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Bank Regulations and Income Inequality: Empirical Evidence

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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, the overall liberalization of banking systems decreases the Gini coefficient and the Theil index significantly. However, this effect fades away for countries with low levels of economic and institutional development and for market-based economies. Among the different liberalization policies, the most significant negative effect on inequality is that of credit controls, which also seem to have a lasting effect on the Gini coefficient. Banking supervision and the abolition of interest rate controls also have a negative yet short-run impact on income inequality. A notable finding is that liberalization of securities markets increases income inequality substantially and over a long time span, suggesting that securitization widens the distribution of income. 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; Instrumental variables; Panel VAR

JEL classification: G28; O15; O16

1. Introduction

Andrei Shleifer (2009) is probably right in that the liberalization policies in the banking industry over the last three decades have left the world with higher incomes, longer average life spans, higher-quality education, and technological advances. Yet, the financial crisis of 2007 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 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), Barth et al. (2008), and Abiad et al. (2010) further motivate our analysis. Beck et al. (2010), which is a study with similar 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.

Abiad et al. (2010) construct a new index of financial reform on the basis of several subindices pertaining to banking regulatory practices in a large number of countries. They show that differences in bank regulations among countries and over time are notable. The same pattern is reflected by Barth et al. (2008), who update their 2001 database on bank regulations.

The diversity in regulatory practices 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 generate more fragmented markets, and borrowers' and investors' costs might 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 might have on the distribution of income in different countries. More specifically, this paper examines empirically whether specific forms of national banking regulation affect income inequality and poverty. The comprehensive database on financial reforms and bank regulatory policies developed by Abiad et al. (2010) covers the period

1973–2005 and makes this study possible. This database covers the reforms on seven pillars of banking regulation, pertaining to credit controls and reserve requirements, interest rate controls, banking-sector entry, capital-account transactions, privatizations of banks, liberalization of securities markets, and banking-sector supervision and capital regulation. We trace the impact of these indices on income inequality for 91 countries worldwide. Our identification strategy involves numerous ways to overcome the difficult identification problem, stemming from the endogeneity of banking regulations in empirical models of income inequality.

The major empirical findings are that banking deregulation (higher liberalization) generally leads to narrower income distribution. Yet, this effect is not uniform across all liberalization policies, nor is it across all countries with different levels of development or different types of financial environments. In particular, the abolishment of credit controls decreases income inequality substantially, and this effect is long-lasting. Interest-rate controls and tighter banking supervision also decrease income inequality; however, their effect fades away in the long term. For banking supervision, the negative effect on inequality is reversed in the long run, a pattern associated with stricter capital requirements that tend to lower the availability of credit and widen the distribution of income. In turn, abolishing barriers to entry and enhancing privatization laws seem to lower income inequality only in the developed countries. Hence, we are once again reminded that the initial level of economic and institutional development is a prerequisite for regulations to have a positive effect on the real economy (e.g., Laffont, 2005, and references therein).

Finally, we contend that the liberalization of securities markets increases income inequality. However, banks do tend to pass on the increased costs of higher risks from the liberalization of securities markets and higher capital requirements to the relatively lower-

income population that lacks good credit and collateral. The latter effects seem to be more pronounced in less developed countries.

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 identification issues and the econometric methodology. Section 4 presents the empirical results. Section 5 offers some policy implications and concludes the paper.

2. Data Description

To examine the impact of different forms of regulation on income inequality in the international setting, we collect country-level data. The final sample includes data from 91 countries for which information on bank regulations is available over the period 1973–2005. We use primarily five-year averages for four 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 are not likely to affect income inequality in the very short term; and fourth, identification of relations among macroeconomic variables calls for a longer-term horizon of the variables. We also verify that our main results hold when we use annual, three-year, and 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 provides a collective, formal definition of the variables used in the empirical analysis; Table 2 offers summary statistics; and Table 3 offers correlation coefficients among the explanatory variables.

[INSERT TABLES 1, 2, AND 3]

2.1. Income Inequality

The dependent variables used to proxy inequality are the Gini coefficient and the Theil index.[1] For expositional brevity of the results, both variables are in logs. Data for the two variables are from the University of Texas Inequality Project. Data on the Gini coefficient is available for 154 countries over the period 1963–2002. The Theil index is available for 156 countries over the same period. Both panels are unbalanced, with the Theil index having a larger number of missing observations. This database is the most comprehensive of the databases containing information on income inequality (e.g., the United Nations University World Institute for Development Economics Research World Income Inequality Database or the World Bank's World Development Indicators).

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 empirical literature (e.g., Beck et al., 2007; Dollar and Kraay, 2002). The average value in our data set is 41.02. Countries such as Armenia, Bahamas, Kuwait, Mongolia, and Qatar obtain very high values, and the Czech Republic, China, Macao, Slovenia, and Sweden exhibit low Gini coefficients.

Theil's index of inequality is an entropy measure. Maximum entropy occurs once income earners cannot be distinguished by their resources (i.e., when there is perfect equality). In real societies, different resources—incomes—distinguish people. The more "distinguishable" they are, the lower the "actual entropy" of a system consisting of income

[1] In the literature, other measures of inequality include the top and lower 10^{th} or 25^{th} percentile of the income distribution, the difference between top and lower income groups, etc. For these measures, we are severely constrained by data availability because observations reduce to about 100 (when using five-year averages). Because we are more concerned with identification, we do not use these variables.

and income earners. Thus, higher values on the Theil index reflect higher inequality.[2] In our dataset, the Theil index has a correlation coefficient of 0.71 with the Gini coefficient and obtains an average value of 0.05. Countries with high and low values are about the same as those reported for the Gini coefficient.

2.2. Bank Regulations and Their Potential Impact on Income Inequality

Abiad et al. (2010) describe in detail the regulatory conditions characterizing the banking industries for 91 countries over the period 1973–2005 and offer seven indices of financial sector policy that compose a single general indicator of financial reform. For each index, a country is given a score on a graded scale, with zero corresponding to being fully repressed, one to partially repressed, two to largely liberalized, and three to fully liberalized.

The first index relates to credit controls, such as credit directed toward favored sectors or industries, ceilings on credit toward other sectors, and excessively high reserve requirements. The second index documents interest rate controls, including whether the government directly controls interest rates, or whether floors, ceilings, or interest rate bands exist. The third index considers entry barriers, such as licensing requirements, limits on the participation of foreign banks, and activity restrictions relating to bank specialization or the establishment of universal banks. The fourth index considers the prudential regulation and supervision of the banking sector. It encompasses regulatory policies pertaining to capital regulation, compliance with Basel guidelines, the degree of independence and legal power of the supervisory agency, and the effectiveness of the authorities in imposing the legal framework. The fifth index characterizes the policies relating to privatization in the financial sector. The sixth index considers policies relating

[2] For a thorough description of the Theil index, see information provided at http://utip.gov.utexas.edu/.

to international capital flows, such as restrictions on capital- and current-account convertibility, and the use of multiple exchange rates. The final index documents policies relating to securities markets. Included here are operational restrictions, such as on staffing, branching, and advertising. Establishment of new securities markets is also included in this category. We provide notations for these indices in Table 1.

Even though the general indicator is labeled a “financial reforms index,” it primarily reflects policies related to the banking sector. In the empirical analysis we examine the effects each of the seven pillars have on income inequality, as well as the effect of the aggregate index, which is the sum of the seven indices and is labeled "banking regulations." Fortunately, the database of Abiad et al. (2010) covers a large number of countries over a lengthy time period, whereas previous indices (e.g., the indices of Barth et al., 2006; Kaminsky and Schmukler, 2003; or the European Bank for Reconstruction and Development index of banking-sector reforms) have smaller coverage in terms of years and/or countries. This large coverage makes our study possible and diminishes concerns about the number of available observations.

