Finance and Inequality: How Does Globalization Change Their Relationship?

Takuma Kunieda and Keisuke Okada and Akihisa Shibata

City University of Hong Kong

7. December 2011

Finance and Inequality: How Does Globalization Change Their Relationship?

Takuma Kunieda*
Department of Economics and Finance,
City University of Hong Kong

Keisuke Okada†
Graduate School of Economics,
Kyoto University

Akihisa Shibata‡
Institute of Economic Research,
Kyoto University

December 12, 2011

Abstract

This research demonstrates that international financial integration changes the way in which financial development affects inequality within a country. Specifically, both the cross-country analysis and the dynamic panel data analysis using data collected from more than 100 countries provide evidence indicating that if the financial market of a country is highly open to the world market, financial development widens inequality within that country, whereas if the financial market of a country is highly closed to the world market, financial development narrows inequality within that country. Our theoretical framework provides a possible explanation for our empirical findings.

Keywords: Financial integration; Inequality; Financial development; Credit constraints; Capital flows.

JEL Classification Numbers: F36; F41; O16; O41

*Corresponding author. P7315, Academic Building, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon Tong, Hong Kong, Phone: +852 3442-7960, Fax: +852 3442-0195, E-mail: tkunieda@cityu.edu.hk

†Graduate School of Economics, Kyoto University, Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501, JAPAN, Phone: +81-75-753-3400, Fax: +81-75-753-3492, E-mail: keisuke.okada.1125@gmail.com

‡Institute of Economic Research, Kyoto University, Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501, JAPAN, Phone: +81-75-753-7126, Fax: +81-75-753-7198, E-mail: shibata@kier.kyoto-u.ac.jp

1 Introduction

Income inequality in advanced economies has widened since the mid-1980s. This fact is documented by the Organisation for Economic Co-operation and Development (OECD) in its 2008 report "Growing Unequal?". According to this report, from the mid-1980s to the mid-2000s, approximately two thirds of the OECD countries experienced widening income inequality. Such increases in inequality in advanced economies appear inconsistent with Kuznets' inverted-U hypothesis, according to which income inequality in an economy increases during early stages of economic development before beginning to decrease at some point in the process of development as the economy matures (Kuznets, 1955).[1]

The upward trend in income inequality witnessed in advanced economies over the past decades has drawn the attention of many researchers who have proposed several possible explanations for this phenomenon. Among those who attribute increased income inequality to skill-biased technological innovation, Galor and Moav (2000) develop a model that explains income inequality not only between the two groups of skilled and unskilled workers but also within these groups. Aghion et al. (2002) develop a model in which income inequality originates from the enlarged generality of new technologies.[2] Others ascribe income inequality to increased trade globalization (e.g., Wood, 1995, 1998) using the Heckscher-Ohlin model, in which skilled workers in advanced economies benefit from trade globalization while unskilled workers are disadvantaged.

Indeed, the above explanations based on the models of skill-biased technological innovation and international trade are consistent with the recent increases in inequality in advanced economies. Few researchers, however, have focused on the impact of financial globalization on inequality within an economy.[3]

Since the early 1980s, international financial integration has advanced remarkably (Lane and Milesi-Ferretti, 2007; Kose et al., 2009, 2010). Although the effects of financial liberalization on economic outcomes have been studied by many researchers,[4] the effects of the combination of international financial integration and financial development on income

[1] There are debates regarding whether Kuznets' hypothesis still holds. Some researchers support the inverted-U hypothesis on the basis of the trickle-down view of development brought on by a new industrial revolution of information technologies. See Piketty (2006).

[2] For empirical evidence of the effects of technological advances on inequality, see Katz and Murphy (1992) and Autor et al. (1998).

[3] The study by Mendoza et al. (2009) is a notable exception, as they compare dynamic behaviors of wealth inequality in two countries facing different degrees of financial development after financial liberalization and demonstrate that after financial liberalization, a country with a fully developed financial market experiences an increase in wealth inequality, whereas a country with a poorly developed financial market experiences almost no change in its wealth inequality. They do not, however, examine how inequality responds to the relaxation of credit constraints after financial liberalization. In contrast, as later described, we empirically demonstrate that financial integration changes the manner in which financial development affects income inequality within an economy.

[4] For instance, Bekaert et al. (2005) provide evidence that equity market liberalization has a significantly positive impact on economic growth, and Tressel and Verdier (2011) theoretically demonstrate that capital account liberalization induces corruption in domestic banks in countries with institutional weaknesses.

inequality within an economy remain unexplored. Specifically, it remains unclear whether widening income inequality in the advanced economies is a consequence of continuing financial globalization. In this paper, we address this question.

Our empirical analysis of cross-country data and panel data from 1985 to 2009 demonstrates that international financial integration changes the way in which financial development affects income inequality within an economy. Our findings are as follows. If there is a high degree of financial openness in a country, financial market development widens inequality within that country, whereas if there is a low degree of financial openness in a country, financial market development reduces inequality within that country.

While performing regressions, we must deal with the endogeneity problem associated with financial development. On the one hand, in the traditional literature on finance and growth, economists have carefully addressed causality from economic growth to financial development. See Levine et al. (2000) and Levine (2005), among others. On the other hand, since Galor and Zeira (1993) published their pioneering work, many economists have studied the interaction between inequality and economic growth. For instance, in the literature on political economy and economic growth, Alesina and Rodrik (1994), Persson and Tabellini (1994), and Bertola (1993) demonstrate that inequality has a negative effect on economic growth in a politico-economic equilibrium. Galor and Moav (2004) develop a unified theory of the effects of inequality on the process of development. According to their model, a non-monotonic relationship exists between inequality and economic growth. At early stages of economic development, in which physical capital is the main engine of growth, inequality has a positive impact on development. In contrast, at later stages of economic development, when human capital is the main engine of economic growth, equality promotes human capital investment and, thus, economic growth. In addition, focusing on the role of human capital accumulation, Asano (2010) derives a non-monotonic relationship between inequality and economic growth. According to Matsuyama's (2002) model of mass-consumption economies, some level of inequality is necessary for sustainable economic growth.

On the basis of the aforementioned studies, we argue that reverse causality from inequality to financial development should be carefully controlled for. Following the standard approach in the literature on finance and growth, we employ the instrumental variables (IV) technique in the cross-country regressions using legal origins as the instrumental variables. Although the Hansen tests for over-identifying restrictions and the tests of the excluded instruments in the first-stage regressions confirm the validity of instrumental variables, one might argue that legal origins affect inequality through a channel different from the financial market. Therefore, we conduct a sensitivity analysis in the Appendix with respect to legal origins and verify that each legal origin does not have a direct effect on inequality under the condition that the other legal origin satisfies the orthogonality condition. Moreover, to complement the cross-country analysis, we also perform a dynamic panel data analysis using the system generalized method of moments (GMM) estimators developed by Arellano and Bond (1991),

Arellano and Bover (1995), and Blundell and Bond (1998). The dynamic panel data analysis produces results consistent with those of the cross-country analysis.

Our empirical findings regarding the relationship between finance and inequality are novel in the extant literature. Several related studies using panel data or cross-country data, such as Li et al. (1998), Clarke et al. (2006), and Beck et al. (2007), have empirically demonstrated that as the financial sector fully develops, income inequality decreases. No previous study, however, has examined the effect of financial integration on the relationship between financial development and inequality.

Our theoretical model provides a possible explanation for our empirical findings. Specifically, if an economy is financially closed to the world market, its financial market clears within the economy. In this case, as the financial market matures, less-talented agents are more likely to lend their financial resources to talented agents. Accordingly, production inefficiency is reduced, and the less-talented agents benefit from the abilities of the talented agents. Thus, financial development narrows inequality. In contrast, if an economy is financially open to the world market, the talented agents borrow production resources at the world interest rate as long as credit constraints permit them to do so, whereas the less-talented agents lend their resources in the world financial market. In such an economy, if the financial market fully develops and credit constraints relax, the talented borrowers benefit from borrowing in the world financial market at an interest rate that is low relative to their abilities. This leaves the less-talented lenders unable to utilize the abilities of the talented agents. Thus, inequality widens as the financial market matures.

Although many researchers have examined the relationship between financial development and inequality in the vast literature on finance, growth, and inequality,[5] they have obtained mixed theoretical results. Although Greenwood and Jovanovic (1990) derive an "inverted U-shaped" relationship between income inequality and financial development, Galor and Zeira (1993) and Banerjee and Newman (1993) demonstrate the existence of a "negative linear" relationship between the two. None of these researchers, however, has demonstrated that international financial integration changes the way in which financial development affects income inequality.

The key mechanism of our theoretical model is capital inflow in an economy from abroad. If an economy is financially open to the world market, capital flows in or flows out of the economy. If a country is a closed economy, an interest rate increases as the domestic financial market matures because the demand for private credit increases. In contrast, if a country liberalizes its capital account, an increase in demand for private credit in the domestic market induces capital inflow from abroad without increasing the interest rate. Again, in our theoretical model, the increased private credit is intensively used by talented agents, and thus, inequality widens. If the mechanism of our theoretical framework is correct, it can be observed in practice that an increase in domestic private credit causes capital inflow. In

[5]For a survey of finance and inequality, see Demirgüç-Kunt and Levine (2009).

section 6, we verify this hypothesis by performing the system GMM estimations.

This paper is organized as follows. In the following section, we describe the estimation method, specifying the estimation equations for the cross-country analysis as well as for the dynamic panel analysis. In section 3, we provide a description of the data used in our estimation, and we obtain the estimation results in section 4. In sections 5, we develop an overlapping generations model to provide a possible explanation for our empirical findings. In section 6, we empirically verify the key mechanism of our theoretical model. In section 7, we present our concluding remarks.

2 Estimation Method

As discussed in the Introduction, we examine the hypothesis that if an economy is highly open to the world financial market, income inequality widens as the financial market matures, whereas if an economy is highly closed, income inequality narrows as the financial market matures. We empirically test this hypothesis by analyzing cross-country data and panel data. Although the availability of the data for each country varied, we were able to collect data for more than 100 countries (i.e., more than those of other studies in the existing literature).[6]

2.1 Cross-country Analysis

In our cross-country analysis, we use the averaged data from 1985 to 2009 for 119 countries listed in Table A1 in Appendix A.1. We estimate an equation specified as

$$\text{Inequality}_i = \alpha_1 + \alpha_2 \text{Financial Development}_i + X_i\beta + \epsilon_i, \tag{1}$$

where i shows a country and ϵ is an error term. As will be explained in the next section, we use the Gini coefficient developed by Solt (2009) as a proxy for inequality. To measure financial market development, we use the ratio of private credit to the gross domestic product (GDP). The annual data for these two variables are averaged over the period 1985 to 2009. X encompasses other control variables pertaining to the country such as the natural logarithm of per capita real GDP, the average years of total schooling as a proxy for human capital, the democracy indicator, and the extent of political risk. For these explanatory variables, we use the data points in 1985, the initial year of our estimation, presuming that the average inequality from 1985 to 2009 is affected by the predetermined social conditions. See the next section for more details of the data descriptions. According to our hypothesis, the highly open financial market in a country results in a positive value of α_2, whereas the highly closed financial market results in a negative value of α_2.

