Collateral Constraints and Legal Protection of Lenders: A Macroeconomic Perspective

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Abstract

We identify countries that establish collateral-based lending systems with a small-open-economy version of Nobuhiro Kiyotaki and John Moore's (1997) model. We find that 47 countries in 1980s and 48 countries in 1990s out of 98 countries establish collateral-based lending systems. We also investigate the origin of collateral-based lending systems and find that if a country offers good legal protection for lenders, then a collateral-based lending system is more likely to be embedded in that country.

Keywords: Credit constraints; Collateral-based lending; Legal protection of lenders; Kiyotaki-Moore model.

JEL Classification Numbers: E10; E51; F41; K10

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1 Introduction

Collateral-based lending systems seem prevalent in most countries. However, it is not obvious whether it is actually embedded in all countries. It is important to investigate whether a collateral-based lending system functions in an economy because many researchers often presume collateral constraints when studying business cycles or economic growth.

The importance of credit market imperfections in understanding macroeconomic phenomena has been emphasized ever since the seminal paper by Ben Bernanke and Mark Gertler (1989).[1] More recently, a large number of articles have attempted to address topics in financial crises, in which credit market imperfections play an important role. However, if collateral-based lending is not embedded in an economy, one will be at a risk of deriving inadequate policy implications from models with collateral constraints.

To the best of our knowledge, however, few studies have focused on the fundamental question concerning which countries establish collateral-based lending systems in their financial sectors, although, as cited below, there are some articles that investigate lending systems in specific countries. One of the objectives of this paper is to detect countries that establish collateral-based lending systems with only macroeconomic data.[2] We also address

[1] Typical examples of empirical studies on finance and growth include Robert G. King and Ross Levine (1993), Ross Levine, Norman Loayza, and Thorsten Beck (2000), and Phileppe Aghion, Peter Howitt, and David Mayer-Foulkes (2005). See also Jeremy Greenwood and Boyan Jovanovic (1990), Oded Galor and Joseph Zeira (1993), Jeremy Greenwood and Bruce D. Smith (1997), and Phileppe Aghion, Peter Howitt, and David Mayer-Foulkes (2005) for the theoretical literature on finance and growth. For business cycles and credit market imperfections, see Nobuhiro Kiyotaki and John Moore (1997) and Kiminori Matsuyama (2007) among others. For financial market globalization and credit market imperfections, see Matsuyama (2004). Matsuyama (2008) provides a clear review of the macroeconomic implications of credit market imperfections.

[2] The role of collateral has been investigated both theoretically and empirically in the literature on banking. Theoretically, it has been demonstrated that the problems of adverse selection and moral hazard are mitigated by collateral. See Helmut Bester (1985, 1994) and Arnoud W.A. Boot, Anjan V. Thakor, and Gregory F. Udell (1991) among others. Moreover, Michael Manove, A Jorge Padilla, and Marco Pagano (2001) show that collateral is a substitute for screening and monitoring efforts of creditors, whereas Stanley D. Longhofer and Joao A.C. Santos (2000) demonstrate that it is a complement to them. Empirically, the role of collateral in relationship lending has been extensively studied. For surveys of recent research on relationship lending, see Arnoud W.A. Boot (2000) and Elyas Elyasiani and Lawrence G. Goldberg (2004). Evidence for the role of collateral in relationship lending is mixed. For instance, a negative relationship of collateral with relationship lending is found by Allen N. Berger and Gregory F. Udell (1995), Dietmar Harhoff and Timm Körting (1998), Ivan E. Brick and Darius Palia (2007), and Gabriel Jiménez, Vicente Salas, and Jesus Saurina (2006), whereas a positive relationship is demonstrated by

a question about the origin of collateral-based lending. In particular, we demonstrate that the legal protection of lenders promotes the establishment of a collateral-based lending system.

By a "collateral-based lending system," we mean a system in which collateral holding is a requirement for borrowers to access credit in the financial market. In the literature on banking, researchers have investigated lending systems in specific countries with microeconomic data. For example, in the United States, where the financial sector is fully developed, most agents can access credit, even if they do not hold collateral, whereas some agents are preventinted from accessing credit for other reasons. Robert E. Hall and Frederic S. Mishkin (1982) and Tullio Jappelli (1990) estimate that approximately 20 percent of the United States consumers are credit-constrained. According to the 1983 Survey of Consumer Finances, only 8.6 percent of the rejected applicants for credit were rejected because they had insufficient assets as collateral. The rest of the rejected applicants were rejected for other reasons.[3]

According to research on Italy's lending system by Daniela Fabbri and Mario Padula (2004), whether households hold sufficient collateral does not matter for their obtaining credit from financial intermediaries.[4] This means that even though households hold sufficient collateral, they cannot easily acquire credit from financial intermediaries. Whether they can access credit depends upon the legal enforceability of each judicial district in Italy.