Theoretically, different forms of banking regulation can affect the distribution of income in many ways. For example, more stringent capital requirements and the efficient enforcement of prudential bank supervision (related to the fourth index) 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 lower income inequality. Repullo and Suarez (2008, 2009) highlight this procyclical effect of banking regulations 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 banking regulations 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 raise banks' incentives to lend to "safer" individuals and firms rather than 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)

In turn, the superior ability to enforce the regulatory initiatives of the abolition of interest-rate and entry requirements (indices 2 and 3), the privatization of banks (index 5), and the liberalization and transparency of capital-account transactions (index 6) should improve financial intermediation services and the screening and monitoring of projects. This would also allow banks to obtain the liquidity 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 privatizations, looser entry requirements, and liberalized capital-account transactions guarantee a more competitive and efficient banking sector. That is, a bank's market power is usually associated with relationship lending, higher interest-rate margins, and entry restrictions, and these elements constitute barriers for individuals and firms with less collateral or poor credit. Therefore, we expect that the indices pertaining to abolition of interest rate controls and entry barriers, enhanced privatization of banks, and liberalization of capital account transactions will be negatively related to income inequality.

The potential impact of the liberalization of the securities markets on income inequality seems more difficult to predict. On one hand, the liberalization of securities markets enhances financial liquidity and increases the volume of lending. In line with the discussion of the potential impact of effective banking supervision 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, the recent financial crisis has taught us that intense securitization would lead banks to excess risk-taking and a rise in the probability of bank failures. In particular, 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 addition, liberalization of securities markets could lead not to funding projects, but to investments in nontraditional activities. Thus, the overall impact of the liberalization of securities markets on income inequality is ambiguous.

Note, however, the implicit assumption that the laws giving supervisors power can be offset by a low level of institutional quality (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 (e.g., Laffont, 2005). Identifying which effects prevail becomes fundamentally an empirical issue.

We report correlations between banking regulations and the Gini coefficient in graphical form by using a local regression technique (see Figure 1). The eight graphs, which correspond to the impact of the aggregate banking-regulation index and its seven components on the Gini coefficient, are a first indication of a negative relationship between regulations and income inequality. In addition, most of the regression lines reveal an approximately linear relationship, with only a small number of outliers. It is unknown whether causality indeed runs from banking regulations to inequality and whether the negative slope of these regression lines are driven by characteristics of the macroeconomic environment common to both regulations and income inequality.

[INSERT FIGURE 1]

2.3. Control Variables

The control variables in this study 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 financial variables that may affect income inequality.[3]

First, we use the log of GDP per capita to control for the level of economic development, the inflation rate to control for the monetary conditions, and the log of the population size to control for the demographics in each country. Information for these variables is from the World Development Indicators (WDI).[4]

Second, we control for trade openness and public sector growth. Our measure for trade openness is the sum of exports and imports as a share of GDP. Data come from the Penn World Table (PWT). The literature's empirical findings concerning the impact of trade openness 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, with most studies suggesting an insignificant correlation (Easterly, 2005; Beck et al., 2007; Roine et al., 2009). In turn, to account for the activity and growth of government over the period, we include the ratio of central government expenditures as a share of GDP (data also taken from the PWT). Higher government spending may disproportionately help the poor if used efficiently, but

[3] Because we use estimators based on either fixed effects or first differences, we do not control for the initial level of income inequality in each country.

[4] We also experiment with other macroeconomic variables, such as the unemployment and the GDP growth rate, a number of interest rates, the capacity utilization rate, etc. The results on our banking-regulation variables remain practically unchanged.

in cases where institutions are weak (primarily in developing countries), higher government spending may be wasteful.

Another control variable usually included in equations characterizing income inequality is some variable reflecting the education. A usual output of education in the literature, are the years of schooling provided by Barro and Lee (2001). We use the data on primary education. In further sensitivity analysis we multiplied the Barro-Lee indicator by the educational quality indicator "*cognitive*" developed by Hanushek and Woessmann (2009). The *"cognitive"* indicator allows us to capture potential qualitative differences on education among different countries. We found quantitatively similar results.

Further, 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. The higher this ratio is, the higher the bank liquidity. A higher liquidity ratio also indicates lower dependence on the banking sector in that country, as it reflects higher financial depth; thus, we expect it to relate negatively to inequality. In addition, we use a dummy variable equal to 1 when a country experiences a banking crisis. We expect that banking crises widen the distribution of income by having a marginally more significant effect on the poor.[5]

Finally, we control for a number of political and institutional variables. In particular, we use information on the political orientation of the government in place (left or right) to examine whether left-leaning governments yield a narrower income distribution. In addition, we include an overall index of freedom (that excludes financial freedom) to guarantee that our banking-regulation variables do not capture the overall

[5] We also experiment with variables characterizing the mobility of funds across countries (ratio of offshore bank deposits to domestic bank deposits), the capitalization of the stock market (ratio of stock market capitalization to GDP), the performance of the banking sector (ratio of profits to total assets), the concentration in the banking sector (three-bank concentration ratio), etc. Most of these variables are only marginally correlated to our inequality measures and do not affect the impact of the banking regulations.

political-liberalization processes that might have occurred within a country. Also, 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 might 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 Transparency (the inverse of Corruption) indices of the International Country Risk Guide (ICRG).[6] For explicit definitions of all these variables, see Table 1; for descriptive statistics, see Table 2; and for a correlation matrix, see Table 3.

3. Econometric Identification

The empirical model to be estimated is of the following form:

$$y_{it} = a_1 y_{i,t-1} + a_2 r_{i,t} + a_3 x_{it} + \lambda_t + v_i + u_{it}, \quad (1)$$

where y is a measure of income inequality observed in the country i at time t, r is the vector of different types of banking regulations, x is the vector of control variables explaining y, u is the stochastic term, and λ and v are time- and country-effects, respectively.[7] The model is dynamic due to persistence in inequality (see Roine et al., 2009; Beck et al., 2007).

We seek a robust method to identify the impact of bank regulations on income inequality. The primary identification issue is the endogeneity of r. The major concern on this front is not necessarily that income inequality influences the choice of bank regulation (reverse causality), but that factors that influence banking regulation are also correlated

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

[7] We keep the basic econometric model in levels because the time dimension of the dataset is small but the cross-sectional dimension is relatively large. Thus, concerns about potential serial correlation of the error term are mitigated. These concerns are further mitigated by the use of a correction of the error terms when applying GMM.

with changes in income inequality. For example, simply the state of the macroeconomic environment may simultaneously determine both elements (see e.g., Evans, 1998).

Likewise, Barth et al. (2008) discuss two important episodes of large changes in the indices of banking regulation. Mexico responded to its 1994 crisis by easing restrictions on banks, but Argentina moved in the direction of greater regulatory restrictions after its crisis. Thus, if periods of major economic turmoil are important drivers of changes in banking regulation, even in the absence of any effect from banking regulations on inequality, we should expect changes in banking regulation to be correlated with changes in income inequality. This will happen as long as economic turmoil affects inequality. Moreover, this type of endogeneity will be relevant if the political equilibrium of a country drives changes in banking regulation, because changes in the political equilibrium are likely to affect both the type of regulatory reforms and other policies that might directly influence the distribution of income.

To solve this problem, one can follow two paths. The first is to focus on a specific episode and type of banking regulation and identify its impact on inequality within a single-country study. This is the essence of Beck et al. (2010). The second would be to identify a clear source of change in banking regulations that is not highly correlated with political and economic sources of income inequality. The merit of this strategy is that it allows for examining different types of regulation within a single empirical model. However, this comes at the cost of identifying proper instruments—a very difficult problem indeed. Here, we try to make progress on this identification issue (i) in terms of understanding the determinants of banking regulations, and (ii) by exploiting the implications of important econometrics literature on instrumental variables.

In trying to identify proper instrumental variables, one has to rule out any institutional characteristics because of the potential causality these variables have with

political reforms and, thus, with income inequality. The same holds for the legal-origin variables that a large number of studies use as instruments in identifying growth equations. The literature also uses geographic elements to identify growth equations, but establishing geographic elements as a source of banking regulation seems rather arbitrary.