When performing regressions, the endogeneity problem associated with financial development must be addressed to avoid the possibility of reverse causality from inequality to

[6]For instance, the number of observed countries in Beck et al. (2007) is, at most, 72.

financial development.[7] As previously discussed, to address the endogeneity problem, we employ the IV technique, in which we use legal origins as instrumental variables. As such, we follow Levine et al. (2000), among others. According to the legal origin theory developed by La Porta et al. (1997, 1998), when compared to civil law countries, common law countries provide better protection of property rights, which impacts the development of financial markets.[8]

To measure the extent of financial openness, we refer to the work of Lane and Milesi-Ferretti (2007). Specifically, their dataset allows us to compute the sum of total assets and total liabilities divided by the GDP. Because the data points of the dataset created by Lane and Milesi-Ferretti (2007) are only available up to 2007, these are averaged for the period 1985 to 2007. We use this measure as a proxy for financial openness. This variable is thought of as a *de facto* measure of financial openness.[9] The averaged values of this financial openness index from 1985 to 2007 range from 0.428 to 140.365 for 177 countries, with larger values indicating greater openness. The averaged value over the countries of the averaged values is 2.766.[10]

Before testing our hypothesis, we have to determine cutoffs to define highly open countries and highly closed countries. When making this determination, we face a trade-off between maintaining an adequate sample size and ensuring the precision of the extent of financial openness. For instance, if we had included only countries whose index values are extremely high, then we would have been certain of examining the countries that were financially open to the world market, but the sample size would have been too small to perform estimations. The same situation would have occurred if we had included only those countries with extremely small index values.

By considering countries with an index value greater than the 60th percentile of the 177 countries listed in the dataset of Lane and Milesi-Ferretti (2007) as highly open countries, we categorize 42 of the 119 countries in our analysis as highly open, a group that includes not only advanced but also developing countries (see Table A1 in Appendix A.1). To perform robustness checks, we create two other datasets for highly open countries. We create one dataset of countries whose index values are greater than the median value (the 50% percentile) and the other dataset of countries whose index values are greater than the 75th

[7] As discussed in the Introduction, researchers have carefully treated causality from economic growth and financial development in the traditional literature on finance and growth. See, for instance, Levine et al. (2000) and Levine (2005). Moreover, the effect of inequality on economic growth has been studied by many economists. See Alesina and Rodrik (1994), Asano (2010), Galor and Moav (2004), Matsuyama (2002), Persson and Tabellini (1994), and Bertola (1993), among others.

[8] See La Porta et al. (2008) for more discussion of the legal origin theory.

[9] A *de facto* measure of financial openness is considered more appropriate than a *de jure* measure. See Kose et al. (2009, 2010) for this discussion.

[10] Although 178 countries are available in the dataset of Lane and Milesi-Ferretti (2007), we excluded Taiwan from our analysis because it is not included in the World Development Indicators by the World Bank (2011b). We also excluded Luxemburg from our regression analysis. This is because the highest index value of financial openness, 140.365, is for Luxemburg and the second highest is Bahrain, which is 19.670, implying that Luxemburg is regarded as an outlier.

percentile. Thus, the two datasets include 56 and 26 countries, respectively.

As for financially closed countries, we create a dataset for the 49 highly closed countries with index values less than the 40th percentile of the 177 countries. To perform robustness checks, we also create two datasets consisting of the 63 countries whose financial openness values fall below the median value and the 31 countries whose financial openness values are below the 25th percentile.

2.2 Panel Data Analysis

We also perform the dynamic panel data analysis, which is a complement to our cross-country analysis, by using the system GMM estimators developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The system GMM estimation enables us to control for unobserved country-specific effects and to address the endogeneity problems by employing the internal lagged variables as the instrumental variables. We collected unbalanced panel data for 120 countries from 1985 to 2009 and created five-year averaged data for the non-overlapping five periods: 1985 to 1989, 1990 to 1994, 1995 to 1999, 2000 to 2004, and 2005 to 2009.[11] The use of the five-year averaged data enables us to mitigate noises associated with short-run economic fluctuations.

Unlike the cross-country analysis, we do not divide the entire sample into highly open and closed countries because we need as many countries as possible in performing the system GMM estimation, which is designed for dynamic panel data with few time series and many cross sections (see for instance Roodman, 2009). Instead, we add the interaction term between financial development and financial openness to demonstrate our hypothesis. The estimation equation is specified as

$$\begin{aligned} \text{Inequality}_{it} &= \alpha_1 \text{Inequality}_{it-1} + \alpha_2 \text{Financial Development}_{it} \\ &\quad + \alpha_3 \text{Financial Development}_{it} \times \text{Financial Openness}_{it} + X_{it}\beta + \mu_t + \eta_i + \epsilon_{it}, \end{aligned} \tag{2}$$

where i and t stand for a country and time, respectively. μ is a time-specific effect, η is a country-specific effect, and ϵ is an error term. X includes control variables similar to those of the cross-country analysis plus financial openness. In contrast to the cross-country analysis, we use the five-year averaged control variables in this dynamic panel analysis.

The partial effect of financial development on inequality is given by $\alpha_2 + \alpha_3 \times$Financial Openness. Our hypothesis predicts that α_2 is negative and α_3 is positive, implying that financial development decreases inequality when financial openness is of the low degree and increases when financial openness is of the high degree.

To obtain consistent estimates, we must address the validity of the instruments and thus we conduct two specification tests. The first test examines the hypothesis that the error

[11] Again, because the financial openness index computed from the dataset by Lane and Milesi-Ferretti (2007) is only available up to 2007, the data points are averaged from 2005 to 2007 for the last period.

terms are not serially correlated. We test whether the differenced error terms are second-order serially correlated. The second test is the Hansen test of overidentifying restrictions, which examines the orthogonality conditions of the instrumental variables.

We must also consider a small sample bias associated with an estimate of the variance-covariance matrix when performing the two-step system GMM estimation because the number of countries in our dataset is at most 114.[12] In the second-step estimation, the residuals from the first-step estimation are used to produce a consistent estimate of the variance-covariance matrix; however, the obtained estimate of the variance-covariance matrix is severely downward biased if the sample size is small. Windmeijer (2005) develops corrected standard errors to correct such a small sample bias. We report Windmeijer's (2005) corrected standard errors in our estimation results when performing the system GMM.

3 Data

Apart from the financial openness index computed from the dataset by Lane and Milesi-Ferretti (2007), we draw the data used in our estimations from various databases and create cross-country and panel datasets using the annual data over the period 1985 to 2009. To measure inequality, we use the net Gini coefficient in the dataset developed by Solt (2009).[13] Cross-country comparison of income inequality by using the existing inequality data has faced limitations such that while greater coverage across countries and over time is available, comparability across observations is untrustworthy. To overcome these limitations, Solt (2009) standardizes the United Nations University's World Income Inequality Database such that cross-country comparison of income inequality can be more reliable than when using the existing inequality data. Solt's algorithm creates standardized Gini coefficients for 173 countries.

As a measure of financial market development, we use the ratio of private credit to the GDP (abbreviated as "private credit" henceforth), obtained from Beck et al. (2010). In the literature on finance and growth, private credit is often used as a measure of financial market development (Aghion et al., 2005; Levine, 2005). We include the log of per capita real GDP to control for the effect of economic development on inequality. We collected the per capita real GDP data from the World Development Indicators database, created by the World Bank (2011b).

The average years of total schooling index created by Barro and Lee (2010) is likely to control for the impact of human capital on inequality. The PRS Group (2011) provides a political risk rating consisting of 12 sub-components, as described in detail in Table A2 in Appendix A.1. The index for democracy, democratic accountability, is one of these sub-

[12]Note that although we collected the unbalanced panel data for 120 countries, the sample size for each regression is reduced if we incorporate control variables.

[13]We employ the Standardized World Income Inequality Database (Version 3.0, released July 2010) developed by Solt (2009).

components, which likely controls for the impacts of political events on inequality. Although the original data range from 0 (autocratic) to 6 (democratic), we rescale this variable from 0 (autocratic) to 100 (democratic). Furthermore, we also include the overall political risk rating provided by the PSR Group (2011). These data are ranged from 0 (highest risk) to 100 (lowest risk). The full list of countries is shown in Table A1 in Appendix A.1. Detailed definitions and sources of all the data are presented in Table A2 in Appendix A.1, and descriptive statistics of all variables for cross-country and panel analyses are shown in Tables A3 and A4 in Appendix A.1.

4 Results

4.1 Cross-country Analysis

Table 1 presents estimation results for the entire sample of 119 countries. As can be observed in the ordinary least squares (OLS) estimations in column (1), in which per capita GDP and education are controlled for, the coefficient of private credit is negative, which is consistent with the findings of Clarke et al. (2006). The effect of private credit on inequality, however, is not statistically significant and remains insignificant even if democracy and political risk are controlled for in columns (2) to (3).

[Table 1 here]

Because the OLS estimations may suffer from the endogeneity problem, we perform IV estimations using legal origins as instrumental variables. Columns (4) to (6), whose specifications are respectively the same as those in columns (1) to (3), show the IV estimation results where French and German legal origins are employed as instrumental variables.[14] Although columns (4) and (5) report that the coefficients of private credit are negative and significant, column (6) indicates that the coefficient of private credit is not significant when controlling for various explanatory variables despite the negative sign of the coefficient.[15]

While private credit seems to have a negative impact on inequality, the whole sample regression analysis does not uncover our hypothesis which suggests that international financial integration changes the way in which financial development affects income inequality within an economy. To investigate our hypothesis more formally, we created a dataset of 42 countries whose financial openness are above the 60th percentile.

[14]If we had used three of the five variables of English, French, German, Scandinavian, and Socialist legal origins as instrumental variables for private credit, as does the literature on finance and growth, the F-values for the tests of the excluded instruments in the first-stage regressions would have been extremely low. Therefore, following Alfaro et al. (2004), we use only French and German legal origins as instrumental variables for private credit in our estimations shown in columns (4) to (6) in Table 1.

[15]In columns (4) to (6), the F-values for the tests of the excluded instruments in the first-stage regressions are slightly low. However, our interest is in estimations for highly open countries and highly closed countries. Therefore, we do not conduct further analysis for the whole sample.

As shown in columns (1) to (3) of Table 2, the OLS estimation results for these 42 highly open countries indicate that the coefficients of private credit are statistically insignificant although they are negative.