A further example is "related lending" in Mexico, which has been investigated by Rafael La Porta, Florencio Lopéz-de-Silanes, and Guillermo Zamarripa (2003). According to their research, due to the privatization of government-owned commercial banks from the late 1980s to the early 1990s, banks were obtained by local families that already controlled industrial firms. In Mexico, related lending was unregulated in 1990s, and during this time, banks owned by local families largely loaned to their related parties with lower collateral requirements compared to unrelated parties. This lending behavior weakens a collateral lending system.

From these studies, we predict that collateral lending systems are not established in the United States, Italy, or Mexico. Indeed, our estimation

Hans Degryse and Patrick Van Cayseele (2000) and Arito Ono and Iichiro Uesugi (2009). In this paper, we do not address a question about the role of collateral at a microeconomic level. Our perspective is macroeconomic, and again our objective is to search out countries with collateral-based lending systems comprehensively.

[3]For a summary of the survey, see table 1 of Tullio Jappelli (1990).

[4]See table 3 of Daniela Fabbri and Mario Padula (2004).

results are consistent with this prediction.

By contrast, collateral-based lending systems seem to be used in Costa Rica and Japan. As demonstrated by Alexander Monge-Naranjo, Javier Cascante, and Luis J. Hall (2001), borrowers' collateral holding is one of the most important criteria when they are granted loans by financial intermediaries. Their paper reports that Costa Rica's financial sector establishes a collateral-based lending system. Likewise, there is much evidence of Japan's banking sector that, as long as borrowers held land as collateral, they could access credit in the 1980s and 1990s. According to Mitsuhiro Fukao (2003), due to the deregulation of a financial sector in Japan since the mid-1980s, large listed companies gradually shifted their financial resources from banks to the capital markets. As a result, banks were urged to find a new market, and most banks commenced real estate lending, where their judgments on investment projects associated with loans relied exclusively on whether borrowers held collateral with little attention to the cash flow of the investment projects. Fukao's research tells us that Japan's lending system seems to have gradually shifted toward collateral-based lending since the mid 1980s. Moreover, Arito Ono and Iichiro Uesugi (2009) provide evidence from Japan's small and medium-sized enterprise market that more than 70% of the investigated firms pledge collateral. These observations from the cases of Costa Rica and Japan are consistent with our estimation results.

One additional example is the case of Thailand's lending system. Lukas Menkhoff, Doris Neuberger, and Chodechai Suwanaporn (2006) provide evidence that collateral-based lending is prevalent in Thailand and conclude that collateral seems to be more important in an emerging market than in a developed one. Chutatong Charumilind, Raja Kali, and Yupana Wiwattanakantang (2006) reveal not only relationship lending but also collateral-based lending in long-term loan contracts in Thailand before the financial crisis in 1997. Firms that had close relationships with banks needed much less collateral to obtain long-term loans than those without such relationships. The practice of relationship lending weakened the collateral lending system, as in the case of Mexico. Nevertheless, we find from their examination that the collateral-based lending system functioned steadily before the crisis.[5] These microeconomic findings are also consistent with our findings.

While using microeconomic data, as was performed in the studies cited above, seems suitable for addressing our questions, we incur a great cost to examine many countries with microeconomic data for each country. In this

[5]See tables 4 and 5 of Charumilind, Kali, and Wiwattanakantang (2006).

paper, we develop a dynamic general equilibrium model following Kenneth Kasa (1998) and Takuma Kunieda and Akihisa Shibata (2005), which is a small-open-economy version of Nobuhiro Kiyotaki and John Moore's (1997) model (KM model, henceforth) to test whether a collateral-based lending system is established in a country with only macroeconomic data. To address our questions, we first derive a closed-form solution for the current account dynamics associated with private credit. The KM model is suitable for investigating whether a collateral-based lending system is established in a country because in their model, potential borrowers can access credit in the financial market only when they hold collateral. In other words, if the KM model is statistically rejected in a country, then we judge that collateral-based lending is not a major lending system in that country.