Another intuitive approach is to consider the structural elements of the banking sector as potential elements affecting banking regulations. In particular, regulators might be interested in shaping banking industry concentration, given the potential trade-off between efficiency and concentration or concerns regarding international competition faced by domestic banks. The same may hold for the liquidity provided in the economic system and the importance of the banking sector in providing credit to the economy. Unfortunately, using such instrumental variables still falls into the economic channel discussed earlier, as these elements may affect (or be affected by) economic outcomes and, through them, inequality.

An interesting result is that of Barth et al. (2006), which is to our knowledge the only study along with Krozner and Strahan (1999) that considers what determines banking regulations. The authors establish a relationship among the constitutional constraints of the policy maker, the competition in the electoral process, and the policy maker's transparency. From these, we find that constitutional constraints significantly affect financial reforms, while their relationship with income inequality when controlling for the variables discussed in Section 2 is statistically insignificant. Therefore, the constitutional constraints variable is the first instrumental variable employed.[8]

Another interesting case comes from elements of regulation that are not recorded in the index of Abiad et al. (2010). Barth et al. (2006) are an exceptionally rich source of information on this front. From the various indices they discuss, we focus on the index

[8] The variable is called XCONST in the Polity IV Project database and measures the extent of institutionalized constraints on the decision-making powers of the chief executive in each country. The variable is coded on a 7-point scale, where higher values signify greater constraints.

named “official supervisory power”. This variable reflects whether the supervisory authorities have the authority to take specific actions to prevent and correct problems in the banking sector. Therefore, more powers for the supervisor reflect more stringent regulation for operational banking procedures. As these procedures deal primarily with corporate governance issues of every day banking, they should not have any substantial real effects on income inequality. This is substantiated by statistical analysis that shows that the impact of official supervisory power on financial reforms is negative and statistically significant, while this index bears no effect on any of our inequality indices. Therefore, we use official supervisory power as a second instrumental variable.

Given the persistence of inequality and the presence of the dynamic term y_{t-1} among the regressors, we have to use GMM for dynamic panels along with 2SLS. However, the latter is also an efficient estimator given that we resort to five-year averages of the data. Also, 2SLS allows using fixed effects that might improve the precision of our estimates (see e.g., Acemoglu et al., 2008) and testing for underidentification. In turn, the GMM procedure is the system GMM estimator of Blundell and Bond (1998). This method assumes that lagged values of the dependent and independent variables also serve as valid instruments under certain restrictions. In our setting, including lagged values of r and x as additional instruments might not be a good idea. This is because political and institutional variables change slowly and, therefore, previous changes might still be correlated with contemporaneous levels of inequality. Thus, in the equations estimated by GMM, we only include lagged levels of y among the instrumental variables.

A final alternative to identify the isolated impact of bank regulations on inequality is a panel VAR approach. Through a VAR all variables are endogenous and can even identify the extent of reverse causality. Specifically, we focus on the procedure implemented by Love and Zicchino (2006). These authors focus on the orthogonalized

impulse-response functions, which show the response of the variable of interest (here, income inequality) to an orthogonal shock in another variable of interest (here, banking regulations). By orthogonalizing the response we are able to identify the effect of one shock at a time, while holding other shocks constant. This method is a suitable alternative to simple regressions because the underlying empirical analysis can be conducted using GMM for dynamic panels and all variables included are endogenous by assumption. Smaller time intervals are a requirement for using this approach, because we will be regressing y on r_{t-1}, and naturally we are interested in short-term responses. Nevertheless, the panel VAR illustrates the path of the impulse response through time. Thus, in carrying out the panel VAR, we resort to annual data. With these issues in mind we now turn to the estimation results.

4. Empirical Findings

In this section we present the main results of the study and conduct various sensitivity analyses to assess whether results change (i) when choosing between the Gini coefficient or the Theil index, (ii) for different levels of economic development, (iii) when including alternative control variables among the regressors, (iv) when using annual, three-, and five-year time intervals for the data, and (v) when employing the different estimation methods proposed above.[9]

4.1. Bank Regulations and Income Inequality: Results for the Effect of the General Indicator of Bank Regulations

[9] Another potential drawback to the empirical analysis may be that outliers drive results. 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). 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.

Panels with a large cross-sectional and relatively small time dimensions are usually prone to considerable heteroskedasticity, and a simple likelihood ratio test shows that our panel is no exception. Therefore, in applying 2SLS or GMM we use robust standard errors. The first set of empirical results is in Table 4, where the dependent variable is the Gini coefficient and the main explanatory variable the aggregate index of banking regulations. We start with a simple OLS regression of banking regulation on the Gini coefficient. The result poses an immediate challenge, as it shows that regulations increase income inequality. Of course, this finding is counterintuitive, contradictory to the picture reflected in Figure 1, and probably driven by omitted-variable and endogeneity bias. In the second regression (column 2) we add simple time effects, and the impact of bank regulations on the Gini coefficient becomes insignificant.

[INSERT TABLE 4]

Following our discussion in Section 3, we turn to identification through instrumental variables techniques. In columns (3) and (4) we report the results from a 2SLS regression with fixed effects, robust standard errors, and time effects. The instrument used in column (3) is the constitutional constraints variable, and in column (4) we add the index of official supervisory power. These instruments perform the best among the various other potential instruments discussed in Section 3. In particular, the first-stage results for the equation presented in column (4) show that the constitutional constraints and the official supervisory power indices are statistically significant determinants of bank regulations (results are coeff.=0.52, t-stat.=2.61 and coeff.=-0.35, t-stat.=-2.66, respectively). Moreover, both these instruments are insignificant determinants of the Gini coefficient in a simple fixed-effects regression with robust standard errors and time effects (results are coeff.=-0.33, t stat.=-1.52 and coeff.=0.44, t-stat.=1.22, respectively). The full array of the first-stage results is available on request.

The findings in columns (3) and (4) show that higher *Bank Regulations* values (reflecting a more liberalized banking system) are associated with lower Gini values, and this effect is statistically significant at the 5% level. In column (4) the coefficient is significantly smaller. Given that we should have enough instrumental variables to be unable to reject the overidentification test of Hansen, we favor the inclusion of official supervisory power as an instrument (i.e., if we include only one instrument, the model will be exactly identified, rendering the Hansen test irrelevant). We obtain similar first-stage results for the rest of the specifications.

The economic effect is substantial. According to the results of column (4), a one-point increase in bank regulations lowers the Gini coefficient by 5.4%. In the UK for example, the 10-point rise in the *Bank Regulations* variable over the sample period is equivalent to a 54% reduction in the Gini coefficient, ceteris paribus. Therefore, the increase in the Gini, from an average of 27.3 in the period 1973–1977 to an average 36.2 in the period 1998–2002, would have been much higher if the banking sector had not been liberalized. In India, a country with the same legal origin as the UK, *Bank Regulations* rises by 6.2 points. The associated reduction in Gini is 33.48%, ceteris paribus. The Gini coefficient rises from an average of 44.2 in the period 1973–1977 to an average 47.5 in the period 1998–2002, and it would have in fact been lower in the period 1998–2002 if the only driving force of the Gini were banking liberalization policies. In general, and given the fact that the Gini coefficient trends upward in most countries, the liberalization of banking systems seems to have contained this upward trend by creating opportunities for those at the lower end of the income distribution. It remains to examine whether all types of bank regulation contribute to this effect.

In columns (5) and (6) we add more explanatory variables. The statistical significance of the *Bank Regulations* variable remains practically unchanged, while the

coefficient somewhat strengthens. Among the rest of the explanatory variables, the most interesting results are those showing a negative effect between (i) the log of *GDP per Capita* and Gini, (ii) between *Bank Liquidity* and Gini and (iii) between the years of schooling and Gini. In the literature, the relationship between economic development and inequality seems to be running primarily in the opposite direction (Bourguignon, 1996), but controlling for the impact of the economic development seems crucial because the *Bank Regulations* variable may capture the positive trend in development. Yet, the coefficient on *Bank Regulations* remains significant, even though *GDP per Capita* enters with a negative and significant coefficient. Similarly, the impact of *Bank Regulations* on inequality does not change when controlling for the increasing loans to deposits ratio, even though a higher ratio translates to a narrower distribution of income. Finally, the higher the level of primary education, the lower the inequality, a finding that finds ample support in the relevant literature (e.g., Barro, 1999).