[Table 2 here]

These results should be treated as tentative because we did not address endogeneity in our analysis. To address this problem, we perform IV estimations using the Scandinavian and Socialist legal origins as instrumental variables for private credit.[16] To verify the validity of the instrumental variables, we first address the problem of weak instruments. In columns (5) and (6), the F-values for the tests of the excluded instruments in the first-stage regressions are greater than 10, satisfying the "rule of thumb" proposed by Staiger and Stock (1997) although the F-value in column (4) is 5.94. Moreover, the Hansen tests of overidentifying restrictions do not reject the orthogonality conditions at the conventional significance level in all the estimations reported in columns (4) to (6). These results support the appropriateness of using Scandinavian and Socialist legal origins as instrumental variables for private credit in our regressions. As shown in columns (4) to (6), the coefficients of private credit are positive and significant. Therefore, we conclude that financial development widens inequality in financially open countries.

Next, we examine highly closed countries. According to our hypothesis, in a financially closed economy that is closed to the world market, income inequality narrows as the financial market matures. Therefore, we expect that an estimated coefficient of private credit would be negative for these countries.

Table 3 presents estimation results for 49 highly closed countries, all of whose financial openness values are below the 40th percentile. The OLS estimation results in columns (1) to (3) reveal that the effect of private credit is statistically insignificant; however, these OLS results may be biased and inconsistent because of an endogeneity problem associated with private credit. To address endogeneity, we conduct IV estimations using French and German legal origins as instrumental variables for private credit. The results of the F-tests of the excluded instruments and of Hansen's over-identifying restrictions tests imply that these instruments are valid. The estimation results shown in columns (4) to (6) indicate that private credit has a significantly negative impact on inequality even when controlling for various explanatory variables. These results are consistent with our hypothesis, which suggests that financial development narrows inequality in financially closed countries.

[Table 3 here]

In Appendix A.2, we perform robustness checks of our cross-country analysis on the impact of private credit on inequality. We conduct the checks using the two datasets created for

[16] We use only Scandinavian and Socialist legal origins as instrumental variables for private credit in our estimations, shown in columns (4) to (6) in Table 2, because these two legal origins even better identify private credit in the first-stage regressions for the highly open countries than do other combinations of legal origins.

highly open countries and the two datasets created for highly closed countries, as described in subsection 2.1. Tables A6 and A7 report the estimation results for 56 and 26 highly open countries whose financial openness values are respectively above the 50th percentile and the 75th percentile. These tables report the same qualitative impact of private credit on inequality as in the IV estimation results in Table 2. Tables A8 and A9 show estimation results for 63 and 31 highly closed countries whose financial openness values are respectively, below the 50th percentile and the 25th percentile. While columns (5) and (6) in Table A9 report insignificance of the coefficients of private credit, Tables A8 and A9 display the same qualitative results as those in Table 3.

Because one may argue that legal origins affect inequality through a channel different from the financial market, we perform a sensitivity analysis in Appendix A.2 following the procedure employed by Tabellini (2010). We find that each legal origin used as an instrumental variable does not have a direct effect on inequality under the condition that the other legal origin satisfies the orthogonality condition. See Tables A10 and A11.

4.2 Panel Data Analysis

Although we have obtained the estimation results consistent with our hypothesis from the cross-country analysis, we complement the analysis by performing a dynamic panel data analysis. Table 4 shows the system GMM estimation results for 120 countries. In columns (1) to (3), where the interaction term between private credit and financial openness is not included, we find that private credit has no significant impact on inequality. Columns (4) to (6) report the results with the interaction term. The partial effect of financial development on inequality is given by $\alpha_2 + \alpha_3 \times$Financial Openness from Eq. (2). We find in columns (4) to (6) that α_2 is negative and α_3 is positive. Although the coefficient of private credit, α_2, is insignificant, the null hypothesis of $\alpha_2 = \alpha_3 = 0$ is rejected by the F tests in columns (4) to (6) at the conventional significance level. In column (6), for example, the threshold value of financial openness, which divides countries into ones with a negative effect of private credit and ones with a positive effect, is 1.163, which is approximately the 45th percentile of financial openness in this sample. While private credit has a negative impact on inequality below this threshold, it has a positive impact above this threshold. This result is consistent with our hypothesis and our cross-country analysis.

An interesting, by-product result from columns (4) to (6) is that the partial effect of financial openness depends upon private credit. Because the coefficients of financial openness are negative and significant and the interaction terms of private credit with financial openness are positive and significant, international financial integration widens inequality in a country with a fully developed financial market, whereas it narrows inequality in a country with a poorly developed financial market.

To confirm the validity of the set of instrumental variables, we perform the Hansen tests for overidentifying restrictions. Under the moderate number of overidentifying restrictions

in columns (4) to (6), the Hansen tests for over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level. The consistency of the GMM estimator also depends upon the validity of the assumption that there are no serial correlations of the error terms ϵ_{it}. We examine whether the differenced error terms are serially correlated with respect to the second order. The Arellano-Bond serial correlation tests (AR(2) tests) in all columns do not reject the null hypothesis of non existence of a second-order serial correlation. The results of these two tests verify the validity of instrumental variables.

[Table 4 here]

5 The Theoretical Framework

In this section, we propose a possible mechanism to explain our empirical findings by developing an overlapping generations model. In this economy, there are two types of capital. The first is real capital used for final goods production, which is supplied by private agents. One may think that the real capital broadly includes a combination of physical and human capital. However, real capital is country-specific, and thus, it cannot be traded between countries. The real capital depreciates entirely in one period. The second is financial capital, which is used as a resource for borrowing and lending. If countries are internationally integrated, financial capital is traded in the international financial market.

5.1 Production Sector

Final goods are produced from real capital and augmented labor with a Cobb-Douglas production function as follows

$$Y_t = AZ_t^{\alpha} H_t^{1-\alpha},$$

where Y_t is the output, Z_t is the aggregate real capital, and H_t is the aggregate augmented labor at time t. Following Romer (1986), labor is assumed to be augmented in terms of increased productivity by knowledge spillover through learning-by-doing and/or on-the-job training. Moreover, such knowledge spillover is assumed to be associated with the level of economic development, which is reflected in per capita output. This external effect is also country-specific. More concretely, the augmented labor is given by

$$H_t = f(y_t)L_t,$$

where $y = Y/L$ and $f(.)$ is an increasing function of y. Specifically, $f(y) = y$ is assumed; thus, technology exhibits constant returns to scale with respect to per young agent real capital in equilibrium. The production sector is assumed to be perfectly competitive, and thus, the production factors are paid their marginal products

$$\begin{aligned} q_t &= \alpha Y_t/Z_t \\ w_t &= (1-\alpha)Y_t/L_t, \end{aligned}$$

where q is the price of the real capital and w is the wage rate. Because Z broadly includes not only physical capital but also human capital, q is also thought of as the salary rate of human capital.

5.2 Agents

We consider an economy consisting of overlapping generations of young and old agents, each of whom lives for two periods in which time expands from 0 to ∞. Assuming each agent's risk neutrality, the utility function is given by $u(c_{t+1}) := c_{t+1}$ such that each agent obtains his/ her utility exclusively from his/her second-period consumption c_{t+1}. The population of each generation L_t is assumed to remain constant.[17]

The budget constraints of an agent in the first and second periods are given, respectively, by

$$k_t + b_t \leq w_t \tag{3}$$

and

$$c_{t+1} \leq q_{t+1}\phi k_t + r_{t+1}b_t, \tag{4}$$

where k is the investment in a project and b is the lending when positive and the borrowing when negative. In the first period, each agent invests, borrows and/or lends. If an agent begins investing in a project in the first period, he/she produces real capital, ϕk, which he/she then sells to the final production sector at a certain price q in the second period.[18] ϕ is the productivity of real capital production and r is the gross (real) interest rate.

Owing to the agency problem in the financial market, investors face borrowing constraints. Following Aghion et al. (2005), the credit constraint facing each agent is given by

$$b_t \geq -\nu w_t, \tag{5}$$

where $\nu \in [0, \infty)$ is the extent of the credit constraint. Two microfoundations for Eq. (5) are provided in Appendix A.3.[19] Note that agents can borrow financial capital of a value up to ν times more than the wealth that they earned in the first period. w can be regarded as the down-payment for an investment project. The non-negativity constraint for the investment project is given by

$$k \geq 0. \tag{6}$$

We now introduce agent heterogeneity in terms of productivity into the model. More concretely, we assume that the productivity ϕ varies among agents and is distributed uniformly over $[0, 1]$. Each agent knows his/her own productivity at his/her birth but does not know the productivity of other agents.

[17]The assumption of a constant population has no effects on our results in the following analysis.

[18]If one regards ϕk as human capital, the project is thought of as the education investment.

[19]This type of assumption regarding credit market imperfections often appears in the literature. See Aghion et al. (1999), Aghion and Banerjee (2005) and Aghion et al. (2005).

Each agent maximizes c_{t+1} subject to inequalities (3)-(6). The maximization problem can thus be rewritten as

$$\max_{b_t}(r_{t+1} - \phi q_{t+1})b_t$$

subject to

$$-\frac{\mu}{1-\mu}w_t \leq b_t \leq w_t,$$

where $\mu := \nu/(1+\nu)$. The solution to this problem now appears straightforward. If $\phi_t := r_{t+1}/q_{t+1} > \phi$, it is optimal for an agent to choose $b_t = w_t$ and $k_t = 0$, whereas if $\phi_t < \phi$, then it is optimal to choose $b_t = -\mu w_t/(1-\mu)$ and $k_t = w_t/(1-\mu)$. ϕ_t is a cutoff that divides agents into savers and borrowers. μ or ν is a measure of financial market development, as discussed in Appendix A.3.