We presume that an answer to the second question about the origin of collateral-based lending is in the rule of law. The relationship of the rule of law with the development of financial sectors has been investigated in the extensive literature since the pioneering work of Rafael La Porta, Florencio Lopéz-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1997, 1998).[6] According to these authors, the development of a country's financial market is restricted by the degree of legal protection of outside investors. If laws are protective of lenders, they are willing to lend borrowers and thus, the development of the financial sector is promoted. Meanwhile, if laws are not protective of lenders, the financial sector is stagnant. They demonstrate that historical legal origins account for the contemporary structure of laws and financial development. However, this literature has not focused on the relationship between the type of the lending system and the degree of the legal protection of lenders. Our research sheds light on this point.

We experiment on 98 countries. We find that collateral-based lending systems are established in approximately half of the estimated countries and that countries with good legal protection of lenders are more likely to establish collateral-based lending systems.

This paper proceeds as follows. In the next section, we provide a theoretical ground for our empirical study. In section 3, we describe the data for our estimation. In section 4, we compare the estimation results of the United Sates and Japan, and in section 5 we show the estimation results for the other countries. In section 6, we study the origin of collateral-based lending. Section 7 contains our concluding remarks.

[6] For this literature, see Rafael La Porta, Florencio Lopéz-de-Silanes, and Andrei Shleifer (2008).

2 Theoretical Ground

In the appendix, we obtain a closed-form solution for the current account dynamics associated with private credit by following Kasa (1998) and Kunieda and Shibata (2005). The closed-form solution for the current account dynamics around the steady state of the economy is given by:

$$CA_t = \beta R\, CA_{t-1} + \beta \Delta Z_t - (1-\beta)\Psi\lambda\hat{x}\Delta PC_{t-1}, \tag{1}$$

where CA, PC, and $\hat{x}$ are the current account, private credit, and land held by borrowers in the steady-state, respectively. Z is a so-called net output, which is defined by the output minus the sum of investment and government expenditure, and Δ stands for the first difference in the variable. λ is the proportion of collaterally constrained agents, and Ψ is a constant defined in the appendix. The parameters, β and R, are the subjective discount factor and the world interest rate, respectively. See the appendix for more details.

If there are collaterally constrained agents, then it follows that $\lambda > 0$ in Eq.(1). Intuitively, production resources are allocated inefficiently if agents in the economy are collaterally constrained. In particular, the land is less allocated to borrowers and more allocated to savers in our model compared to the case in which a credit market is perfect. In this situation, if the collateral constraint is relaxed at time $t-1$ due to an anticipation of an increase in the land price, then constrained borrowers raise their borrowing and investment in land. Accordingly, production inefficiency is corrected and the aggregate production in the whole economy will increase at time t. The increase in production leads to an increase in total savings in the whole economy, which positively affects the current account. The term $\beta\Delta Z_t$ in Eq.(1) reflects this effect.

The reallocation of land from unconstrained agents to constrained agents does not affect the consumption behavior of unconstrained agents. This is because their investment in the land market and savings in the credit market are perfect substitutes in their consumption smoothing. Therefore, the Euler equation of an unconstrained agent, Eq.(12), in the appendix, is not subject to the land price. This means that, without technological shocks which affect the agents' permanent income, the reallocation of land does not affect the consumption of the unconstrained agents.

By contrast, the consumption behavior of constrained agents is affected by the land price, as observed with Eq.(16) in the appendix. As the land price increases, each constrained agent's consumption increases as well. Due to credit constraints, their investment in the land market and saving in the credit market are not perfect substitutes for them. It is better for them to raise borrowing and invest more in land because their marginal revenue involving an increase in the land price is greater than the market interest rate. Then, their consumption smoothing is subject to the land price, even though technological shocks, which affect the agents' permanent income, do not occur. Accordingly, the aggregate consumption in the whole economy goes up as the land price increases. This phenomenon is reflected in the third term of Eq.(1), which negatively affects the current account.

If there are no collaterally constrained agents, then it follows that $\lambda = 0$ in Eq.(1). We statistically examine whether $\lambda = 0$ or not, where the null hypothesis is $\lambda = 0$ and the alternative hypothesis is $\lambda > 0$. If we cannot reject the null hypothesis for a country under a reasonable size of the test, we infer that a theoretical model with collateral constraints cannot be applied to the country and thus a collateral-based lending system is not established in the country, whereas if we reject the null hypothesis, we think of the country as being collaterally constrained.

While we basically use Eq.(1) to examine the hypothesis, we have two additional estimable equations. The first is Eq.(34) in the appendix, which is inserted below:

$$\Delta q_{t+1} = \Psi \Delta PC_t. \tag{2}$$

This equation is used as the first test of the existence of collateral-based lending if the land price is observable. If there are no collaterally constrained borrowers, Eq.(2) does not hold and there is thus no direct relationship between the first difference in the land price and the lagged first difference in private credit.