In columns (7)–(9) we report the results of re-estimating the previous three regressions, this time using GMM for dynamic panels. The model now includes the lagged dependent variable y_{t-1}, and as an additional instrument, y_{t-2}. The identification tests show no overidentifying restrictions and no serial correlation between the instruments and the disturbance. The results remain practically unchanged. The impact of *Bank Regulations* on the Gini coefficient is negative and significant. The relevant coefficient is around 0.05, very close to the one observed when the estimation method is 2SLS. A difference in the results is the positive and significant coefficient on *Trade Openness* in column (9). This finding suggests that globalization is partially responsible for the widening income distribution; however, to make such a statement one has to go much deeper in this relationship. Here, we only document that the impact of bank regulations on inequality is not primarily due to some form of trade openness.

In Table 5 we measure inequality by the Theil index and rerun specifications (4), (6), (8), and (9) of Table 4. The rest of the specifications produce similar patterns of results to those in Table 4 and are available on request. Again, *Bank Regulations* enters with a negative and significant coefficient. However, the estimated elasticity is a bit smaller. For example, in columns (2) and (4), which represent regressions with controls, the relevant coefficients are -0.028 and -0.024, respectively. Among the rest of the controls, the most significant ones remain the *GDP per Capita* and *Bank Liquidity* variables.

[INSERT TABLE 5]

We conduct further sensitivity analyses on these results and report the findings in Table 6. Because the results from choosing between (i) 2SLS or GMM and (ii) the Gini coefficient or the Theil index are not different, we only report the results from the computationally simpler 2SLS and from the Gini coefficient. In column (1) we introduce a multiplicative term between *Bank Regulations* and *GDP per Capita* to examine whether the impact of *Bank Regulations* differs with the level of economic development.[10] 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 countries] was that reformers disregarded the functioning of regulatory institutions, assuming implicitly they would work as in developed countries."[11] The results show that the implications of this literature are valid also in our case: the negative impact of bank

[10] In this specification we mean-center the variables and find the product of the demeaned terms. This allows for examining the effect of *Bank Regulations* at the average *GDP per Capita* (and not for *GDP per Capita* equal to 0, which is not interesting) and reduces multicollinearity.

[11] We also experiment with the product of our regulatory variables with the institutional variables (i.e., *Bureaucratic Quality* and *Law & Order*). As shown in Table 3, these variables are highly correlated with the *GDP per Capita* variable and indeed inference is unaltered. The results are available upon request.

regulations on inequality weakens substantially for those countries with low GDP per capita.

[INSERT TABLE 6]

In columns (2) and (3) we introduce the institutional and political variables, respectively. This guarantees that the *Bank Regulations* variable does not capture any general institutional characteristics of countries or the general political freedom or political ideology of the specific time frame. Again, we remove the macroeconomic variables because of high correlations between them and the institutional and political variables. The findings show that stronger institutions and higher political freedoms are associated with lower Gini coefficients. Left-leaning governments are associated with higher Gini coefficients, but the effect is not significant at conventional levels. The impact of *Bank Regulations* is in fact stronger in these specifications, and the coefficients obtain a value of 9% and above.

In column (4) we examine whether the results differ when we estimate our basic specification only for the bank-based economies. To define bank-based economies (as opposed to market-based ones) we use the ratio of private credit provided by banks to stock market capitalization (for a similar definition, see Demirgüç-Kunt and Levine, 2002). Countries with ratios below their mean are bank-based economies.[12] The results show that the negative impact of bank regulations on income inequality for these countries is much stronger. As the relevant coefficient indicates, a one-point increase in *Banking Regulation* decreases the Gini coefficient by 12% — a very large effect. The respective effect on market-based economies is only 2.8%, with the effect being statistically significant only at the 10% level (results are not reported, but are available on request).

[12] Admittedly this is only one of the many measures that could define bank- versus market-based economies. However, more analyses on this front seems to be beyond the scope of the present paper.

This is a large difference and shows that bank regulations can control income inequality primarily in bank-based economies.

The results discussed so far seem robust for the five-year time periods. Thus, we examine whether these results hold for the one- and three-year time intervals, and we report the findings in columns (5) and (6) of Table 6. With very few differences, the findings are equivalent to those of previous regressions. When we use annual data, most of the coefficients show stronger effects, which is probably due to the higher number of observations and the short-run fluctuations of variables. Similarly, the coefficients in column (6) are between those reported in column (5) and those of the baseline specifications in Table 4.

As a final yet very important robustness check, we run a panel VAR as discussed in Section 3. We use annual data so as to explore shorter-term responses and show the time-path of the changes in a more parsimonious way. Because we cannot have time effects, variables are time-demeaned to remove unwanted trends. We present the results in graphical form in Figure 2. The first graph shows the response of the Gini coefficient to a change in the general index of banking regulations. The middle line is the impulse response, and the two lines above and below are the 95% and 5% confidence intervals, respectively, obtained from Monte Carlo simulation (we use 200 replications). The graph shows that the Gini responds negatively and significantly (at the 5% level) to a shock in banking regulation. This is a long-lasting effect, which is expected because changes in regulations tend to have long-term effects on the real economy (see e.g., Evans, 1998).

[INSERT FIGURE 2]

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.

4.2. Bank Regulations and Income Inequality: Results for the Effect of the Different Regulatory Policies

Do all types of regulation have the same impact on income inequality? Answering yes seems highly unlikely, and the results in this subsection confirm this. To save space, we only report the impulse responses of the Gini coefficient to the different banking-regulation indices. The 2SLS regressions and regressions based on the Theil index confirm these findings.

The impact of higher credit and interest rate controls on the Gini coefficient (see Figures 2b and 2c, respectively) is clearly negative. Yet, only the effect of the abolishment of credit controls is lasting, whereas the impact of interest rate controls quickly becomes insignificant. Moreover, the maximum response of the Gini to a shock in credit controls is relatively large, yielding a large decrease in inequality over time. The results imply that credit controls lower liquidity and work against the poor. This mechanism seems 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.

Perhaps surprisingly, the impact of entry barriers and privatizations is negative but statistically insignificant at the 5% level. Given that most developed countries abolished entry restrictions and enhanced privatization policies by the early 1990s, the developing

and transition markets probably drive these nonsignificant relationships. In addition, these economies are usually characterized by inferior institutions and the partial inability to enforce the law. Therefore, we rerun the panel VAR, distinguishing between countries with a GDP per capita above the sample mean and those below it. The impulse responses are reported in Figure 3 and indeed show that the response of Gini to a positive shock in entry barriers and privatizations is more significant in countries with GDP per capita above our sample's average.

[INSERT FIGURE 3]

Figure 2e shows initially a negative and significant relationship between banking supervision and income inequality; however, this relationship turns insignificant after five years. This is a very interesting finding, given the ongoing discussion on the reregulation of the banking system. As discussed, a higher value on this index reflects higher powers for the banking supervisory authority, more stringent capital regulation, more monitoring of bank activities through audits and sanctions for prudential purposes, etc. 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 ideas and thus provide equal opportunities to the relatively poor. Hence, financial stabilization aside, efficient supervision also seems to have a substantial, real, and positive short-run effect in lessening income inequality, allowing equal opportunities in accessing credit and sustaining economic fairness. The question remains why this result does not hold in the long run.

An answer to this question rests in the impact of stricter capital requirements that put a strain on the availability of credit. To examine whether this effect drives our results, we use a dummy variable that reflects when a country has adopted a capital requirement.

