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FINANCE AND INEQUALITY: HOW DOES GLOBALIZATION CHANGE THEIR RELATIONSHIP?

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

Keywords: Financial Integration, Inequality, Financial Development, Credit Constraints

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. These increases in inequality in advanced economies appear to be inconsistent with Kuznets's 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]

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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] Other authors 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, whereas unskilled workers are disadvantaged.

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

Our empirical analysis of cross-country 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 low degree of financial openness in a country, financial market development reduces inequality within that country, whereas if there is a high degree of financial openness in a country, financial market development enhances inequality within that country.

While performing regressions, we must address the endogeneity problem associated with financial development. On 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.[5] 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, Bertola (1993), Alesina and Rodrik (1994), and Persson and Tabellini (1994) 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 nonmonotonic 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 (2012) derives a nonmonotonic 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 these 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 instrumental variables. Although the Hansen tests for overidentifying 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 Appendix B, following the procedure employed by Tabellini (2010), with respect to legal origins, and we verify that neither legal origin has a direct effect on inequality under the condition that the other legal origin satisfies the orthogonality condition. Even with this procedure, it is difficult to check perfectly whether the legal origins satisfy the exclusion restrictions that are necessary for valid instrumental variables. Thus, 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 develops fully, income inequality decreases.[6] Li et al. (1998) and Clarke et al. (2006) investigate the relationship between financial development and the level of inequality, whereas Beck et al. (2007) study the relationship between financial development and the growth rate of inequality. Although, along the same line as Li et al. (1998) and Clarke et al. (2006), we focus on the level of inequality, no previous study 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 develops fully 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. In this case, the less talented lenders are unable to utilize the abilities of the talented agents. Thus, inequality widens as the financial market matures.

The key mechanism for 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 an economy is closed, the 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 used intensively by the talented agents, and thus, inequality widens.

Although many researchers have examined the relationship between financial development and inequality in the vast literature on finance, growth, and inequality,[7] they have obtained mixed theoretical results. Although Greenwood and Jovanovic (1990) derive an "inverted U-shaped" relationship between income inequality and financial development, Banerjee and Newman (1993) and Galor and Zeira (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.

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

2. ESTIMATION METHOD

As discussed in the Introduction, we examine the hypothesis that if an economy is strongly closed to the world financial market, income inequality narrows as the financial market matures, whereas if an economy is strongly open, income inequality widens as the financial market matures. We empirically test this hypothesis by analyzing cross-country and panel data. Although the availability of the data for each country varied, we were able to collect data for more than 100 countries (more than those of other studies in the existing literature).[8]

2.1. Data

We draw the data used in our estimations from various databases and create cross-country and panel data sets using annual data over the period 1985 to 2009.

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The financial openness index is computed from the data set of Lane and Milesi-Ferretti (2007) (see the next section). To measure inequality, we use the net Gini coefficient in the data set developed by Solt (2009).[9] Cross-country comparison of income inequality using the existing inequality data has faced limitations such that although 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 so that the cross-country comparison of income inequality can be more reliable than when the existing inequality data are used. 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 gross domestic product (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 natural logarithm 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 index of average years of total schooling 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 subcomponents, as described in detail in Table A.2 in Appendix A. The index for democracy, democratic accountability, is one of these subcomponents, which likely controls for the impact 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 range from 0 (highest risk) to 100 (lowest risk). The full list of countries is shown in Table A.1 in Appendix A. The detailed definitions and sources of all the data are presented in Table A.2 in Appendix A, and the descriptive statistics of all variables for cross-country and panel analyses are shown in Tables A.3 and A.4 in Appendix A.

2.2. Cross-Country Analysis

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

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

where i shows a country and ϵ is an error term. As explained in the preceding 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 GDP. The annual data for these two variables are averaged over the period

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1985–2009. 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.[10] 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. According to our hypothesis, a strongly closed financial market in a country results in a negative value of α_2, whereas a strongly open financial market results in a positive value of α_2.