The aggregate real capital is supplied by investors as follows

$$Z_{t+1} = \int_{\phi_t}^{1} \phi k_t L_t d\phi = \frac{w_t(1-\phi_t^2)}{2(1-\mu)}L_t. \tag{7}$$

As $Y_t = A^{1/\alpha}Z_t$ in equilibrium, the equilibrium capital price and wage become

$$\begin{aligned} q_t &= \alpha A^{1/\alpha}, \\ w_t &= (1-\alpha)A^{1/\alpha}z_t, \end{aligned}$$

where $z_t := Z_t/L_t$. As $L_{t+1} = L_t$, Eq. (7) can be rewritten as

$$z_{t+1} = \frac{(1-\alpha)A^{1/\alpha}(1-\phi_t^2)}{2(1-\mu)}z_t. \tag{8}$$

5.3 Gini Coefficient of a Closed Economy

In the following sections, the total population of each generation is normalized to one. In a closed economy, the financial market at time t clears within the country and within generation t. From the solution to the maximization problem for each agent, the financial market clearing condition in a closed economy is given by

$$w_t\phi_t - \frac{\mu w_t}{1-\mu}(1-\phi_t) = 0,$$

or equivalently,

$$\phi_t = \mu. \tag{9}$$

We measure inequality among agents in terms of consumption (or, equivalently, income in the second period). To obtain the Lorenz curve, we subsequently compute the average consumption at time t, $\bar{c}_t$. Consumption of agents with $\phi < \phi_{t-1}$ is given by $c_t = \phi_{t-1}\alpha A^{1/\alpha}w_{t-1}$, and consumption of agents with $\phi > \phi_{t-1}$ is given by $c_t = (\phi - \mu\phi_{t-1})\alpha A^{1/\alpha}w_{t-1}/(1-\mu)$. Therefore, we obtain

$$\begin{aligned} \frac{\bar{c}_t}{\alpha A^{1/\alpha}w_{t-1}} &= \phi_{t-1}\int_0^{\phi_{t-1}} d\phi + \frac{1}{1-\mu}\int_{\phi_{t-1}}^{1}(\phi - \mu\phi_{t-1})d\phi, \\ &= \frac{1}{2(1-\mu)}(\phi_{t-1}^2 - 2\mu\phi_{t-1} + 1). \end{aligned} \tag{10}$$

From Eq. (10), the Lorenz curve, $L(x)$, is given by

$$L(x) = \int_0^x \frac{c_t}{\bar{c}_t} d\phi = \begin{cases} \frac{2(1-\mu)\phi_{t-1}x}{\phi_{t-1}^2 - 2\mu\phi_{t-1}+1} & \text{if} \quad 0 \leq x < \phi_{t-1}, \\ \\ \frac{\phi_{t-1}^2 - 2\mu\phi_{t-1}x + x^2}{\phi_{t-1}^2 - 2\mu\phi_{t-1}+1} & \text{if} \quad \phi_{t-1} \leq x \leq 1. \end{cases}$$

As the Gini coefficient is formulated by $G := 1 - 2\int_0^1 L(x;t)dx$, we have

$$G = \frac{2\phi_{t-1}^3 - 3\phi_{t-1}^2 + 1}{3(\phi_{t-1}^2 - 2\mu\phi_{t-1} + 1)}. \tag{11}$$

Substituting Eq. (9) into Eq. (11), the Gini coefficient is given by

$$G = \frac{-2\mu^2 + \mu + 1}{3(\mu + 1)}. \tag{12}$$

The right-hand side of Eq. (12) is a decreasing function with respect to μ. Therefore, we have established the basis for Proposition 1.

Proposition 1 *In a closed economy, the Gini coefficient decreases as the financial market develops.*

Proof. The claim follows from the fact that $dG/d\mu = -2\mu(\mu+2)/(3(\mu+1)^2) < 0$. □

5.4 Gini Coefficient of a Small Open Economy

We now consider an economy that opens its financial market to the world market. In a small open economy, the world interest rate is exogenously given at $r_t = \bar{r}$. In this case, the cutoff ϕ_t is given by

$$\phi_t = \frac{\bar{r}}{\alpha A^{1/\alpha}} := \bar{\phi}. \tag{13}$$

We assume $\bar{r} < \alpha A^{1/\alpha}$ such that borrowers always exist in the economy. While the cutoff is constant, as it is in a closed economy, it is independent of the degree of credit constraint, μ. By substituting Eq. (13) into Eq. (11), we obtain the Gini coefficient of the small open economy as follows

$$G = \frac{2\bar{\phi}^3 - 3\bar{\phi}^2 + 1}{3(\bar{\phi}^2 - 2\mu\bar{\phi} + 1)}.$$

In contrast with that of a closed economy, the Gini coefficient of a small open economy is an increasing function with respect to μ. Thus, we have established the basis for Proposition 2.

Proposition 2 *In a small open economy, the Gini coefficient increases as the financial market develops.*

Proof. It is obvious that $dG/d\mu > 0$. □

5.5 Discussion

Our theoretical analysis has allowed us to derive two propositions. In a closed economy, as credit constraints relax, production resources are intensively used by the talented agents who borrow financial capital from the less-talented agents in the economy. In turn, these less-talented agents lend financial capital to the talented agents through the domestic financial market. Thus, in a closed economy, the less-talented agents can utilize the abilities of the talented agents, while the latter must pay a higher interest rate as credit constraints relax. As a result, income inequality narrows as credit constraints relax.

In contrast, in a small open economy, the talented agents can borrow financial capital in the world market at a low interest rate relative to their abilities. In this case, financial capital flows in the economy and it is intensively used by talented agents. As a result, the less-talented agents cannot utilize the abilities of the talented agents even though credit constraints relax. Thus, inequality widens.

The key mechanism of our model is illustrated by a supply-demand analysis of the financial market. From the optimal behavior of individuals, the aggregate supply of financial capital in the economy is given by

$$F^s := w_t \phi_t = \frac{w_t}{\alpha A^{1/\alpha}} r.$$

The supply curve of financial capital is an increasing function of r. On the other hand, the aggregate demand for financial capital is given by

$$F^d := \frac{\mu w_t}{1-\mu}(1-\phi_t) = \frac{\mu w_t}{1-\mu}(1 - r/\alpha A^{1/\alpha}).$$

The demand curve is a decreasing function of r. The supply and demand curves are shown by the SS locus and the DD locus in Figure 1, respectively. Let us consider the case in which μ increases as the domestic financial market develops. In this case, the demand for financial capital increases and then the demand curve rotates counterclockwise, while the supply curve does not move.

[Figure 1 here]

Suppose that a country is a closed economy, in which the equilibrium interest rate is determined at the intersection of the supply and demand curves. As seen in Figure 1, if the demand increases and the demand curve rotates from D_0D_0 to D_1D_1, the equilibrium interest rate increases. The increase in the interest rate leads to the decrease in the number of investors. Moreover, the increase in the interest rate becomes a burden for investors, whereas it becomes advantageous for lenders. That is why inequality narrows as the domestic financial market develops.

Now consider the case in which a country opens its financial market to the world market and becomes a small open economy. Because the world interest rate $\bar{r}$ is constant, financial capital flows in the country and the total liabilities increase when the demand for financial

capital increases. In this case, even though the demand curve rotates from D_0D_0 to D_1D_1, the number of investors does not decrease. Furthermore, each investor borrows more financial capital in the world market than when μ is small, implying that financial capital inflows are intensively utilized by investors. Because the interest rate does not increase, the lenders in the country do not benefit from the development of the domestic financial market, whereas the investors incur no burden, unlike the case of a closed economy. Accordingly, inequality widens as the domestic financial market develops.[20]

We have obtained a by-product result in the panel data analysis that international financial integration widens inequality in a country with a fully developed financial market, whereas international financial integration narrows inequality in a country with a poorly developed financial market. See the partial effects of financial openness on inequality shown in columns (4) to (6) in Table 4. Figure 1 provides an explanation for this result. Consider two countries whose supply curves of domestic financial capital are the same as given by the SS curve in Figure 1. Suppose that the demand curves in countries 1 and 2 are, respectively, given by the D_1D_1 and D_2D_2 curves, implying that the financial market in country 1 is more fully developed than that in country 2. As seen in Figure 1, when country 1 is a closed economy, its equilibrium interest rate is greater than the world interest rate, whereas when country 2 is a closed economy, its equilibrium interest rate is less than the world interest rate. Because country 1 opens its financial market to the world market, financial capital flows in country 1. In this case, the number of borrowers increases because the world interest rate is less than the equilibrium interest rate when country 1 was a closed economy. The declined interest rate facing country 1 is beneficial to investors and disadvantageous to savers. As a result, inequality widens in country 1. However, if country 2 opens its financial markets to the world market, then financial capital flows out of country 2 and the number of borrowers decreases because the world interest rate is greater than the equilibrium interest rate when country 2 was a closed economy. The increased interest rate facing country 2 is beneficial to savers and disadvantageous to borrowers. Therefore, inequality narrows in country 2.[21]

This section concludes with a remark on a large open economy. Our empirical exercise includes large open economies such as the United States. The same idea as in the case of a small open economy about the effect of financial capital inflow on inequality can be applicable to a large open economy. It is true that financial development in a large open economy, leading to an increase in demand for financial capital, exerts upward pressure on the interest rate. However, many rapidly growing countries in East Asia, such as China, have participated in the world financial market since the early 1990s. Those rapidly-growing countries, whose financial markets are not fully developed, provide the world market with a significant amount of financial capital. The total supply of financial capital by those countries

[20]While Figure 1 illustrates only the case in which the net total liabilities are positive and, thus, the country is a net borrower, the same mechanism works when the net liabilities are negative.

[21]The fact that the Gini coefficient in Eq. (11) is a decreasing function with respect to ϕ confirms the illustrative analysis with Figure 1.

may likely offset the upward pressure on the interest rate.[22] Accordingly, the same idea, as in the case of a small open economy, is applicable to a large open economy.

6 Financial Capital Inflow and Financial Development

As discussed in the previous section, the key mechanism of our theoretical framework is the relationship between financial capital inflow in an economy and financial market development. If the key mechanism is correct, we will observe in practice that an increase in private credit in a country causes an increase in the total liabilities in that country. We empirically verify this hypothesis in this section by using the system GMM estimators.[23] The estimation equation is specified as

$$\begin{aligned} \text{Net Liabilities}_{it} &= \alpha_1 \text{Net Liabilities}_{it-1} + \alpha_2 \text{Financial Development}_{it} \\ &\quad + X_{it}\beta + \mu_t + \eta_i + \epsilon_{it}. \end{aligned}$$

The three disturbance terms show the same variables as those in Eq. (2). Net liabilities represent the net liabilities/GDP ratio. The one-period lagged variable of the net liabilities/GDP ratio in the right-hand side captures a persistence effect of the past financial capital inflow in the country, reflecting, for example, the agglomeration of investment from abroad. The set of the control variables X includes the per capita GDP, political risk, inflation, and capital controls.

We prepared two kinds of the net liabilities/GDP ratio to check the robustness for our estimations, each of which is computed from the dataset created by Lane and Milesi-Ferretti (2007). The first is total liabilities minus total assets divided by the GDP in the dataset, and the second is debt liabilities minus debt assets divided by the GDP. We assembled the data for inflation provided by the World Bank (2011b). For capital controls, we use a measure of capital account liberalization created by Chinn and Ito (2006, 2008). The Chinn-Ito index is a *de jure* measure of capital account openness. Other variables are the same as those used in previous empirical analyses. The data availability allowed us to prepare the dataset for 120 countries from 1985 to 2009, listed in Table A1 in Appendix A.1. As in the panel data analysis in the previous section, we use the five-year averaged data. The definitions and sources of all the data are presented in Table A2 in Appendix A.1 and the descriptive statistics are shown in Table A5 in Appendix A.1.

Table 5 reports estimation results for the relationship between the net liabilities and domestic private credit. The validity of the instruments is confirmed by the tests for serial correlations and by the Hansen tests as in the panel data analysis in the previous section. In columns (1) to (3), where the total net liabilities are used as a dependent variable, we find

[22] Warnock and Warnock (2009) estimate that financial capital inflow in the United States has significantly reduced the real interest rates in the country since the mid-1990s.