The new impulse response is shown in Figure 4 and confirms the proposition that the introduction of a capital requirement leads to higher income inequality. This effect picks after approximately eight years and is clearly long-lasting. Thus, we contend that higher capital requirements aiming at enhanced financial stability have adverse real effects on income inequality. These effects are probably related to the reduced liquidity that banks create when capital requirements are raised.

[INSERT FIGURE 4]

A final notable result is the positive response of the Gini coefficient to a shock in securities markets (Figure 2h). This finding suggests that the liberalization of securities markets leads to higher income inequality. Further, the effect is long-lasting and economically significant. A mechanism that explains this finding might be that banks gradually expanded their lending activity following the liberalization of credit and interest rates, but they also expanded their involvement in securities markets to safeguard themselves against the higher credit risk. This suggests a trade-off between liquidity going to securities markets and liquidity available to finance investment projects. When securitization or involvement in the bonds market increases, banks tend to fund fewer projects (especially the ones proposed by individuals with less collateral and credit history), which would lead to a widening income distribution.

Notably, these findings imply something that may not have received special attention in the regulatory literature. Specifically, bank regulations may aim, successfully in many circumstances, to strengthen the financial system and absorb failures that may lead to crises. Further, some banking regulatory policies enhance the availability of credit, provide funding opportunities, and lead to a narrower income distribution. On the other hand, some other bank regulatory policies may have adverse effects on the real economy in the long run. Phrased differently, regulatory policies, such as higher capital

requirements that aim at short-term financial stability or policies aiming at increased short-term liquidity through liberalization of securities markets seem to have an adverse long-term effect on income equality.

5. Conclusions and Policy Considerations

This study links, for the first time, the full array of banking regulations with income inequality. In general, the liberalization policies from the 1970s through the early 2000s have contributed significantly to containing income inequality. Yet, the pattern is not similar across (i) all regulatory policies, (ii) countries with different levels of economic and institutional development, and (iii) market versus bank-based economies. In particular, abolishing credit controls decreases income inequality substantially, and this effect is long-lasting. Interest-rate controls and tighter banking supervision decrease income inequality; however, these effects fade away in the long term. For banking supervision, the negative effect on inequality is reversed in the long run, a pattern associated with stricter capital requirements that tend to lower the availability of credit. In turn, abolishing entry barriers and enhancing privatization laws seem to lower income inequality only in developed countries. In contrast, the liberalization of securities markets increases income inequality. These results are robust to a number of estimation methods that account, *inter alia*, for the endogeneity of banking regulations.

What are the policy implications of these findings? 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 (Barth et al., 2010) and the probability of banking crises (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 these effects are asymmetric and certain liberalization policies (i.e., liberalization of securities markets) or regulation policies (i.e., higher capital requirements) actually increase income inequality. That is, banks pass the increased costs of higher risks (coming from the liberalization of securities markets) and higher capital requirements on to the relatively lower-income population that lacks good credit and collateral. In other words a trade-off between banking stability and inequality may be present. Given the contemporary discussion surrounding (i) the rebirth of Glass-Steagall-type regulatory reforms as they relate to securities trading, and (ii) the discussions under Basel III to increase the risk-adjusted capital base of banks, there may be more to think about before taking those steps.

On the good side, 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 credit controls, 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 prudential regulation should provide less costly incentives to banks to increase regulatory 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 a certain level of economic and institutional development to see any positive effect of the abolishment of entry restrictions and privatizations on equality. Though this type of 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, more research is needed on the nexus between inequality and banking regulations. First and foremost, if data availability concerns are raised, bank regulations should be linked to the incomes of individuals in the top and lower end of the income distribution. Another interesting extension of this paper relates to 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.

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Table 1
Variable Definitions and Sources

Notation	Measure	Data Source
A. Dependent Variables		
Gini coefficient	Measure of inequality obtained from the Lorenz curve (natural logarithms).	University of Texas Inequality Project
Theil index	Wage inequality measure (natural logarithm).	UTIP-UNIDO Industrial Statistics
B. Explanatory Variables		
Credit controls	Index of liberalization of credit controls and reserve requirements for banks. Takes values between 0 and 3.	Abiad et al. (2010)
Interest rate controls	Index of liberalization of interest rates. Takes values between 0 and 3.	Abiad et al. (2010)
Entry barriers	Index of lower entry barriers for banks. Takes values between 0 and 3.	Abiad et al. (2010)
Banking supervision	Index of prudential regulation and supervision of the banking sector. Takes values between 0 and 3.	Abiad et al. (2010)
Privatization	Index of the extent of privatization of banks. Takes values between 0 and 3.	Abiad et al. (2010)
International capital flows	Index of liberalization of international capital flows. Takes values between 0 and 3.	Abiad et al. (2010)
Securities markets	Index of liberalization of securities markets. Takes values between 0 and 3.	Abiad et al. (2010)
Bank regulations	This index is constructed on the basis of the sum of the values of the seven indices above, thus it takes values between 0 and 21. Higher values reflect more liberalized banking sectors.	Abiad et al. (2010)
Population	The natural logarithm of the population of a country.	World Development Indicators (World Bank)
GDP per capita	The natural logarithm of the gross domestic product per capita.	World Development Indicators (World Bank)
Trade openness	The ratio of the sum of exports and imports over GDP.	Penn World Tables 6.3
Government expenditure	The ratio of government expenditures over GDP.	The Heritage Foundation
Inflation	The CPI inflation rate.	World Development Indicators (World Bank)
Bank liquidity	The ratio of bank deposits to bank credit.	Beck and Demirgüç-Kunt (2009)
Education	Barro-Lee (2001) years of schooling.	Data obtained from Barro-Lee (2001).
Left power	Chief executive and largest party in congress have left-center political orientation.	Botero et al. (2004)
Law and order	Law and order are assessed separately, with each subcomponent worth 0 to 3 points. The law subcomponent is an assessment of the strength and impartiality of the legal system, while the order subcomponent is an assessment of popular observance of the law.	International Country Risk Guide
Transparency	Index of transparency (inverse of corruption), taking values from 0 to 6. The higher the value of the index, the more transparent is the country.	International Country Risk Guide
Nonfinancial freedom	Overall index of freedom minus the value on the financial freedom component.	The Heritage Foundation

Table 2
Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Gini coefficient	805	41.02	6.90	21.87	61.61
Theil index	767	0.05	0.06	0.00	0.67
Bank regulations	540	10.47	6.26	0	21
Credit controls	540	1.61	1.07	0	3
Interest rate controls	540	1.82	1.24	0	3
Entry barriers	540	1.79	1.15	0	3
Banking supervision	540	0.81	0.94	0	3
Privatization	540	1.27	1.17	0	3
International capital flows	540	1.67	1.09	0	3
Securities markets	540	1.49	1.10	0	3
Population	1202	33,900	118,000	47.5	1,300,000
GDP per capita	1105	6397.85	8539.21	100.11	73568.63
Trade openness	1083	70.72	50.86	1.91	434.39
Government expenditure	1083	16.84	8.18	1.47	69.49
Inflation	959	41.36	292.72	-100	5398.58
Bank liquidity	1008	0.95	0.43	0.10	3.05
Education	803	5.02	2.92	0.04	12.25
Left power	711	0.55	0.33	0	1
Law and order	550	3.72	1.48	0.25	6
Transparency	550	3.28	1.41	0.25	6
Nonfinancial freedom	374	52.41	18.98	10	90

The table presents the number of available observations and summary statistics (mean, standard deviation, minimum, and maximum) for the variables of the empirical analysis. The variables are defined in Table 1. Population is in thousand people and GDP per capita in $US.