To measure the extent of financial openness, we refer to the work of Lane and Milesi-Ferretti (2007). Specifically, their data set allows us to compute the sum of total assets and total liabilities divided by GDP. Because the data points of the data set created by Lane and Milesi-Ferretti (2007) are only available up to 2007, these are averaged for the period 1985–2007. We use this measure as a proxy for financial openness. This variable is thought of as a de facto measure of financial openness.[11] The averaged values of this financial openness index from 1985 to 2007 range from 0.428 to 140.365 for 177 countries, with higher values indicating greater openness. The average of the averaged values over the countries is 2.766.[12]

Before testing our hypothesis, we must determine the cutoffs to define the strongly closed countries and the strongly open 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 low, then we would have been certain of examining the countries that were financially closed 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 high index values. Another possible strategy for examining our hypothesis is to introduce the interaction term between financial development and financial openness, rather than splitting the whole sample into subsamples. However, if we follow this strategy, it is extremely difficult to discover the instrumental variables both for financial development and for its interaction term with financial openness. Although we do not follow this strategy for the cross-country analysis, we perform the dynamic panel analysis incorporating the interaction term between financial development and financial openness.

By considering countries with an index value less than the 40th percentile of the 177 countries listed in the data set of Lane and Milesi-Ferretti (2007) as the strongly closed countries, we categorize 49 of the 119 countries in our analysis as strongly closed (see Table A.1 in Appendix A). To perform robustness checks, we create two other data sets for the strongly closed countries. We create one data set of countries whose index values are below the median value (the 50th percentile) and another data set of countries whose index values are less than the 25th percentile. The two data sets include 63 and 31 countries, respectively.

As for financially open countries, we create a data set for the 42 strongly open countries with index values higher than the 60th percentile of the 177 countries.

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To perform robustness checks, we also create two data sets consisting of the 56 countries whose financial openness values are above the median value and the 26 countries whose financial openness values are above the 25th percentile.

Discussion of instrumental variables. When regressions are performed, the endogeneity problems associated with reverse causality from inequality to financial development and omitted variables must be addressed.[13] As previously discussed, to address the endogeneity problem, we employ the IV technique, in which we use legal origins as instrumental variables. In doing so, we follow Levine et al. (2000), among others. Although we will discuss the validity of the instrumental variables in Section 3, we refer to the choice of the instrumental variables in this section.

According to the legal origin theory developed by La Porta et al. (1997, 1998), when the common or civil law was introduced into a country via conquest or colonization, not only the legal rules but also human capital and the ideologies of the legal system were transplanted into the new country. The protection of property rights in common law countries, which impacts the development of financial markets, is stronger than that in civil law countries, particularly in French civil law countries.[14] Accordingly, the financial markets in French civil law countries are in general less developed than those in common law countries, as noted by many previous studies. Therefore, we can essentially use French and German legal origins as instrumental variables as long as we can clearly identify their impact on private credit in the first-stage regressions.[15] As in Acemoglu and Johnson (2005), we assume that legal origins have impacts on institutions that affect private contracts and transactions. Accordingly, we assume that control variables such as the natural logarithm of per capita real GDP, the democracy indicator, and the extent of political risk are not directly affected by legal origins.[16]

Table 1 shows the results of the first-stage estimations where we regress private credit on legal origins and all of the other control variables. Columns (1) and (2) report the results, respectively, for the entire set of countries and for the financially closed countries. As noted in columns (1) and (2), the coefficients of French and German legal origins are significant at the conventional level, which implies that we can clearly identify the impact of French and German legal origins on private credit in all countries and the financially closed countries in the first-stage estimations. In contrast, column (3) shows that the coefficients of French and German legal origins are no longer significant. We cannot identify the impact of these legal origins on private credit in the financially open countries. This result may come from the fact that the group of strongly open countries includes a number of fully developed countries whose legal origins are common law and civil law. The extent of financial development in those developed countries is highly likely to be similar, no matter what legal origins they have. Alternatively, this result could reflect the hypothesis of common and civil law convergence that is maintained by many comparative law scholars [e.g., Del Duca (2007)].[17] If

TABLE 1. First-stage regression for private credit on legal origins

	(1) All	(2) Closed	(3) Open	(4) Open
French legal origin	−0.144*	−0.279**	0.036	
	(0.074)	(0.115)	(0.111)	
German legal origin	0.389***	0.773***	0.287	
	(0.135)	(0.145)	(0.257)	
Scandinavian legal origin				−0.236**
				(0.111)
Socialist legal origin				−0.379***
				(0.083)
GDP per capita (log)	0.200***	0.199**	0.263***	0.215***
	(0.057)	(0.073)	(0.078)	(0.074)
Education	−0.008	−0.071**	0.008	0.022
	(0.021)	(0.027)	(0.026)	(0.022)
Democracy	0.001	0.004*	−0.001	−0.001
	(0.002)	(0.002)	(0.004)	(0.003)
Political risk	0.001	−0.002	−0.001	0.004
	(0.003)	(0.003)	(0.006)	(0.006)
Constant	−1.285***	−0.926*	−1.654***	−1.549***
	(0.270)	(0.446)	(0.322)	(0.331)
Observations	89	36	36	36