[23] To limit the number of the instrumental variables, we employ the collapsed form of instrument sets for our regressions. See Roodman (2009) for more details.

that private credit has a significantly positive impact on the net liabilities. For a robustness check, columns (4) to (6) report the results of the case in which the net debt liabilities are used. The effect of private credit on the net debt liabilities is also significantly positive. Therefore, an increase in domestic private credit causes an increase in the net liabilities in a country, implying that the key mechanism of our theoretical framework is consistent with the estimation results in Table 5.

[Table 5 here]

7 Concluding Remarks

Whether the combination of financial development and international financial integration widens or narrows inequality within a country remains an open question. In this study, we empirically demonstrated that if an economy is closed to the world financial market, inequality within the economy narrows as its financial market develops; in contrast, if an economy is open to the world financial market, inequality within the economy widens as its financial market develops. We thus presented a possible explanation for our empirical findings with an overlapping generations model.

Our findings have a policy implication for financially open countries. The degree of financial openness varies greatly among countries as demonstrated by Lane and Milesi-Ferretti (2007). The group of highly open countries in our empirical exercise consists of not only highly developed countries but also less developed countries. These financially open countries experience increasing inequality as their financial markets mature. The financially open countries that desire to decrease inequality resulting from having open financial markets should consider implementing redistributional policies to mitigate the widening inequality if they are oriented to equal societies.

While our results are novel, a caveat regarding them must be noted. We extracted sub-samples from the entire sample in our cross-country analysis, and we incorporated the interaction term between financial openness and private credit in our dynamic panel analysis. These procedures did not allow us to control for other factors affecting financial development and inequality simultaneously, if they exist. Even with this caveat, our results provide a possible explanation for the widening inequality observed in many advanced economies over the past decades in terms of international financial integration and financial development. Our results should provide guidance in future research into the relationship between financial development and inequality.

Appendix

A.1 Data Description

[Table A1 here]

[Table A2 here]

[Table A3 here]

[Table A4 here]

[Table A5 here]

A.2 Robustness Analysis

We perform robustness analysis using the other datasets that we created for highly open countries and highly closed countries. Table A6 presents the results obtained from our dataset of the 56 highly open countries whose financial openness values are above the median value (the 50th percentile). In the IV estimations in columns (4) to (6), the coefficients of private credit are significantly positive, and the overall results in Table A6 are consistent with those in Table 2.

[Table A6 here]

Table A7 shows the estimation results for 26 highly open countries whose financial openness values are above the 75th percentile. This table reports the same qualitative impact of private credit on inequality as in the IV estimation results of Table 2 and table A6.

[Table A7 here]

Table A8 shows the results in the case of the 63 highly closed countries whose financial openness values are less than the median value. In columns (4) to (6), the IV estimation results indicate that an increase in private credit decreases inequality, which is consistent with the results in Table 3.

[Table A8 here]

Table A9 presents the results for the 35 highly closed countries whose financial openness values are below the 25th percentile. The coefficient of private credit in column (4) is significant and negative, although columns (5) and (6) show insignificant negative coefficients of private credit. The results for the insignificant coefficients of private credit in columns (5) and (6) are probably due to the reduced number of highly closed countries. The 25 observed countries must have relatively homogeneous features in private credit and inequality.

[Table A9 here]

Next, we perform a sensitivity analysis to further check the validity of the instruments, following the procedure of Tabellini (2010). Specifically, we add one of the two instrumental

variables to the second stage regression as an explanatory variable, treating it as exogenous. Under this specification, only the other legal origin is an excluded instrumental variable, implying that the model is just identified. If the legal origins used in our estimations are valid instrumental variables, they have no direct impact on inequality or have no impact through channels other than private credit. In other words, if the legal origins are valid instrumental variables, the coefficient of legal origin directly added to the second stage regression should have no impact on inequality under the condition that the other legal origin satisfies the orthogonality condition.

Table A10 presents estimation results obtained from our data set of the 42 highly open countries, the same country group as in Table 2. We find that the legal origin directly included in the second stage regression has no significant impact on inequality and the coefficient of private credit is significantly positive, implying that the legal origins added to the second stage regressions have no direct impact on inequality.

[Table A10 here]

The same procedure is conducted in Table A11 for 49 highly closed countries, the same country group as in Table 3. We find that the legal origin directly included in second stage regression has no significant impact on inequality, although the coefficient of private credit is not significant. Overall, these results reinforce the results of overidentification tests in our estimations in the main text.

[Table A11 here]

A.3 Microfoundations for Credit Constraints

Two types of microfoundations for a credit constraint are described in this appendix.

Microfoundation I

Following Aghion and Banerjee (2005), we assume that credit market imperfections arise simply from the possibility that borrowers may not repay their obligations.[24]

Each agent prepares his/her own wealth w_t, which consists of wages earned when he/she is young, to invest. His/her total resources are $k_t = w_t - b_t$. The return on one unit of investment is $q_{t+1}\phi$. If a borrower consistently repays his/her obligations, then he/she earns a net income, $q_{t+1}\phi k_t + r_{t+1}b_t$. In contrast, if the borrower does not repay his/her obligations, he/she incurs a cost δk_t to hide his/her revenue. In such a case, a financial intermediary monitors the borrower, and the intermediary is able to capture the borrower with a probability of p_{t+1}. In this case, his/her expected income is given by $q_{t+1}\phi k_t - \delta k_t + p_{t+1}r_{t+1}b_t$

[24] Aghion et al. (1999) and Aghion et al. (2005) provide a microfoundation for a credit constraint in the same manner as do Aghion and Banerjee (2005).

Under this lending contract, the incentive compatibility constraint that incentivizes the borrower not to default is given by

$$q_{t+1}\phi k_t + r_{t+1}b_t \geq [q_{t+1}\phi - \delta]k_t + p_{t+1}r_{t+1}b_t, \tag{A1}$$

which is rewritten as

$$b_t \geq -\frac{\delta}{r_{t+1}(1-p_{t+1})}k_t, \tag{A2}$$

The left-hand side of Eq. (A1) is the revenue that the borrower acquires when he/she invests in a project and repays his/her obligations, and the right-hand side is the gain when he/she defaults. Eq. (A2) is independent of the return on one unit of investment.

To attain the probability p_{t+1} to detect the borrower's deception, the financial intermediary incurs an effort cost, $b_t C(p_{t+1})$, which is increasing and convex with respect to p_{t+1}. As in Aghion and Banerjee (2005), we assume $C(p_{t+1}) = \kappa \log(1-p_{t+1})$, where κ is strictly greater than δ so that all borrowers face credit constraints more severe than their natural debt limits. The financial intermediary can choose an optimal probability to solve a maximization problem such that

$$\max_{p_{t+1}} \ -p_{t+1}r_{t+1}b_t - \kappa \log(1-p_{t+1})b_t.$$

As $-b_t > 0$, this maximization problem is rewritten as

$$\max_{p_{t+1}} \ p_{t+1}r_{t+1} + \kappa \log(1-p_{t+1}).$$

From the first-order condition, we have

$$r_{t+1} = \frac{\kappa}{1-p_{t+1}}. \tag{A3}$$

As the interest rate r_{t+1} increases, the financial intermediary chooses the high probability to detect defaulting borrowers. From Eqs. (A2) and (A3), we obtain

$$b_t \geq -\frac{\delta}{\kappa}k_t,$$

or equivalently,

$$b_t \geq -\frac{\delta}{\kappa - \delta}w_t. \tag{A4}$$

As the agent's productivity ϕ is not observable, the financial intermediary does not impose agent-specific credit constraints; however, the financial intermediary must know the agent's wealth, w_t. As long as it imposes a credit constraint given by inequality (A4) on all agents, none will default in equilibrium. As $\delta < \kappa$, we can let $\nu := \delta/(\kappa - \delta) \in [0, \infty)$, and thus,

$$b_t \geq -\nu w_t,$$

which is a credit constraint in the main text. δ and κ are associated with a default cost and a monitoring cost, respectively. We can consider that as δ increases or κ decreases, a financial market fully develops.

Microfoundation II

We extend the microfoundation for a credit constraint developed by Antràs and Caballero (2009) in a manner suitable for our model. In particular, we consider the participation constraint faced by the financial intermediary and the incentive compatibility condition of the borrowers which incentivizes them not to default.

It is assumed that at the end of the first period of each borrower's lifetime and after investment has occurred, any borrower can abscond with no cost from carrying out his/her investment project, taking some fraction of his investment, $(1-\mu)(w_t-b_t)$, where $0<\mu<1$, and not repaying his obligations to the financial intermediary. In this case, the borrower will engage in capital production somewhere and sell capital goods in a market.

If a borrower absconds at the end of the first period, then the financial intermediary can reclaim the remainder of investment, $\mu(w_t-b_t)$. We assume that the financial intermediary can relend the remainder of the investment in the financial market. Therefore, when the financial intermediary makes a financial contract with a borrower, it faces a participation constraint such that

$$r_{t+1}\mu(w_t-b_t)\geq -r_{t+1}b_t,$$

or equivalently

$$b_t\geq -\frac{\mu}{1-\mu}w_t.$$

On the other hand, the incentive compatibility constraint for a borrower, which incentivizes him/her not to abscond from engaging in his/her project at the end of the first period, is given by

$$\phi q_{t+1}(w_t-b_t)+r_{t+1}b_t\geq \phi q_{t+1}(1-\mu)(w_t-b_t). \tag{A5}$$

For agents with ϕ such that $r_{t+1}-\mu\phi q_{t+1}\leq 0$, Eq. (A5) always holds. Therefore, we focus on agents with ϕ such that $r_{t+1}-\mu\phi q_{t+1}>0$. Then, Eq. (A5) is rewritten as

$$b_t\geq -\frac{\mu}{(\phi_t/\phi)-\mu}w. \tag{A6}$$

As $\phi_t/\phi\leq 1$ in equilibrium, it follows that $-\mu/((\phi_t/\phi)-\mu)\leq -\mu/(1-\mu)$, implying that Eq. (A6) is redundant.

In summary, if the financial intermediary imposes a credit constraint $b_t\geq -\mu w_t/(1-\mu)$, which is the participation constraint of the financial intermediary, borrowers never default. By letting $\mu/(1-\mu):=\nu$, we obtain the credit constraint $b_t\geq -\nu w_t$, as shown in the main text.

As μ, or equivalently ν, increases, it becomes more difficult for the borrowers to withdraw their investment without repaying their obligations. If we consider these variables as being associated with the legal protection of the lenders, a financial market fully develops as they increase.

References

[1] Aghion, P., Banerjee, A., 2005. Volatility and Growth. Oxford University Press, Oxford.