Table 3
Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1. Bank regulat.	1.00																		
2. Credit controls	0.82	1.00																	
3. Int. rate controls	0.73	0.45	1.00																
4. Entry barriers	0.74	0.44	0.52	1.00															
5. Bank. superv.	0.74	0.43	0.54	0.56	1.00														
6. Privatization	0.66	0.42	0.34	0.38	0.43	1.00													
7. Int. capital flows	0.69	0.49	0.60	0.46	0.53	0.46	1.00												
8. Securities markets	0.78	0.49	0.61	0.54	0.59	0.48	0.65	1.00											
9. Population	-0.03	-0.11	0.09	-0.02	-0.10	0.02	-0.02	0.16	1.00										
10. GDP per capita	0.51	0.29	0.38	0.32	0.51	0.28	0.58	0.69	-0.03	1.00									
11. Trade openness	0.19	0.17	0.15	0.04	0.22	0.16	0.23	0.08	-0.24	0.05	1.00								
12. Gov. expend.	-0.09	-0.03	-0.06	-0.03	-0.03	-0.18	-0.11	-0.21	-0.33	-0.09	-0.01	1.00							
13. Inflation	-0.24	-0.21	-0.05	-0.29	-0.17	-0.17	-0.09	-0.14	0.05	-0.09	-0.18	0.00	1.00						
14. Bank liquidity	0.03	0.10	0.00	-0.06	-0.09	0.06	0.11	0.02	-0.04	0.25	-0.05	-0.09	0.23	1.00					
15. Education	0.53	0.47	0.16	0.34	0.53	0.35	0.41	0.58	-0.24	0.69	0.07	-0.15	-0.19	0.35	1.00				
16. Left power	0.01	0.03	-0.10	0.23	0.04	-0.09	-0.20	-0.25	-0.41	-0.17	-0.13	0.41	-0.09	-0.14	0.12	1.00			
17. Law and order	0.52	0.38	0.34	0.40	0.40	0.22	0.46	0.60	-0.11	0.65	0.11	0.05	-0.20	0.12	0.68	-0.03	1.00		
18. Transparency	0.32	0.11	0.18	0.04	0.34	0.05	0.40	0.52	-0.16	0.78	0.21	-0.15	-0.11	0.37	0.65	-0.10	0.59	1.00	
19. Nonfin. freed.	0.39	0.15	0.28	0.42	0.36	0.38	0.47	0.43	-0.12	0.74	0.48	-0.08	-0.16	0.15	0.45	-0.06	0.54	0.51	1.00

The table reports correlation coefficients between the explanatory variables of the empirical analysis. The variables are defined in Table 1.

Table 4
Bank Regulations and Income Inequality: Gini Coefficient Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged Gini							0.725***	0.592***	0.543***
							(7.856)	(6.447)	(6.050)
Bank regulations	0.039***	0.002	-0.086**	-0.054**	-0.056**	-0.070**	-0.075***	-0.054**	-0.061***
	(5.505)	(0.154)	(-2.261)	(-2.040)	(-2.103)	(-2.380)	(-2.684)	(-2.158)	(-2.785)
Population					0.218***	0.234***		0.147**	0.124**
					(3.810)	(4.120)		(2.515)	(1.993)
GDP per capita					-0.116***	-0.124***		-0.041**	-0.028**
					(-2.902)	(-3.020)		(-2.263)	(-2.015)
Trade openness					0.030	0.010		0.041*	0.049**
					(0.904)	(0.377)		(1.604)	(2.010)
Government expenditure					0.056	0.084*		0.046	0.040
					(1.515)	(1.874)		(1.419)	(1.355)
Inflation						-0.003			0.014
						(-0.318)			(0.804)
Bank liquidity						-0.062**			-0.067***
						(-2.510)			(-2.808)
Education						-0.250**			-0.260**
						(-2.402)			(-2.446)
Observations	382	382	381	336	334	321	324	323	311
Time effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.136	0.291	0.094	0.138	0.261	0.273			
Underidentification test			0.002	0.001	0.000	0.000			
Overidentification test				0.165	0.487	0.202	0.316	0.480	0.429
AR2 test							0.316	0.208	0.422

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable is the natural logarithm of the Gini coefficient. The explanatory variables are defined in Table 1. Regressions (1) and (2) are estimated by OLS for panel data with fixed effects and robust standard errors. Regressions (3)–(6) are estimated by 2SLS with fixed effects and robust standard errors. Regressions (7)–(9) are estimated using GMM for dynamic panel data with robust standard errors. The underidentification test is the p-value of the Kleibergen-Paap F-statistic for the underidentification of the equation, and rejection of the null implies that the model is identified. The overidentification test is the p-value of the Hansen J-statistic for the overidentification of the equation, and rejection of the null casts doubt on the validity of the instruments.

Table 5
Bank Regulations and Income Inequality: Theil Index Regressions

	(1)	(2)	(3)	(4)
Lagged Theil			0.677***	0.652***
			(5.024)	(4.808)
Bank regulations	-0.035**	-0.030**	-0.037***	-0.028**
	-(1.973)	(-2.100)	(-2.705)	(-2.454)
Population		0.234***		0.149**
		(4.805)		(2.155)
GDP per capita		-0.037***		-0.021***
		(-2.914)		(-2.917)
Trade openness		-0.003		0.004
		(-0.412)		(0.186)
Government expenditure		0.010		0.016
		(0.405)		(0.815)
Inflation		0.007		0.003
		(1.120)		(0.496)
Bank liquidity		-0.020**		-0.018***
		(-2.287)		(-3.028)
Education		-0.247**		-0.261**
		(-2.268)		(-2.454)
Observations	333	256	287	264
R-squared	0.170	0.204		
Underidentification test	0.001	0.000		
Overidentification test	0.158	0.440	0.487	0.513
AR2 test			0.652	0.639

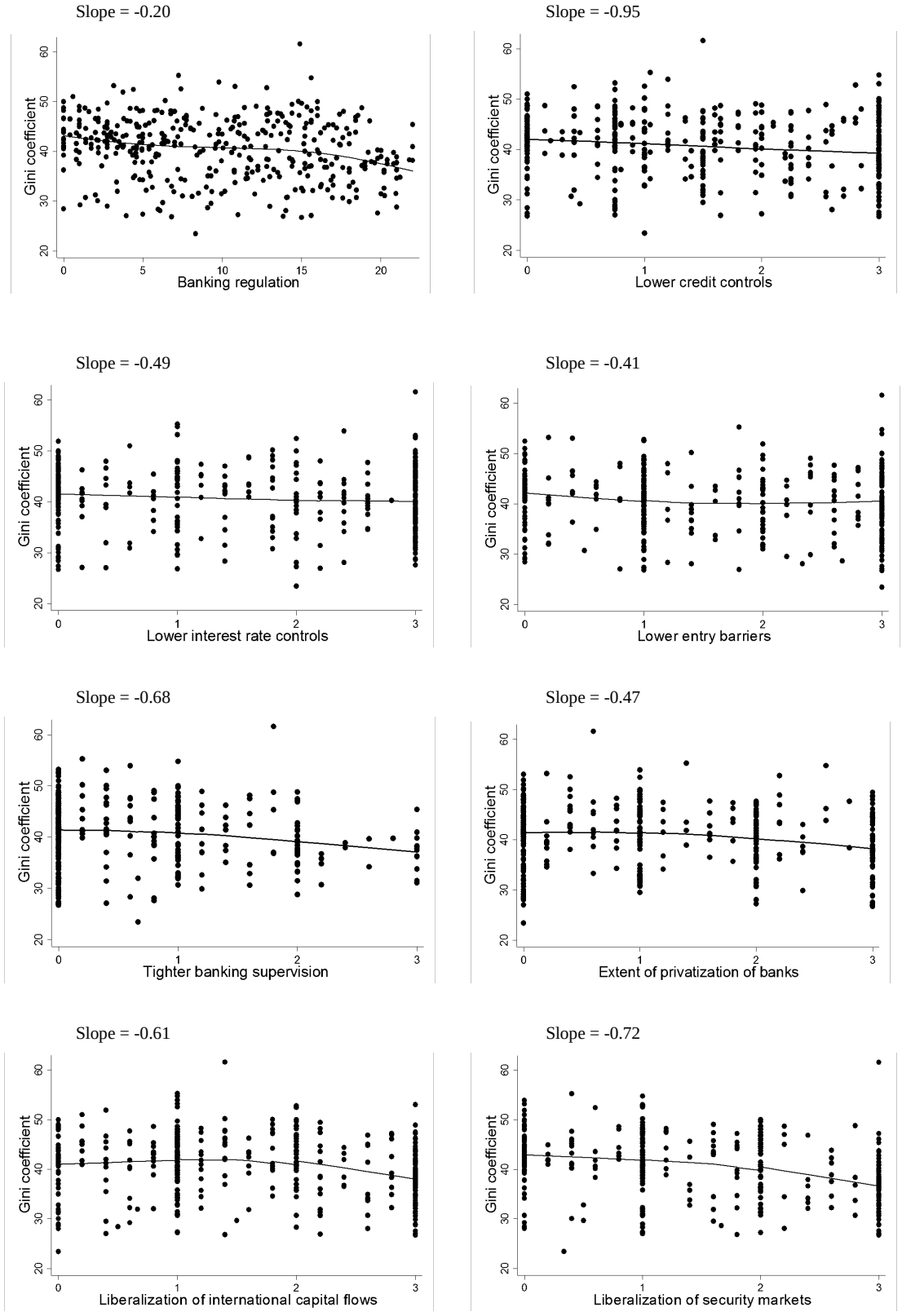
The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable is the natural logarithm of the Theil index. The explanatory variables are defined in Table 1. Regressions (1) and (2) are estimated by 2SLS with fixed effects and robust standard errors. Regressions (3) and (4) are estimated using GMM for dynamic panel data with robust standard errors. Underidentification test is the p-value of the Kleibergen-Paap F-statistic for the underidentification of the equation and rejection of the null implies that the model is identified. The overidentification test is the p-value of the Hansen J-statistic for the overidentification of the equation, and rejection of the null casts doubt on the validity of the instruments. AR2 test is the p-value of the test for second-order autocorrelation in first differences and rejection of the null implies presence of such autocorrelation. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