Notes: ***, **, and * 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors.

common and civil law convergence is accelerated by globalization, the failure to identify the impact of French and German legal origins on private credit may be a natural consequence. Although this failure is a somewhat new finding, more elaborate discussion of this convergence hypothesis is beyond the scope of this paper, and we must discover new instrumental variables for the financially open countries.

La Porta et al. (2008) note that although Scandinavian law can be viewed as part of the civil law tradition, most scholars consider the Scandinavian legal systems to be different from others. Meanwhile, by the classification of La Porta et al. (1999), the group of the financially open countries includes the socialist law countries. As shown in column (4) in Table 1, the countries with these two legal origins have unique features that impact private credit. The coefficients of both Scandinavian and socialist legal origins are negative and significant at the 5% or 1% significance level, which implies that we can better identify the impact of Scandinavian and socialist legal origins on private credit in the financially open countries than we can identify the impact of French and German legal origins. Therefore, we use Scandinavian and socialist legal origins as instrumental variables for private credit in the financially open countries.

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2.3. Panel Data Analysis

We also perform a 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 endogeneity problems by employing the internal lagged variables as instrumental variables. We collected unbalanced panel data for 120 countries from 1985 to 2009 and created five-year averaged data for five nonoverlapping periods: 1985–1989, 1990–1994, 1995–1999, 2000–2004, and 2005–2009.[18] The use of the five-year averaged data enables us to mitigate noise associated with short-run economic fluctuations.

In contrast to the cross-country analysis, we do not divide the entire sample into strongly closed and open 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

$$\begin{aligned}\text{Inequality}_{it} &= \alpha_1 \text{Inequality}_{it-1} + \alpha_2 \text{Financial Development}_{it} \\ &+ \alpha_3 \text{Financial Openness}_{it} + \alpha_4 \text{Financial Development}_{it} \\ &\times \text{Financial Openness}_{it} + X_{it}\beta + \mu_t + \eta_i + \epsilon_{it}, \end{aligned} \quad (1)$$

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 in the cross-country analysis.[19] 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 $\alpha_2 + \alpha_4 \times$Financial Openness. Our hypothesis predicts that α_2 is negative and α_4 is positive, implying that financial development decreases inequality when financial openness is of a low degree and increases it when financial openness is of a 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 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 two-step system GMM estimation is performed, because the number of countries in our data set is at most 114.[20] In the second-step estimation, the residuals from the first-step estimation are used to produce

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TABLE 2. Inequality and financial development (all countries)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and * 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)–(6). "p" is the p-value of a statistical test.

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 avoid this small-sample bias. We report Windmeijer's (2005) corrected standard errors in our estimation results when we perform the system GMM.

3. RESULTS

3.1. Cross-Country Analysis

Table 2 presents the estimation results for the entire sample of 119 countries. As can be observed in the ordinary least squares (OLS) estimates 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) and (3).

Because the OLS estimations may suffer from the endogeneity problem, we perform IV estimations using legal origins as instrumental variables. Columns (4)–(6), whose specifications are respectively the same as those in columns (1)–(3), show the IV estimation results where French and German legal origins are employed as instrumental variables. Although columns (4) and (5) report that the

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

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

coefficients of private credit are negative and significant, column (6) indicates that the coefficient of private credit is not significant when the various explanatory variables are controlled for, despite the negative sign of the coefficient.[21]

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

Table 3 presents the estimation results for the 49 strongly closed countries, all of whose financial openness values are below the 40th percentile. The OLS estimation results in columns (1)–(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. To verify the validity of the instrumental variables, we first address the problem of weak instruments. In columns (4)–(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

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TABLE 4. Inequality and financial development (42 financially open countries, cutoff: 60th percentile)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

(1997). Moreover, the Hansen tests of overidentifying restrictions do not reject the orthogonality conditions at the conventional significance level in all the estimation results. The estimation results shown in columns (4)–(6) indicate that private credit has a significantly negative impact on inequality even controlling for various explanatory variables. These results are consistent with our hypothesis, which suggests that financial development narrows inequality in the financially closed countries.