[2] Aghion, P., Banerjee, A., Piketty, T., 1999. Dualism and macroeconomic volatility. Quarterly Journal of Economics 114, 1359-1397.

[3] Aghion, P., Howitt, P., Mayer-Foulkes, D., 2005. The effect of financial development on convergence: theory and evidence. Quarterly Journal of Economics 120, 173-222.

[4] Aghion, P., Howitt, P., Violante, G.L., 2002. General purpose technology and wage inequality. Journal of Economic Growth 7, 315-345.

[5] Alesina, A., Rodrik, D., 1994. Distributive politics and economic growth. Quarterly Journal of Economics 109, 465-490.

[6] Alfaro, L., Chanda, A., Kalemli-Ozcan, S., Sayek, S., 2004. FDI and economic growth: the role of local financial markets. Journal of International Economics 64, 89-112.

[7] Antràs, P., Caballero, R.J., 2009. Trade and capital flows: a financial frictions perspective. Journal of Political Economy 117, 701-744.

[8] Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277-297.

[9] Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68, 29-51.

[10] Asano, A., 2010. Is there a "double bonus" from reducing inequality? Economic Inquiry, forthcoming.

[11] Autor, D.H., Katz, L.F., Krueger, A.B., 1998. Computing inequality: have computers changed the labor market? Quarterly Journal of Economics 113, 1169-1213.

[12] Banerjee, A.V., Newman, A.F., 1993. Occupational choice and the process of development. Journal of Political Economy 101, 274-298.

[13] Barro, R.J., Lee, J.-W., 2010. A new data set of educational attainment in the world, 1950-2010. NBER Working Paper 15902.

[14] Beck, T., Demirgüç-Kunt, A., Levine, R., 2007. Finance, inequality and the poor. Journal of Economic Growth 12, 27-49.

[15] Beck, T., Demirgüç-Kunt, A., Levine, R.E., 2010. A New Database on Financial Development and Structure (updated November 2010). World Bank, Washington, DC.

[16] Bekaert, G., Harvey, C.R., Lundblad, C., 2005. Does financial liberalization spur growth? Journal of Financial Economics 77, 3-55.

[17] Bertola, G., 1993. Factor shares and savings in endogenous growth. American Economic Review 83, 1184-1198.

[18] Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-143.

[19] Chinn, M.D., Ito, H., 2006. What matters for financial development? capital controls, institutions, and interactions. Journal of Development Economics 81, 163-192.

[20] Chinn, M.D., Ito, H., 2008. A new measure of financial openness. Journal of Comparative Policy Analysis 10, 309-322.

[21] Clarke, G.R.G., Xu, L.C, Zou, H., 2006. Finance and income inequality: what do the data tell us? Southern Economic Journal 72, 578-596.

[22] Demirgüç-Kunt, A., Levine, R., 2009. Finance and inequality: theory and evidence. Annual Review of Financial Economics 1, 287-318.

[23] Galor, O., Moav, O., 2000. Ability-biased technological transition, wage inequality, and economic growth. Quarterly Journal of Economics 115, 469-497.

[24] Galor, O., Moav, O., 2004. From physical to human capital accumulation: inequality and the process of development. Review of Economic Studies 71, 1001-1026.

[25] Galor, O., Zeira, J., 1993. Income distribution and macroeconomics. Review of Economic Studies 60, 35-52.

[26] Greenwood, J., Jovanovic, B., 1990. Financial development, growth, and the distribution of income. Journal of Political Economy 98, 1076-1107.

[27] Katz, L.F., Murphy, K.M., 1992. Changes in relative wages, 1963-1987: supply and demand factors. Quarterly Journal of Economics 107, 35-78.

[28] Kose, M.A., Prasad, E., Rogoff, K., Wei, S-J., 2009. Financial globalization: a reappraisal. IMF Staff Papers 56, 8-62.

[29] Kose, M.A., Prasad, E., Rogoff, K., Wei, S-J., 2010. Financial globalization and economic policies. In: Rodrik, D., Rosenzweig, M. (Eds.) Handbook of Development Economics, Vol.5. Elsevier, Amsterdam, pp. 4283-4362.

[30] Kuznets, S., 1955. Economic growth and income inequality. American Economic Review 45, 1-28.

[31] Lane, P.R., Milesi-Ferretti, G.M., 2007. The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970-2004. Journal of International Economics 73, 223-250.

[32] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2008. The economic consequences of legal origins. Journal of Economic Literature 46, 285-332.

[33] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1997. Legal determinants of external finance. Journal of Finance 52, 1131-1150.

[34] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1998. Law and finance. Journal of Political Economy 106, 1113-1155.

[35] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1999. The quality of government. Journal of Law, Economics, and Organization 15, 222-279.

[36] Levine, R., 2005. Finance and growth: theory and evidence. In: Aghion, P., Durlauf, S.N., (Eds.) Handbook of Economic Growth. Elsevier, Amsterdam, pp. 865-934.

[37] Levine, R., Loayza, N., Beck, T., 2000. Financial intermediation and growth: causality and causes. Journal of Monetary Economics 46, 31-77.

[38] Li, H., Squire, L., Zou, H., 1998. Explaining international and intertemporal variations in income inequality. Economic Journal 108, 26-43.

[39] Matsuyama, K., 2002. The rise of mass consumption societies. Journal of Political Economy 110, 1035-1070.

[40] Mendoza, E.G., Quadrini, V., Ríos-Rull, J.-V., 2009. On the welfare implications of financial globalization without financial development. In: Clarida, R., Giavazzi, F., (Eds.) NBER International Seminar on Macroeconomics 2007. University of Chicago Press, Chicago, pp. 283-312.

[41] OECD, 2008. Growing Unequal? Income Distribution and Poverty in OECD Countries. OECD, Paris.

[42] Persson, T., Tabellini, G., 1994. Is inequality harmful for growth? American Economic Review 84, 600-621.

[43] Piketty, T., 2006. The Kuznets' curve, yesterday and tomorrow. In: Banerjee, A.V., Bénabou, R., Mookherjee, D., (Eds.) Understanding Poverty. Oxford University Press, Oxford, pp. 63-72.

[44] PRS Group, 2011. International Country Risk Guide. PRS Group, New York.

[45] Romer, P.M., 1986. Increasing returns and long-run growth. Journal of Political Economy 94, 1002-1037.

[46] Roodman, D., 2009. How to do xtabond2: an introduction to difference and system GMM in Stata. Stata Journal 9, 86-136.

[47] Solt, F., 2009. Standardizing the world income inequality database. Social Science Quarterly 90, 231-242.

[48] Staiger, D., Stock, J.H., 1997. Instrumental variables regression with weak instruments. Econometrica 65, 557-586.

[49] Tabellini, G., 2010. Culture and institutions: economic development in the regions of Europe. Journal of the European Economic Association 8, 677-716.

[50] Tressel, T., Verdier, T., 2011. Financial globalization and the governance of domestic financial intermediaries. Journal of the European Economic Association 9, 130-175.

[51] Warnock, F.E., Warnock, V.C., 2009. International capital flows and U.S. interest rates. Journal of International Money and Finance 28, 903-919.

[52] Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. Journal of Econometrics 126, 25-51.

[53] Wood, A., 1995. How trade hurt unskilled workers. Journal of Economic Perspectives 9, 57-80.

[54] Wood, A., 1998. Globalisation and the rise in labour market inequalities. Economic Journal 108, 1463-1482.

[55] World Bank, 2011a. Education Statistics. World Bank, Washington, DC.

[56] World Bank, 2011b. World Development Indicators. World Bank, Washington, DC.

Table 1: Inequality and financial development (all countries)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	-2.648	-3.857	-2.396	-13.316**	-14.227**	-8.822
	(2.936)	(3.215)	(3.493)	(5.848)	(6.371)	(6.820)
GDP per capita (log)	-0.884	-0.012	1.203	1.575	1.966	2.185
	(1.129)	(1.237)	(1.292)	(1.551)	(1.578)	(1.535)
Education	-1.251***	-1.157**	-1.277***	-1.277***	-1.022*	-1.177**
	(0.354)	(0.479)	(0.472)	(0.388)	(0.547)	(0.515)
Democracy		-0.054	0.016		-0.036	0.015
		(0.040)	(0.054)		(0.043)	(0.055)
Political risk			-0.220**			-0.184*
			(0.096)			(0.104)
Constant	55.645***	52.243***	50.513***	39.518***	38.239***	42.440***
	(7.584)	(8.298)	(8.520)	(10.405)	(10.822)	(11.370)
First stage F statistic				8.50	10.09	7.40
Hansen test				p=0.27	p=0.52	p=0.56
Observations	119	89	89	118	89	89

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in the parentheses are heteroskedasticity-robust standard errors. French and German legal origins are used as instrumental variables for private credit in columns (4) to (6). "$p =$" is the p-value of a statistical test.

Table 2: Inequality and financial development (42 financially open countries, cutoff: 60 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	-5.063	-4.931	-4.525	43.690***	33.675***	27.908***
	(5.438)	(5.256)	(5.404)	(14.919)	(12.536)	(10.125)
GDP per capita (log)	-2.491	-1.009	1.433	-14.733***	-11.524***	-7.052
	(2.179)	(2.159)	(2.779)	(4.457)	(4.157)	(4.994)
Education	-0.337	-0.520	-0.924	-0.408	-0.654	-1.092
	(0.755)	(0.723)	(0.794)	(1.065)	(0.990)	(1.030)
Democracy		-0.112*	0.017		-0.060	0.078
		(0.060)	(0.073)		(0.107)	(0.106)
Political risk			-0.337*			-0.383
			(0.181)			(0.269)
Constant	64.315***	60.243***	54.716***	142.100***	126.529***	109.550***
	(14.238)	(14.378)	(14.977)	(29.524)	(26.360)	(26.275)
First stage F statistic				5.94	11.51	11.10
Hansen test				p=0.97	p=0.67	p=0.89
Observations	42	36	36	42	36	36

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in the parentheses are heteroskedasticity-robust standard errors. Scandinavian and Socialist legal origins are used as instrumental variables for private credit in columns (4) to (6). "$p =$" is the p-value of a statistical test.

Table 3: Inequality and financial development (49 financially closed countries, cutoff: 40 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	0.773	-1.892	-1.466	-14.943***	-15.657***	-15.352***
	(6.600)	(6.465)	(6.571)	(4.747)	(4.780)	(5.182)
GDP per capita (log)	1.105	3.577**	3.962**	3.378**	5.185***	5.271***
	(1.553)	(1.583)	(1.840)	(1.482)	(1.668)	(1.895)
Education	-1.517***	-2.057***	-2.028**	-1.523***	-1.941**	-1.934**
	(0.491)	(0.748)	(0.743)	(0.522)	(0.854)	(0.841)
Democracy		0.042	0.060		0.099	0.103
		(0.073)	(0.093)		(0.084)	(0.102)
Political risk			-0.084			-0.023
			(0.163)			(0.155)
Constant	40.478***	22.147*	22.092*	26.733**	10.021	10.170
	(10.983)	(11.310)	(12.205)	(10.651)	(12.152)	(12.059)
First stage F statistic				25.32	67.46	56.65
Hansen test				p=0.22	p=0.66	p=0.62
Observations	49	36	36	49	36	36

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in the parentheses are heteroskedasticity-robust standard errors. French and German legal origins are used as instrumental variables for private credit in columns (4) to (6). "$p =$" is the p-value of a statistical test.

