%	(7) Gini	(8) Gini	(9) Lower 10%
Initial Gini or first lag of Gini	0.799***	0.792***	0.615***	0.741***	0.744***	0.560***	0.541***	0.555***	0.488***
	(43.57)	(42.13)	(31.81)	(112.64)	(68.72)	(46.13)	(18.74)	(20.17)	(27.12)
Capital requirements	-0.201***	-0.175**	0.069	-0.104**	-0.136**	0.081	-0.131*	-0.127**	0.051
	(-3.31)	(-2.25)	(0.80)	(-2.36)	(-2.15)	(1.34)	(-1.76)	(-2.31)	(0.70)
Supervisory power	-0.065	-0.188***	-0.184***	-0.206***	-0.189***	-0.252***	-0.188***	-0.275***	-0.155***
	(-0.96)	(-2.70)	(-3.54)	(-10.42)	(-4.23)	(-6.56)	(-3.14)	(-5.01)	(-2.80)
Market discipline	0.341***	0.285**	0.366***	0.515***	0.454***	0.335***	0.327***	0.232***	0.348***
	(2.64)	(2.29)	(3.83)	(6.96)	(3.74)	(3.95)	(3.44)	(2.67)	(3.14)
Activity restrictions	1.156***	1.083***	1.181***	0.998***	1.047***	1.350***	0.881***	0.876***	1.007***
	(5.48)	(5.83)	(4.42)	(12.92)	(6.14)	(5.63)	(4.01)	(4.44)	(4.07)
Log of population	0.165	0.276***	0.225**	0.349***	0.380***	0.177***	0.233***	0.387***	0.281***
	(1.62)	(3.15)	(2.32)	(11.49)	(6.56)	(3.44)	(2.92)	(4.07)	(3.10)
GDP per capita	-0.000***	-0.000***	-0.000	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(-4.17)	(-4.49)	(-1.42)	(-12.12)	(-6.06)	(-5.72)	(-4.10)	(-4.61)	(-4.01)
Inflation	0.007	-0.011	-0.016	0.148***	0.149***	0.110	0.006	0.022	-0.010
	(0.35)	(-0.46)	(-1.37)	(22.10)	(10.42)	(5.95)	(0.84)	(1.04)	(-1.02)
Time effect							-0.035	0.233	-0.303
							(-0.09)	(1.20)	(-1.61)
Time effect (2001)	-0.327	-0.592*	0.011						
	(-0.93)	(-1.81)	(0.02)						
Time effect (2004)	-0.712**	-0.872***	-0.143						
	(-2.14)	(-2.99)	(-0.27)						
Trade openness	-0.006*	-0.010***	0.000	0.003	-0.002	0.004	-0.007**	-0.006**	-0.018**
	(-1.85)	(-3.30)	(0.25)	(1.52)	(-0.73)	(1.34)	(-2.42)	(-2.17)	(-2.41)

Government expenditure	-0.008	0.012	0.006	0.002	0.013	-0.05***	-0.031	-0.017*	-0.025
	(-0.41)	(0.62)	(0.39)	(0.17)	(0.80)	(-5.05)	(-1.49)	(-1.83)	(-0.99)
Bank liquidity	-0.115	0.502	-0.415	-0.246*	-0.258*	0.125	0.017	0.843**	0.610***
	(-0.32)	(1.42)	(-1.22)	(1.76)	(-1.79)	(0.33)	(0.03)	(2.49)	(2.81)
Mobility of funds	1.348***	1.558***	0.465*	1.499***	1.137***	0.701***	1.182***	1.397***	0.501**
	(2.74)	(3.06)	(1.94)	(4.72)	(3.05)	(3.17)	(3.09)	(3.79)	(1.97)
GDP per capita * Capital requirements		0.000***			0.000***			0.000**	
		(3.17)			(2.76)			(2.40)	
GDP per capita * Supervisory power		0.000***			0.000***			0.000***	
		(5.10)			(7.67)			(6.80)	
GDP per capita * Market discipline		-0.000			-0.000			0.000	
		(-0.95)			(-0.52)			(0.91)	
GDP per capita * Activity restrictions		-0.000			-0.000			-0.000	
		(-0.87)			(-0.83)			(-0.09)	
Constant term	4.113	4.269*	0.272	1.249	-0.0135	4.188**	1.584	1.677	0.537
	(1.37)	(1.65)	(0.10)	(1.37)	(-0.01)	(2.21)	(0.98)	(1.52)	(0.60)
Observations	195	195	124	94	94	77	94	94	77
Wald test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan test (p-value)							0.203	0.288	0.191
AR1 test (p-value)							0.122	0.132	0.290
AR2 test (p-value)							0.022	0.034	0.029