Next, we examine the strongly open countries. As shown in columns (1)–(3) of Table 4, the OLS estimation results for these 42 strongly open countries indicate that the coefficients of private credit are statistically insignificant, although they are negative.

These results should be treated as tentative because we did not address endogeneity in our analysis. Columns (4)–(6) in Table 4 show the IV estimation results using Scandinavian and socialist legal origins as instrumental variables for private credit. In columns (5) and (6), the F-values for the tests of the excluded instruments in the first-stage regressions are greater than 10, although the F-value in column (4) is 5.94. In addition, Hansen's overidentifying restrictions tests imply that these instruments are valid. 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)–(6), the coefficients of private credit

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are positive and significant. Therefore, we conclude that financial development widens inequality in financially open countries.

It should be noted that the results from Tables 2 through 4 show that private credit enters insignificantly into the OLS estimations, whereas it enters significantly into the IV estimations, except in column (6) in Table 2. These outcomes are highly likely to reflect the endogeneity problems associated with reverse causality and/or omitted variables in the OLS estimations. The IV estimations must have mitigated these problems to a great extent.

In Appendix B, we perform robustness checks for our cross-country analysis on the impact of private credit on inequality. We conduct the checks using the two data sets created for the strongly closed countries and the two data sets created for the strongly open countries, as described in the preceding section. Tables B.1 and B.2 show the estimation results for the 63 and 31 strongly closed countries whose financial openness values are respectively below the 50th and the 25th percentile. Although columns (5) and (6) in Table B.2 report insignificance of the coefficients of private credit, Tables B.1 and B.2 display the same qualitative results as Table 3. Tables B.3 and B.4 report the estimation results for the 56 and 26 strongly open countries whose financial openness values are respectively above the 50th and the 75th percentile. These tables report the same qualitative impact of private credit on inequality as observed in the IV estimation results in Table 4.

Legal origins may affect inequality through a channel different from the financial market. In other words, legal origins may not satisfy the exclusion restrictions that are necessary for valid instrumental variables. To examine whether this problem has a serious effect on our estimation results, we perform a sensitivity analysis in Appendix B 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 B.5 and B.6. Of course, even with this procedure, it may be imperfect to check whether legal origins satisfy the exclusion restrictions. Therefore, to complement the cross-country analysis, we perform a dynamic panel data analysis in the next section.

3.2. Panel Data Analysis

Table 5 shows the system GMM estimation results for 120 countries. In columns (1)–(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)–(6) report the results with the interaction term. The partial effect of financial development on inequality is given by $\alpha_2 + \alpha_4 \times$Financial Openness from (1). We find in columns (4)–(6) that α_2 is negative and α_4 is positive. Although the coefficient of private credit, α_2, is insignificant, the null hypothesis of $\alpha_2 = \alpha_4 = 0$ is rejected by the F tests in columns (4)–(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

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TABLE 5. Inequality and financial development (dynamic panel data analysis)

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM	(5) System GMM	(6) 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: ***, **, and *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.

credit and ones with a positive effect, is 1.163, which is approximately the 45th percentile of financial openness in this sample.[22] Although private credit has a negative impact on inequality below this threshold, it has a positive impact above it. This result is consistent with our hypothesis and our cross-country analysis.

An interesting by-product result from columns (4)–(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.

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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)–(6), the Hansen tests for overidentifying 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 nonexistence of a second-order serial correlation. The results of these two tests verify the validity of instrumental variables.

4. 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, the 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.

4.1. 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 $y_t = Y_t/L_t$ and $f(.)$ is an increasing function of y. Specifically, $f(y) = y$ is assumed; thus, technology exhibits constant returns to scale with respect to

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real capital per young agent in equilibrium. The production sector is assumed to be perfectly competitive, and thus, the production factors are paid their marginal products,

$$q_t = \alpha Y_t / Z_t,$$
$$w_t = (1-\alpha) Y_t / L_t,$$

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.

4.2. 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 or her utility exclusively from his or her second-period consumption c_{t+1}. The population of each generation L_t is assumed to remain constant.[23]

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

$$k_t + b_t \leq w_t \tag{2}$$

and

$$c_{t+1} \leq q_{t+1}\phi k_t + r_{t+1} b_t, \tag{3}$$

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 or she produces real capital, ϕk, which he or she then sells to the final production sector at a certain price q in the second period.[24] ϕ is the productivity of real capital production and r is the gross (real) interest rate.