Table 6
Bank Regulations and Income Inequality: Other Sensitivity Analysis

	(1) Level of development	(2) Institutions	(3) Politics	(4) Bank-based economies	(5) Annual panel	(6) Three-year panel
Bank regulations	-0.032**	-0.094***	-0.092***	-0.128***	-0.096***	-0.064**
	(-2.560)	(-3.207)	(-3.116)	(-3.519)	(-3.446)	(-2.461)
Population	0.203***	0.194***	0.191***	0.219***	0.128***	0.105***
	(4.126)	(3.808)	(3.745)	(4.210)	(5.145)	(2.710)
GDP per capita	-0.030**			-0.040***	-0.120***	-0.061***
	(-2.518)			(-2.714)	(-7.040)	(-3.240)
Bank regulations*GDP per capita	0.075**					
	(2.401)					
Trade openness	0.046**			0.047**	0.041*	0.030
	(2.004)			(2.101)	(1.925)	(1.111)
Government expenditure	0.027			0.048*	0.024	0.019
	(1.003)			(1.650)	(1.158)	(0.770)
Inflation	0.004			0.003	-0.003	-0.004
	(0.395)			(0.368)	(-1.107)	(-1.115)
Bank liquidity	-0.070***			-0.066***	-0.075***	-0.042**
	(-3.488)			(-3.400)	(-3.559)	(-2.277)
Education	-0.202**			-0.193*	-0.386***	-0.318***
	(-2.012)			(-1.882)	(-3.401)	(-2.808)
Law and order		-0.080**				
		(-2.333)				
Transparency		-0.094***				
		(-3.345)				
Left power			-0.016			
			(-0.940)			
Freedom			-0.039***			
			(-3.024)			
Observations	321	106	121	156	1312	511
R-squared	0.225	0.161	0.170	0.206	0.229	0.199
Underidentification test	0.000	0.001	0.001	0.000	0.000	0.000
Overidentification test	0.119	0.440	0.418	0.503	0.487	0.653

The table reports coefficient estimates and t-statistics (in parentheses). The dependent variable is the natural logarithm of the Gini coefficient. The explanatory variables are defined in Table 1. All regressions are estimated using 2SLS with fixed effects and robust standard errors. The underidentification test is the p-value of the Kleibergen-Paap F-statistic for the underidentification of the equation, and rejection of the null implies that the model is identified. The overidentification test is the p-value of the Hansen J-statistic for the overidentification of the equation and rejection of the null casts doubt on the validity of the instruments. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10 % level, respectively.

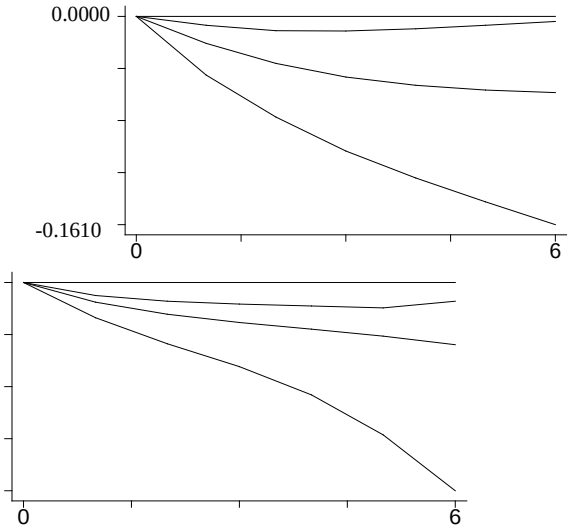
Figure 1
Correlation between Banking Regulations and the Gini Coefficient



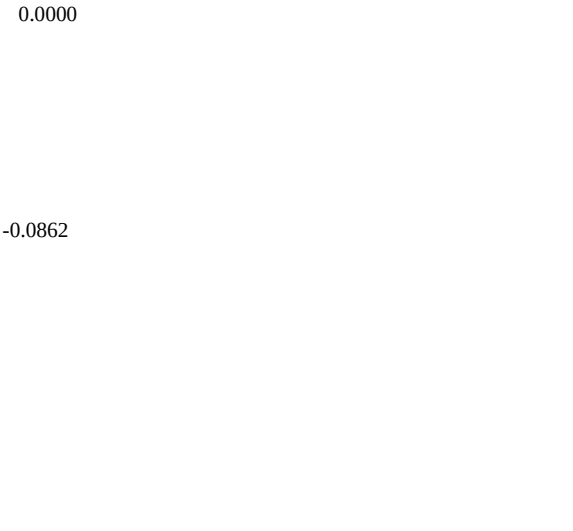
The figures present local regressions of the overall index of banking regulation and its seven components with the Gini coefficient. The average slope of each line is shown above each figure.

Figure 2
Impulse Responses of the Gini Coefficient to Banking Regulation Shocks

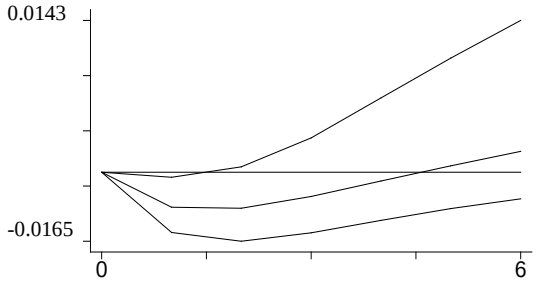
a. Response of Gini to bank regulations



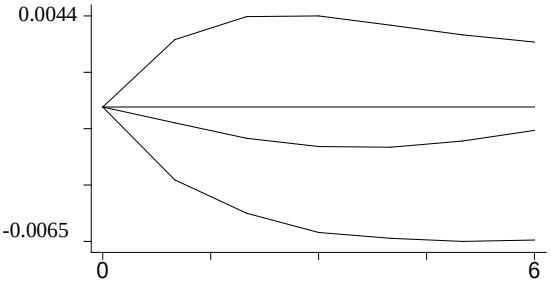
b. Response of Gini to credit controls



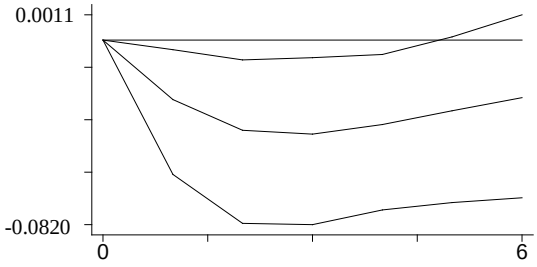
c. Response of Gini to interest rate controls