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable of each equation is in the top of the table. The first six regressions are estimated using the feasible generalized least squares (FGLS) with heteroskedastic errors. The last three regressions are estimated on the basis of five-year averages using the Blundell and Bond (1998) method for dynamic panels. *Initial Gini or first lag of Gini* is the Gini coefficient in the year before our sample period begins (for the first six regressions) or the first lag of Gini for the GMM regressions (last three regressions). *Capital requirements*, *Supervisory power*, *Market discipline*, and *Activity restrictions* are the regulatory indices from Barth et al. (2001, 2006, 2008). *Trade openness* is the sum of exports and imports as a share of GDP. *Government expenditure* is the ratio of central government expenditure as a share of GDP. *Bank liquidity* is defined as the ratio of bank deposits to bank credit and mobility of funds as the ratio of offshore bank deposits to domestic bank deposits. The Wald test and its associated p-value show the goodness of fit of the FGLS regressions. Sargan is the test for overidentifying restrictions for the dynamic panel method, and AR1 and AR2 are the tests for first- and second-order autocorrelation in the disturbances (second-order autocorrelation should not be present). The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

Table 8
Outlier Analysis

	Min. coefficient	t-statistic	Max. coefficient	t-statistic
	Outlier analysis for regression (4) of Table 3			
Initial Gini	0.762***	53.26	0.820***	47.18
Capital requirements	-0.238***	-4.63	-0.064	-1.22
Supervisory power	-0.262***	-5.58	-0.102**	-2.14
Market discipline	0.167**	1.98**	0.530***	5.64
Activity restrictions	0.552**	2.57	1.327***	9.85
Log of population	0.128**	2.05	0.473***	5.66
GDP per capita	-0.000***	-7.04	-0.000***	-3.85
Inflation	-0.017	-1.07	0.037**	2.23
Trade openness	-0.010***	-4.35	-0.001	-0.39
Government expenditure	-0.045***	-4.04	0.023	1.36
Bank liquidity	-0.272	-0.85	0.799***	2.75
Mobility of funds	0.777**	2.10	4.541***	9.30
Time effect	-0.529***	-2.93	0.236	1.00
	Outlier analysis for regression (1) of Table 4			
Initial Gini	0.587***	31.41	0.642***	37.11
Capital requirements	-0.114	-1.59	0.152	2.33
Supervisory power	-0.216***	-4.62	-0.121**	-2.26
Market discipline	0.285***	3.21	0.596***	6.59
Activity restrictions	0.813***	3.29	1.538***	6.47
Log of population	0.163**	1.97	0.430***	4.67
GDP per capita	-0.000****	-3.47	-0.000	-0.99
Inflation	-0.037**	-2.27	-0.015	-0.89
Trade openness	-0.002	-0.60	0.009***	2.68
Government expenditure	-0.032	-1.53	0.016	1.36
Bank liquidity	-0.653**	-1.96	0.215	0.50
Mobility of funds	0.178*	1.91	0.974***	4.02
Time effect	-0.940***	-4.31	-0.278	-0.94
	Outlier analysis for regression (5) of Table 6			
Initial Gini	0.761***	56.71	0.795***	45.01
Capital requirements	-0.247***	-3.49	-0.039	-0.66
Supervisory power	-0.351***	-8.12	-0.175***	-2.72
Market discipline	0.175	2.08**	0.555***	7.02
Activity restrictions	0.608***	2.64	1.373***	7.98
Log of population	0.220**	2.46	0.592***	8.02
GDP per capita	-0.000***	-6.70	-0.000***	-4.75
Inflation	-0.003	-0.12	0.031*	1.66
Trade openness	-0.010***	-3.32	-0.002	-0.78
Government expenditure	-0.047***	-3.92	0.017	1.19
Bank liquidity	0.263	0.77	1.472***	6.04
Mobility of funds	1.107***	2.90	3.356***	5.43
Time effect	-0.131	-0.67	0.360*	1.88
GDP per capita*Capital requirements	0.000*	1.68	0.000***	3.75
GDP per capita* Supervisory power	0.000***	4.88	0.000***	10.29
GDP per capita*Market discipline	-0.000	-0.97	0.000***	4.34
GDP per capita*Activity restrictions	-0.000*	-1.70	0.000	0.59

The table presents outlier analysis for the main specifications of the empirical analysis. The first part corresponds to regression (4) of Table 3, the second to regression (1) of Table 4, and the third to regression (5) of Table 6. The minimum and maximum coefficients and the associated t-statistics are presented. If outliers do not have a significant impact on the regression equations, then both minimum and maximum coefficients must retain the sign and statistical significance according to the respective regressions in Tables 3, 4, and 6.