Because of 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

$$b_t \geq -\nu w_t, \tag{4}$$

where $\nu \in [0, \infty)$ is the extent of the credit constraint. Two microfoundations for (4) are provided in Appendix C.[25] Note that agents can borrow financial capital of 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 nonnegativity constraint for the investment project is given by

$$k_t \geq 0. \tag{5}$$

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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 or her own productivity at birth but does not know the productivity of other agents.[26]

Each agent maximizes c_{t+1} subject to inequalities (2)–(5). 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 C.

The aggregate real capital is supplied by investors as follows:

$$Z_{t+1} = \int_{\phi_t}^{1} \phi k_t L_t d\phi = \frac{w_t(1-\phi_t^2)}{2(1-\mu)}L_t. \tag{6}$$

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

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

where $z_t := Z_t/L_t$. As $L_{t+1} = L_t$, (6) can be rewritten as

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

4.3. 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,

$$\phi_t = \mu. \tag{7}$$

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We measure inequality among agents in terms of consumption (or, equivalently, income in the second period).[27] 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

$$\begin{aligned}\frac{\bar{c}_t}{\alpha A^{1/\alpha} w_{t-1}} &= \phi_{t-1}\int_0^{\phi_{t-1}} d\phi + \frac{1}{1-\mu}\int_{\phi_{t-1}}^1 (\phi - \mu\phi_{t-1})d\phi \\ &= \frac{1}{2(1-\mu)}\left(\phi_{t-1}^2 - 2\mu\phi_{t-1} + 1\right). \end{aligned} \tag{8}$$

From (8), the Lorenz curve, $L(x)$, is given by

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

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

$$G = \frac{2\phi_{t-1}^3 - 3\phi_{t-1}^2 + 1}{3\left(\phi_{t-1}^2 - 2\mu\phi_{t-1} + 1\right)}. \tag{9}$$

When (7) is substituted into (9), the Gini coefficient is given by

$$G = \frac{-2\mu^2 + \mu + 1}{3(\mu + 1)}. \tag{10}$$

The right-hand side of (10) 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. This claim follows from the fact that $dG/d\mu = -2\mu(\mu+2)/[3(\mu+1)^2] < 0$. ■

4.4. 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

$$\phi_t = \frac{\bar{r}}{\alpha A^{1/\alpha}} := \bar{\phi}. \tag{11}$$

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We assume that $\bar{r} < \alpha A^{1/\alpha}$ so that borrowers always exist in the economy. Although the cutoff is constant, as it is in a closed economy, it is independent of the degree of credit constraint, μ. By substituting (11) into (9), 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 the coefficient 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 $dG/d\mu > 0$. ■

4.5. 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, whereas the latter must pay a higher interest rate as credit constraints relax. As a result, income inequality narrows as credit constraints relax. In almost all dynamic general equilibrium models dealing with closed economies, if credit market imperfections relax, the equilibrium interest rate increases. This is because the relaxation of credit market imperfections increases the demand for borrowing in the financial market.[28]

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 the 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

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

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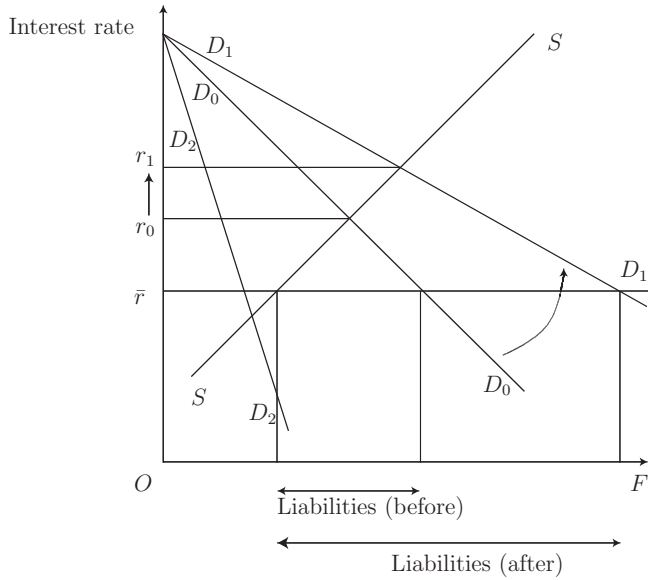

FIGURE 1. The supply–demand analysis of a financial market.