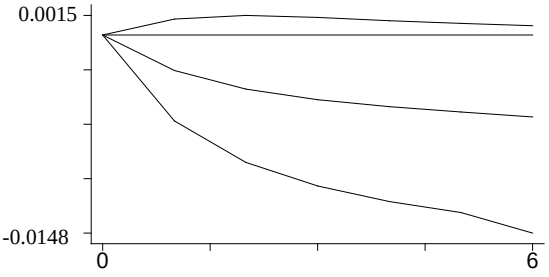
d. Response of Gini to entry barriers



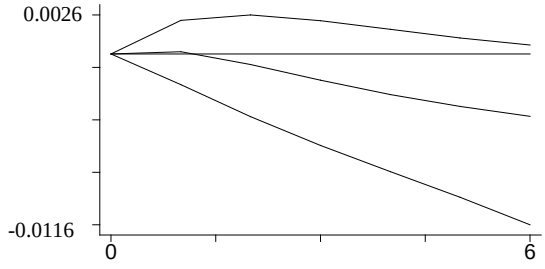
e. Response of Gini to banking supervision



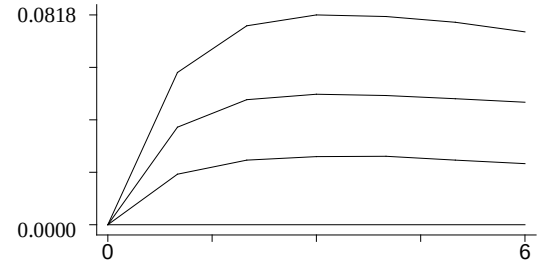
f. Response of Gini to privatizations



g. Response of Gini to international capital flows

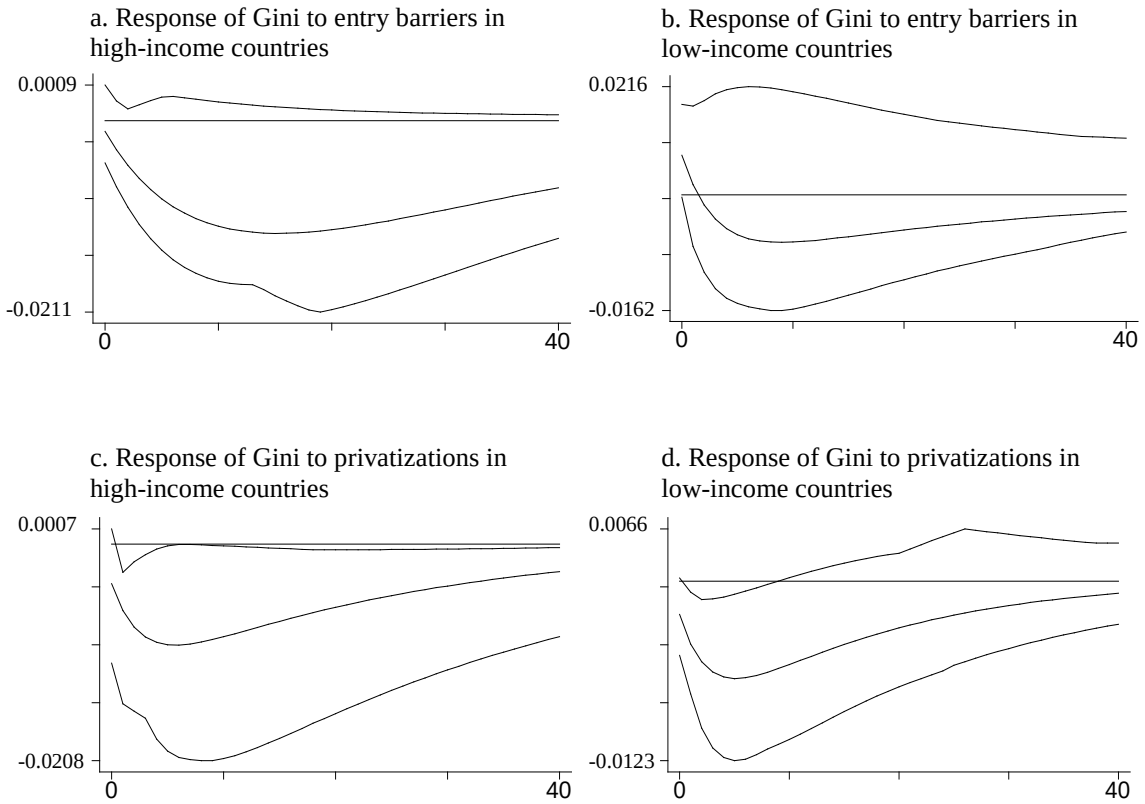


h. Response of Gini to securities markets



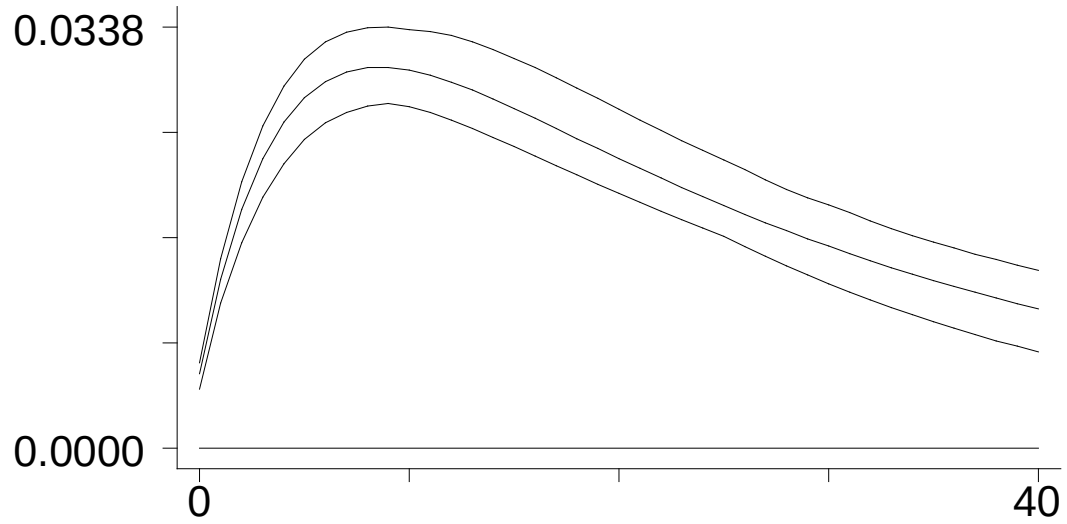
The figures present the response of the natural logarithm of the Gini coefficient (represented on the vertical axis) to the aggregate index of banking regulation and its individual components (represented on the horizontal axis). The indices are defined in Table 1. The middle lines in all figures are the actual impulse responses and the two lines above and below are the 95% and 5% confidence intervals from Monte Carlo simulation.

Figure 3
The Response of the Gini Coefficient to Entry Barriers and Privatizations in High- vs. Low-Income Countries



The figures present the response of the natural logarithm of the Gini coefficient (represented on the vertical axis) to entry barriers and privatizations in high- and low-income countries. The indices are defined in Table 1. The middle lines in all figures are the actual impulse responses, and the two lines above and below are the 95% and 5% confidence intervals from Monte Carlo simulation.

Figure 4
The Response of the Gini Coefficient to Capital Requirements



The figure presents the response of the natural logarithm of the Gini coefficient (represented on the vertical axis) to the introduction of a capital requirement. The middle lines in all figures are the actual impulse responses, and the two lines above and below are the 95% and 5% confidence intervals from Monte Carlo simulation.

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