Table 4: Inequality and financial development (dynamic panel data analysis)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	system GMM	system GMM	system GMM	system GMM	system GMM	system GMM
Lagged inequality	0.919***	0.918***	0.942***	0.974***	0.941***	0.974***
	(0.076)	(0.076)	(0.061)	(0.068)	(0.061)	(0.063)
Private credit	0.848	0.949	0.721	-0.070	-0.298	-0.232
	(0.939)	(0.750)	(0.742)	(0.984)	(0.808)	(0.835)
Financial openness	-0.189	-0.289**	-0.218**	-0.423**	-0.548**	-0.406**
	(0.132)	(0.111)	(0.099)	(0.202)	(0.256)	(0.187)
Private credit				0.210*	0.256*	0.200*
× Financial openness				(0.114)	(0.139)	(0.103)
GDP per capita (log)	-1.124	1.098	0.946	-1.091	0.967*	1.092
	(1.138)	(0.663)	(0.704)	(0.855)	(0.549)	(0.688)
Education	0.769*			0.918**		
	(0.440)			(0.385)		
Democracy		-0.052*			-0.029	
		(0.032)			(0.020)	
Political risk			-0.043			-0.050
			(0.052)			(0.050)
Constant	7.100	-2.048	-2.337	4.155	-2.759	-4.003
	(8.367)	(6.807)	(6.079)	(7.186)	(5.870)	(6.421)
F test				p=0.05	p=0.08	p=0.04
No. of instruments	39	39	39	52	52	52
AR (2) test	p=0.13	p=0.12	p=0.12	p=0.12	p=0.12	p=0.11
Hansen test	p=0.25	p=0.28	p=0.16	p=0.33	p=0.40	p=0.27
Countries	114	107	107	114	107	107
Observations	397	377	377	397	377	377

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's (2005) corrected standard errors. Year dummies are included in all regressions. The null hypothesis of the F test is that the coefficients of private credit and its interaction term with financial openness are simultaneously equal to zero. "p ="is the p-value of a statistical test. The AR(2) test is the Arellano-Bond serial correlation test, where the null hypothesis is that a second-order serial correlation does not exist in the differenced error terms.

Table 5: Net liabilities and financial development (dynamic panel data analysis)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Net liabilities	Total system GMM	Total system GMM	Total system GMM	Debt system GMM	Debt system GMM	Debt system GMM
Lagged net liabilities	0.516***	0.509***	0.499***	0.598**	0.586**	0.534***
	(0.167)	(0.144)	(0.173)	(0.270)	(0.263)	(0.083)
Private credit	0.549***	0.538**	0.592***	0.760***	0.780***	0.799***
	(0.197)	(0.211)	(0.223)	(0.173)	(0.183)	(0.185)
GDP per capita (log)	0.073	0.067	-0.024	0.027	-0.034	-0.095
	(0.245)	(0.271)	(0.324)	(0.191)	(0.241)	(0.257)
Political risk	-0.029	-0.027	-0.039	-0.033**	-0.028	-0.030
	(0.019)	(0.021)	(0.030)	(0.017)	(0.020)	(0.023)
Inflation		0.000	0.000		0.000	0.001
		(0.001)	(0.001)		(0.001)	(0.001)
Capital controls			0.207			0.060
			(0.286)			(0.228)
Constant	1.223	1.152	2.622	1.728*	1.956*	2.539
	(1.174)	(1.286)	(2.138)	(0.892)	(1.085)	(1.616)
No. of instruments	18	18	18	18	18	18
AR (2) test	p=0.14	p=0.12	p=0.16	p=0.26	p=0.28	p=0.28
Hansen test	p=0.22	p=0.20	p=0.20	p=0.57	p=0.55	p=0.50
Countries	120	119	117	120	119	117
Observations	445	438	433	446	439	434

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's (2005) corrected standard errors. Year dummies are included in all the regressions. "p=" is the p-value of a statistical test. The AR(2) test is the Arellano-Bond serial correlation test where the null hypothesis is that a second-order serial correlation does not exist in the differenced error terms.

Table A1: List of countries

Albania (1,3,4,5)	Congo, Dem. Rep. (1,2,5)	Haiti (1,3,4,5)	Malawi (1,4,5)	Portugal (1,2,4,5)	Turkey (1,3,4,5)
Algeria (1,3,4,5)	Congo, Rep. (1,2,5)	Honduras (1,4,5)	Malaysia (1,2,4,5)	Qatar (5)	Uganda (1,3,4,5)
Angola (4,5)	Costa Rica (1,3,4,5)	Hong Kong (1,2,4,5)	Mali (1,4,5)	Romania (1,3,4,5)	United Kingdom (1,2,4,5)
Argentina (1,4,5)	Cote d'Ivoire (1,2,4,5)	Hungary (1,4,5)	Malta (1,2,4,5)	Russia (1,4,5)	United States (1,4,5)
Armenia (1,3,4,5)	Croatia (1,4,5)	Iceland (1,2,4,5)	Mauritania (1,2,4)	Rwanda (1,3,4)	Uruguay (1,4,5)
Australia (1,4,5)	Cyprus (1,2,4,5)	India (1,3,4,5)	Mauritius (1,3,4)	Saudi Arabia (5)	Venezuela (1,4,5)
Austria (1,2,4,5)	Czech Rep. (1,4,5)	Indonesia (1,3,4,5)	Mexico (1,3,4,5)	Senegal (1,3,4,5)	Vietnam (1,3,4,5)
Bahrain (5)	Denmark (1,2,4,5)	Iran (1,3,4,5)	Moldova (1,4,5)	Serbia (1,4,5)	Yemen (1,4,5)
Bangladesh (1,3,4,5)	Dominican Rep. (1,3,4,5)	Ireland (1,2,4,5)	Mongolia (1,3,4,5)	Sierra Leone (1,2,4,5)	Zambia (1,2,4,5)
Belgium (1,2,4,5)	Ecuador (1,3,4,5)	Israel (1,4,5)	Morocco (1,3,4,5)	Singapore (1,2,4,5)	
Belize (1,3,4)	Egypt (1,3,4,5)	Italy (1,4,5)	Mozambique (1,2,4,5)	Slovak Rep. (1,4,5)	
Benin (1,3,4)	El Salvador (1,3,4,5)	Jamaica (1,2,4,5)	Nepal (1,3,4)	Slovenia (1,3,4,5)	
Bolivia (1,4,5)	Estonia (1,4,5)	Japan (1,3,4,5)	Netherlands (1,2,4,5)	South Africa (1,3,4,5)	
Botswana (1,2,4,5)	Ethiopia (4,5)	Jordan (1,2,4,5)	New Zealand (1,2,4,5)	Spain (1,2,4,5)	
Brazil (1,3,4,5)	Fiji (1,3,4)	Kazakhstan (1,3,4,5)	Niger (1,3,4,5)	Sri Lanka (1,3,4,5)	
Brunei Darussalam (5)	Finland (1,2,4,5)	Kenya (1,3,4,5)	Nigeria (4,5)	Sudan (5)	
Bulgaria (1,2,4,5)	France (1,2,4,5)	Korea, Rep. (1,3,4,5)	Norway (1,2,4,5)	Swaziland (1,4)	
Burkina Faso (4,5)	Gabon (1,3,5)	Kuwait (5)	Oman (5)	Sweden (1,2,4,5)	
Burundi (1,2,4)	Gambia (1,2,4,5)	Kyrgyz Rep. (1,4)	Pakistan (1,3,4,5)	Switzerland (1,2,4,5)	
Cambodia (1,3,4)	Germany (1,2,4,5)	Lao PDR (1,2,4)	Panama (1,2,4,5)	Syria (5)	
Cameroon (1,3,4,5)	Ghana (1,3,4,5)	Latvia (1,4,5)	Papua New Guinea (1,4,5)	Tanzania (1,4,5)	
Canada (1,2,4,5)	Greece (1,4,5)	Lesotho (1,2,4)	Paraguay (1,3,4,5)	Thailand (1,3,4,5)	
Central African Rep. (1,3)	Guatemala (1,3,4,5)	Libya (5)	Peru (1,3,4,5)	Togo (1,2,5)	
Chile (1,2,4,5)	Guinea-Bissau (4,5)	Lithuania (1,3,4,5)	Philippines (1,4,5)	Trinidad and Tobago (1,2,4,5)	
Colombia (1,3,4,5)	Guyana (1,2,4,5)	Madagascar (4,5)	Poland (1,3,4,5)	Tunisia (1,4,5)	

Notes. "1", "2", "3", "4", and "5" in the parentheses indicate the 119 countries in Table 1, the 42 highly open countries in Table 2, the 49 highly closed countries in Table 3, the 120 countries in Table 4, and the 120 countries in Table 5.

Table A2: Data definitions and sources

Variable	Description	Source
Inequality	Net Gini coefficient developed by Solt (2009) who standardizes the Gini coefficient in the U.N. University's World Income Inequality Database.	Solt (2009)
Private credit	Private credit by deposit money banks and other financial institutions divided by GDP.	Beck et al. (2010)
GDP per capita (log)	The natural logarithm of per capita real GDP based on purchasing power parity.	World Bank (2011b)
Education	Average years of total schooling of the population over age 25. The data are available in 1985, 1990, 1995, 2000, and 2005.	World Bank (2011a) (Original source: Barro and Lee, 2010)
Political risk	Political risk rating consists of the following 12 sub-components: (A) Government Stability (12points), (B) Socioeconomic Conditions (12points), (C) Investment Profile (12 points), (D) Internal Conflict (12 points), (E) External Conflict (12 points), (F) Corruption (6 points), (G) Military in Politics (6 points), (H) Religious Tensions (6 points), (I) Law and Order (6 points), (J) Ethnic Tensions (6 points), (K) Democratic Accountability (6 points), (L) Bureaucracy Quality (4points). The index for institutions which is defined as the sum of each component is ranged from 0 to 100 and a larger value means a lower political risk.	PSR Group (2011)
Democracy	Democracy is one of the sub-components of political risk, Democratic Accountability. To ensure consistency of interpretation, this variable is rescaled from [0, 6] to [0, 100].	PSR Group (2011)
Financial openness	The sum of total assets and total liabilities divided by GDP. The data are available from 1985 to 2007.	Lane and Milesi-Ferretti (2007)

Table A2 (Continued): Data definitions and sources

Variable	Description	Source
Legal origins	Dummy variables for legal system origin, classified into English Common Law, French Commercial Code, German Commercial Code, Scandinavian Commercial Code, and Socialist Laws.	La Porta et al. (1999)
Total net liabilities	Total net liabilities are defined as total liabilities minus total assets divided by GDP. The data are available from 1985 to 2007.	Lane and Milesi-Ferretti (2007)
Debt net liabilities	Debt net liabilities are defined as debt liabilities minus debt assets divided by GDP. The data are available from 1985 to 2007.	Lane and Milesi-Ferretti (2007)
Inflation	Annual inflation rate based on consumer prices.	World Bank (2011b)
Capital controls	The extent of capital account liberalization.	Chinn and Ito (2006, 2008)

Table A3: Descriptive statistics for Table 1

Variables	Observations	Mean	Std. Dev.	Min.	Max.
Inequality	119	38.657	9.258	22.055	62.493
Private credit	119	0.449	0.385	0.022	1.569
GDP per capita (log)	119	8.589	1.259	5.996	10.590
Education	119	6.563	2.956	0.777	12.513
Democracy	89	60.378	26.142	16.667	100
Political risk	89	59.334	17.482	30.167	94.417
Financial openness	119	1.782	1.680	0.428	12.909

Notes. These statistics are based on the averaged values for 119 countries including in Table 1.