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 thus the demand curve rotates counterclockwise, whereas the supply curve does not move.

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 a 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

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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.[29]

We have obtained the 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)–(6) in Table 5. 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 decreased 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.[30]

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 about the effect of financial capital inflow on inequality as in the case of a small open economy 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 may likely offset the upward pressure on the interest rate.[31] Accordingly, the same idea as in the case of a small open economy is applicable to a large open economy.

5. 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 strongly 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 widening inequality if they are oriented to equal societies.

Although our results are novel, a caveat regarding them must be noted. We extracted subsamples from the entire sample in our cross-country analysis, and we incorporated the interaction term between financial openness and private credit into 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.

NOTES

1. There are debates regarding whether Kuznets's hypothesis still holds. Some researchers support the inverted-U hypothesis based on 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 the dynamic behaviors of wealth inequality in two countries facing different degrees of financial development after financial liberalization. They 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 demonstrate empirically 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) demonstrate theoretically that capital account liberalization induces corruption in domestic banks in countries with institutional weaknesses.

5. See Khan (2001) for a theoretical analysis of the joint causality between economic growth and financial development.

6. The pioneering works by Jeong (2008) and Jeong and Townsend (2008) use microeconomic data collected from Thailand and provide evidence on growth, inequality, and finance that is consistent with Kuznets's (1955) hypothesis.

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

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

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

10. Although one may wonder whether there are multicollinearity problems in this specification, the explanatory variables are not highly correlated, implying that no multicollinearity problems are detected.

11. 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.

12. Although 178 countries are available in the data set 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 for Bahrain, which is 19.670, implying that Luxemburg is an outlier.

13. As discussed in the Introduction, researchers have treated the causality from economic growth to financial development carefully 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 Bertola (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994), Matsuyama (2002), Galor and Moav (2004), and Asano (2012), among others.

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

15. 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 the literature on finance and growth does, the F-values for the tests of the excluded instruments in the first-stage regressions would have been extremely low. Therefore, we use only French and German legal origins as instrumental variables for private credit for all countries and for the financially closed countries.

16. Acemoglu and Johnson (2005) assert that legal origins can be used as instrumental variables for the quality of the institutions that impacts private contracts and transactions, whereas the mortality rate facing potential European settlers and population density before colonization can be used as instrumental variables for the quality of political institutions that impacts expropriation by the government. Following the idea of Acemoglu and Johnson (2005), we assume that legal origins have impacts on institutions that affect private contracts and transactions, and thus, control variables such as the natural logarithm of per capita GDP, the democracy indicator, and the extent of political risk are not directly affected by legal origins. Acemoglu et al. (2001, 2002) and Acemoglu and Johnson (2005) use the mortality rate facing potential European settlers and the population density before colonization as instrumental variables for the quality of political institutions.

17. There are debates regarding common and civil law convergence among comparative law scholars. Merryman et al. (1994) and Del Duca (2007), among others, are supportive of the hypothesis of common and civil law convergence, whereas Legrand (1996), Juenger (1997), and Kerameus (1997), among others, disapprove of the convergence hypothesis. Among economists, only Balas et al. (2009) examine the convergence hypothesis. Their empirical findings on the formalism of legal procedure are inconsistent with the convergence hypothesis.

18. Again, because the financial openness index computed from the data set of Lane and Milesi-Ferretti (2007) is only available up to 2007, the data points are averaged from 2005 to 2007 for the last period.

19. Although one might argue that we should include a country-specific trend as a control variable, we do not do so. This is because if we do so, multicollinearity occurs among the natural logarithm of per capita real GDP, the private credit-to-GDP ratio, and the country-specific trend.

20. 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.

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

22. Following the procedure employed by Alfaro et al. (2004), we also tested the null hypothesis that $\alpha_2 + \alpha_4 \times \text{Financial Openness} = 0$ at the different extent of financial openness. We find from these tests that at the highest level of financial openness, private credit has a significant and positive impact on inequality, whereas at the lowest level of financial openness, it has a negative impact on inequality although the negative impact is statistically insignificant.

23. The assumption of constant population has no effects on our results in the following analysis.

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

25. 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).

26. Because the agents' types with respect to their productivity are private information, no lenders are able to discriminate among borrowers by offering different interest rates in the financial market.

27. Empirical evidence such as Piketty and Saez (2003) indicates that the recent widening income inequality comes about through the labor income channel. Although, in this section and the next section, the Gini coefficients measure inequality that arises from income differences between the return from investment projects and the return from lending in the financial market, our model is not inconsistent with the recent empirical evidence. This is because we are able to extend the current model so that those returns are paid to the agents as salaries. Such a model becomes more complicated when describing our ideas. For simplicity of exposition, we provide a simpler model in this section.

28. See, for example, Townsend (1980), among many others. To the best of our knowledge, there are no empirical studies that explicitly examine the relationship between the relaxation of credit market imperfections and the equilibrium interest rates.

29. Although 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.

30. The fact that the Gini coefficient in (9) is a decreasing function with respect to ϕ confirms the illustrative analysis in Figure 1.

31. 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.

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APPENDIX A: DATA DESCRIPTION

See Tables A.1–A.4.

TABLE A.1. List of countries

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

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

TABLE A.2. Data definitions and sources

Variable	Description	Source
Inequality	Net Gini coefficient developed by Solt (2009), who standardizes the Gini coefficient in the United Nations 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 for 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 subcomponents: (A) Government Stability (12 points), (B) Socioeconomic Conditions (12 points), (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 (4 points). The index for institutions, which is defined as the sum of all components, ranges from 0 to 100, and a higher value means a lower political risk.	PSR Group (2011)
Democracy	Democracy is one of the subcomponents 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)
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)

TABLE A.3. Descriptive statistics for Table 2

	Inequality	Private credit	GDP per capita (log)	Education	Democracy	Political risk	Financial openness
Mean	38.657	0.449	8.589	6.563	60.378	59.334	1.782
Standard deviation	9.258	0.385	1.259	2.956	26.142	17.482	1.680
Maximum	62.493	1.569	10.590	12.513	100	94.417	12.909
Minimum	22.055	0.022	5.996	0.777	16.667	30.167	0.428
Observations	119	119	119	119	89	89	119
Correlations							
Inequality	1						
Private credit	−0.493	1					
GDP per capita (log)	−0.530	0.740	1				
Education	−0.570	0.659	0.841	1			
Democracy	−0.479	0.562	0.663	0.641	1		
Political risk	−0.583	0.663	0.759	0.657	0.775	1	
Financial openness	−0.236	0.531	0.363	0.316	0.191	0.365	1

Notes: These statistics are based on the averaged values for 119 countries included in Table 2.

TABLE A.4. Descriptive statistics for Table 5

	Inequality	Private credit	Financial openness	GDP per capita (log)	Education	Democracy	Political risk
Mean	38.394	0.460	1.862	8.548	6.688	68.605	65.944
Standard deviation	9.673	0.429	2.173	1.268	3.044	23.731	13.931
Maximum	67.756	2.336	23.132	10.782	13.218	100	93.833
Minimum	16.757	0.014	0.257	5.852	0.108	10.139	28.383
Observations	539	560	576	587	570	510	510
Correlations							
Inequality	1						
Private credit	−0.397	1					
Financial openness	−0.195	0.545	1				
GDP per capita (log)	−0.541	0.698	0.385	1			
Education	−0.531	0.550	0.295	0.803	1		
Democracy	−0.489	0.481	0.170	0.648	0.669	1	
Political risk	−0.558	0.658	0.385	0.766	0.709	0.714	1

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

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APPENDIX B: ROBUSTNESS ANALYSIS

We perform robustness analysis using the other data sets that we created for strongly closed countries and strongly open countries. Table B.1 shows the results in the case of the 63 strongly closed countries whose financial openness values are less than the median value (the 50th percentile). In columns (4)–(6), the IV estimation results indicate that an increase in private credit decreases inequality, which is consistent with the results in Table 3.

Table B.2 presents the results for the 31 strongly 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 strongly closed countries. The 25 observed countries must have relatively homogeneous features in private credit and inequality.

Table B.3 presents the results obtained from our data set of the 56 strongly open countries whose financial openness values are above the median value. In the IV estimations in columns (4)–(6), the coefficients of private credit are significantly positive, and the overall results in Table B.3 are consistent with those in Table 4.