Table A4: Descriptive statistics for Table 4

Variables	Observations	Mean	Std. Dev.	Min.	Max.
Inequality	539	38.394	9.673	16.757	67.756
Private credit	560	0.460	0.429	0.014	2.336
Financial openness	576	1.862	2.173	0.257	23.132
GDP per capita (log)	587	8.548	1.268	5.852	10.782
Education	570	6.688	3.044	0.108	13.218
Democracy	510	68.605	23.731	10.139	100
Political risk	510	65.944	13.931	28.383	93.833

Notes. These statistics are based on the five-year averaged values for 120 countries including in Table 4.

Table A5: Descriptive statistics for Table 5

Variables	Observations	Mean	Std. Dev.	Min.	Max.
Total net liabilities	578	0.318	1.141	-10.011	5.079
Debt net liabilities	580	0.275	1.084	-9.941	4.776
Private credit	552	0.468	0.431	0.004	2.336
GDP per capita (log)	582	8.705	1.281	5.517	11.224
Political risk	575	65.035	14.243	21.517	93.833
Inflation	565	58.372	376.750	-19.102	6424.987
Capital controls	557	0.376	1.564	-1.844	2.478

Notes. These statistics are based on the five-year averaged values for 120 countries including in Table 5.

Table A6: Inequality and financial development (56 financially open countries, cutoff: 50 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	-5.565	-5.989	-4.608	33.543**	54.398**	38.426**
	(3.734)	(4.344)	(4.667)	(15.974)	(25.783)	(16.501)
GDP per capita (log)	-1.391	-1.438	0.130	-12.530**	-18.746**	-10.804*
	(1.763)	(1.896)	(2.146)	(4.923)	(8.040)	(5.786)
Education	-0.955*	-0.428	-0.816	-0.133	-0.142	-0.892
	(0.519)	(0.570)	(0.621)	(0.712)	(1.113)	(0.995)
Democracy		-0.095*	-0.009		0.029	0.139
		(0.055)	(0.060)		(0.154)	(0.117)
Political risk			-0.235**			-0.402***
			(0.107)			(0.154)
Constant	59.551***	63.688***	60.983***	129.378***	170.003***	133.086***
	(11.784)	(12.691)	(12.926)	(31.935)	(48.441)	(33.602)
First stage F statistic				6.89	9.21	10.16
Hansen test				p=0.19	p=0.54	p=0.91
Observations	56	44	44	56	44	44

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. Scandinavian and Socialist legal origins are used as instrumental variables for private credit in columns (4) to (6). "p =" is the p-value of a statistical test.

Table A7: Inequality and financial development (26 financially open countries, cutoff: 75 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	7.363*	5.094	5.034	23.706***	23.051**	23.883**
	(3.618)	(3.444)	(3.599)	(7.596)	(9.530)	(10.794)
GDP per capita (log)	-7.532***	-5.271***	-5.110	-12.220***	-11.376***	-12.526**
	(1.565)	(1.351)	(3.196)	(3.003)	(3.941)	(5.998)
Education	-0.977	-1.372**	-1.384**	-1.000	-1.620**	-1.555**
	(0.845)	(0.646)	(0.617)	(0.837)	(0.763)	(0.738)
Democracy		-0.079	-0.074		0.005	-0.023
		(0.061)	(0.073)		(0.088)	(0.079)
Political risk			-0.014			0.088
			(0.253)			(0.281)
Constant	106.570***	96.248***	95.526***	137.740***	135.222***	140.672***
	(10.825)	(8.978)	(15.301)	(19.533)	(24.533)	(32.524)
First stage F statistic				15.04	6.01	5.62
Hansen test				p=0.44	p=0.54	p=0.61
Observations	26	22	22	26	22	22

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. Scandinavian and Socialist legal origins are used as intsrumental variables for private credit in columns (4) to (6). "$p =$" is the p-value of a statistical test.

Table A8: Inequality and financial development (63 financially closed countries, cutoff: 50 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	2.703	0.034	0.854	-15.589**	-16.056***	-15.062**
	(4.990)	(5.009)	(4.993)	(6.349)	(5.371)	(6.407)
GDP per capita (log)	0.236	2.648*	3.354**	2.725**	4.299***	4.561***
	(1.379)	(1.365)	(1.594)	(1.358)	(1.524)	(1.679)
Education	-1.619***	-2.011***	-1.961***	-1.432***	-1.712**	-1.700**
	(0.475)	(0.633)	(0.607)	(0.547)	(0.796)	(0.765)
Democracy		0.013	0.048		0.071	0.085
		(0.063)	(0.083)		(0.072)	(0.088)
Political risk			-0.151			-0.070
			(0.142)			(0.157)
Constant	46.938***	30.424***	30.081***	31.052***	17.505	17.843
	(9.423)	(9.429)	(10.479)	(9.447)	(10.675)	(10.874)
First stage F statistic				18.10	32.46	20.62
Hansen test				p=0.07	p=0.43	p=0.41
Observations	63	45	45	63	45	45

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. French and German legal origins are used as instrumental variables for private credit in columns (4) to (6). "p =" is the p-value of a statistical test.

Table A9: Inequality and financial development (31 financially closed countries, cutoff: 25 percentile)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	OLS	OLS	OLS	IV	IV	IV
Private credit	6.894	7.744	8.153	-16.557**	-12.218	-11.678
	(11.466)	(9.665)	(10.218)	(7.927)	(8.911)	(8.522)
GDP per capita (log)	2.705	3.707	3.222	5.019***	5.177**	5.056*
	(1.694)	(2.209)	(2.669)	(1.639)	(2.127)	(2.691)
Education	-2.193***	-2.887***	-2.974***	-2.171***	-2.555**	-2.578***
	(0.619)	(0.813)	(0.823)	(0.585)	(0.993)	(0.984)
Democracy		0.083	0.069		0.130	0.127
		(0.116)	(0.132)		(0.132)	(0.146)
Political risk			0.080			0.014
			(0.191)			(0.186)
Constant	29.400**	21.089	22.112	16.724	10.656	11.083
	(12.499)	(18.458)	(19.032)	(12.232)	(18.102)	(18.960)
First stage F statistic				130.33	69.62	61.37
Hansen test				p=0.40	p=0.22	p=0.21
Observations	31	25	25	31	25	25

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. French and German legal origins are used as instrumental variables for private credit in columns (4) to (6). "p =" is the p-value of a statistical test.

Table A10: Inequality and financial development in financially open countries: sensitivity analysis on instrumental variables

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	IV	IV	IV	IV	IV	IV
Private credit	43.272***	30.012***	28.900***	44.033**	36.458*	27.234**
	(15.032)	(7.933)	(7.606)	(21.413)	(18.651)	(13.695)
GDP per capita (log)	-14.624***	-10.561***	-7.274	-14.807***	-12.120**	-6.916
	(5.205)	(3.721)	(4.887)	(5.232)	(5.094)	(5.274)
Education	-0.404	-0.618	-1.108	-0.413	-0.731	-1.071
	(1.045)	(0.903)	(1.003)	(1.105)	(1.128)	(1.092)
Democracy		-0.057	0.079		-0.059	0.078
		(0.101)	(0.107)		(0.114)	(0.105)
Political risk			-0.388			-0.382
			(0.282)			(0.265)
Scandinavian legal origin	-0.150	-1.405	0.394			
	(4.466)	(2.922)	(2.967)			
Socialist legal origin				0.198	2.420	-0.632
				(5.991)	(5.724)	(4.578)
Constant	141.387***	120.047***	111.215***	142.562***	130.445***	108.633***
	(35.247)	(24.305)	(26.482)	(33.577)	(32.157)	(28.253)
First stage F statistic	8.76	20.80	20.73	5.46	4.57	4.55
Observations	42	36	36	42	36	36

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. Scandinavian legal origin is directly incorporated in the second stage and Socialist legal origin is used as an instrumental variable in columns (1) to (3). Socialist legal origin is directly incorporated in the second stage and Scandinavian legal origin is used as an instrumental variable in columns (4) to (6)

Table A11: Inequality and financial development in financially closed countries: sensitivity analysis on instrumental variables

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	IV	IV	IV	IV	IV	IV
Private credit	-5.761	-11.127	-10.357	-36.418	-23.058	-23.311
	(5.245)	(8.810)	(8.258)	(26.433)	(22.069)	(22.139)
GDP per capita (log)	-0.260	3.343	3.354	5.283***	5.643***	5.930**
	(3.153)	(4.282)	(4.227)	(2.041)	(2.066)	(2.346)
Education	-0.239	-1.352	-1.294	-1.911***	-2.204**	-2.217**
	(0.989)	(1.454)	(1.361)	(0.729)	(1.096)	(1.092)
Democracy		0.082	0.089		0.126	0.140
		(0.100)	(0.111)		(0.083)	(0.107)
Political risk			-0.039			-0.059
			(0.139)			(0.158)
French legal origin	7.070	3.352	3.616			
	(4.821)	(7.188)	(6.858)			
German legal origin				24.266	8.963	10.018
				(26.904)	(23.360)	(23.504)
Constant	42.867***	19.416	20.317	18.930*	8.283	8.321
	(16.599)	(24.860)	(23.356)	(11.240)	(12.730)	(13.071)
First stage F statistic	23.85	30.14	28.64	6.96	6.13	5.85
Observations	49	36	36	49	36	36

Notes. The asterisks ***, **, and * are the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. German legal origin and French legal origin are used as instrumental variables for private credit in columns (1) to (3) and in columns (4) to (6), respectively.

Figure 1: The supply-demand analysis of a financial market