Table B.4 shows the estimation results for 26 strongly open countries whose financial openness values are above the 75th percentile. This table reports the same qualitative

TABLE B.1. Inequality and financial development (63 financially closed countries, cutoff: 50th percentile)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

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TABLE B.2. Inequality and financial development (31 financially closed countries, cutoff: 25th percentile)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

impact of private credit on inequality as in the IV estimation results of Tables 4 and B.3.

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 B.5 presents estimation results obtained from our data set of the 49 strongly 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 estimates in the main text.

The same procedure is conducted in Table B.6 for 42 strongly open countries, the same country group as in Table 4. 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.

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TABLE B.3. Inequality and financial development (56 financially open countries, cutoff: 50th percentile)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

TABLE B.4. Inequality and financial development (26 financially open countries, cutoff: 75th percentile)

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(6). "p" is the p-value of a statistical test.

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TABLE B.5. Inequality and financial development in financially closed countries: Sensitivity analysis on instrumental variables

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) 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: ***, **, and *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)–(3) and in columns (4)–(6), respectively.

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TABLE B.6. Inequality and financial development in financially open countries: Sensitivity analysis on instrumental variables

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) 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	−14.624***	−10.561***	−7.274	−14.807***	−12.120**	−6.916
capita (log)	(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	−0.150	−1.405	0.394			
legal origin	(4.466)	(2.922)	(2.967)			
Socialist				0.198	2.420	−0.632
legal origin				(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: ***, **, and *1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are heteroskedasticity-robust standard errors. Scandinavian legal origin is directly incorporated into the second-stage and socialist legal origin is used as an instrumental variable in columns (1)–(3). Socialist legal origin is directly incorporated in the second stage and Scandinavian legal origin is used as an instrumental variable in columns (4)–(6).

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APPENDIX C: MICROFOUNDATIONS FOR CREDIT CONSTRAINTS

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

C.1. 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. Aghion et al. (1999) and Aghion et al. (2005) provide a microfoundation for a credit constraint in the same manner as Aghion and Banerjee (2005).

Each agent prepares his or her own wealth w_t, which consists of wages earned when young, to invest. His or 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 or her obligations, then he or 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 or her obligations, he or she incurs a cost δk_t to hide his or 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 or her expected income is given by $q_{t+1}\phi k_t - \delta k_t + p_{t+1}r_{t+1}b_t$.

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

$$q_{t+1}\phi k_t + r_{t+1}b_t \geq (q_{t+1}\phi - \delta)k_t + p_{t+1}r_{t+1}b_t, \tag{C.1}$$

which is rewritten as

$$b_t \geq -\frac{\delta}{r_{t+1}(1 - p_{t+1})}k_t. \tag{C.2}$$

The left-hand side of (C.1) is the revenue that the borrower acquires when he or she invests in a project and repays his or her obligations, and the right-hand side is the gain when he or she defaults. (C.2) is independent of the return on one unit of investment.

To attain the probability p_{t+1} of detecting 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 that $C(p_{t+1}) = \kappa \log(1 - p_{t+1})$, 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

$$r_{t+1} = \frac{\kappa}{1 - p_{t+1}}. \tag{C.3}$$

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As the interest rate r_{t+1} increases, the financial intermediary chooses the high probability to detect defaulting borrowers. From (C.2) and (C.3), we obtain

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

or equivalently,

$$b_t \geq -\frac{\delta}{\kappa - \delta} w_t. \tag{C.4}$$

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 (C.4) on all agents, none will default at 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.

C.2. 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 that 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 or her investment project, taking some fraction of his or her investment, $(1 - \mu)(w_t - b_t)$, where $0 < \mu < 1$, and not repaying his or her 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 the 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 or her not to abscond from engaging in his or her project at the end of the first period, is given by

$$\phi q_{t+1}(w_t - b_t) + r_{t+1}b_t \geq \phi q_{t+1}(1 - \mu)(w_t - b_t). \tag{C.5}$$

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For agents with ϕ such that $r_{t+1} - \mu\phi q_{t+1} \leq 0$, (C.5) always holds. Therefore, we focus on agents with ϕ such that $r_{t+1} - \mu\phi q_{t+1} > 0$. In this case, (C.5) is rewritten as

$$b_t \geq -\frac{\mu}{(\phi_t/\phi) - \mu} w_t. \tag{C.6}$$

As $\phi_t/\phi \leq 1$ in equilibrium, it follows that $-\mu/[(\phi_t/\phi) - \mu] \leq -\mu/(1 - \mu)$, implying that (C.6) 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 develops fully as they increase.

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