The second equation is Eq.(23) in the appendix, which is rewritten as follows:

$$CA_t = \beta R\, CA_{t-1} + \beta \Delta Z_t - (1-\beta)\lambda \hat{x} \Delta q_t, \tag{3}$$

where q_t is the land price. In these equations, if $\lambda = 0$, the coefficients of Δq_t are equal to zero. As long as we obtain the data for land prices, we can statistically examine the significance of the coefficient of Δq_t. If the null hypothesis of $\lambda = 0$ is rejected in a country, we conclude that a collateral-based lending system is established in the country.

If we observe land prices, we can use Eqs.(2) and (3).[7] However, the number of countries for which the data for land prices are available is limited.

[7]One might argue that there are assets that can be collateral other than land. For

Moreover, the data for private credit are available in most countries. In addition, the quality of the data for land prices is not high. If we try to assemble the data for land prices, we can hardly avoid using "the house price index" as a proxy for a land price in most countries. By contrast, we can collect accurate (or at least, more accurate than land prices) data for private credit. Therefore, a closed-form solution for the current account associated with private credit is fascinating to us when examining our model. In this paper, we will use the two estimable equations (2) and (3) for two countries in particular, the United States and Japan, to see their contrasting outcomes.

The other question of our paper concerns the origin of collateral-based lending. We presume that the answer to this question is in the rule of law. By empirically estimating Eq.(1), we judge whether a collateral-based lending system is established in a country and create an index to which a 1 is assigned if a collateral-based lending system is present and a 0 otherwise. The index is regressed on the measure of legal protection and other control variables to determine whether legal protection is the origin of collateral-based lending.

3 Data

Depending upon data availability, we prepared an annual dataset of 98 countries. In the process of data gathering, we eliminated countries for which we could not observe data points for at least 19 years. In the second column of table A2 in the online appendix, the estimation period for each country is entered, where the maximum and minimum numbers of observations are forty-six and eighteen, respectively.[8][9]

To obtain the data for the current account, CA, and the net output, Z, we assembled the gross national product (GNP), the gross domestic product (GDP), aggregate consumption, aggregate investment, government expenditure, exports, and imports from the database of International Financial Statistics, which was created by the International Monetary Fund. All these

instance, asset-based lending to small firms associated with inventories is becoming popular in the United States. Nevertheless, we use only land prices to examine Eqs. (2) and (3) because we believe that land is still common collateral in a collateral-based lending system.

[8]Note that the lagged current account is incorporated in the estimation equation. That is why our minimum number of observations is eighteen and not nineteen.

[9]For some eurozone countries, we gave up using the data from approximately 1999 onward to avoid the risk of data discontinuity. There are missing data points of private credit around those years and the database of International Financial Statistics arranges the data points in question in different tables from approximately 1999 onward for some eurozone countries.

variables are deflated by the consumer price index.

The data for the current account, CA, are generally computed from GNP, aggregate consumption, aggregate investment, and government expenditure. For some countries, however, GNP, aggregate consumption, or government expenditure is not available. In these cases, we compute the current account from exports and imports, although the net investment income from abroad is not taken into account. Because most countries for which we cannot observe those variables are less developed, small countries, the net investment income from abroad in these countries is assumed to be so small that we may ignore them in computing the current account.[10] The net output is computed as the gross domestic product minus aggregate investment and government expenditure.

The data for private credit were collected from the database of the financial structure created by Ross Levine, Norman Loayza, and Thorsten Beck (2000) and updated by them in 2010. In the database, we have a variable entitled "Private Credit by Deposit Money Banks and Other Financial Institutions/GDP," which is the private credit/GDP ratio. To obtain the data for private credit, PC, we multiply the real gross domestic product by the ratio.

For Japan's land price, the Nationwide Urban Land Price Index created by the Japan Real Estate Institute is used. In particular, we use the land price index of all urban land (DPL1) and the land price index of six major cities (DPL2) in the dataset. For the United States' land price, we assembled the data for the price index for residential land from the dataset entitled "Decennial Census of Housing-Based price index: aggregate land data, annual, 1930-2000," which is created by Morris A. Davis and Jonathan Heathcote (2007).[11] Every land price index is deflated by the consumption price index to derive real land prices.

Table A1 in the online appendix provides the Mackinnon approximate p-values of the Dickey-Fuller test (henceforth, the DF test) under the null hypothesis of a unit root. The statistics of the Kwiatkowski-Phillips-Schmidt-Shin (1992) test (henceforth, the KPSS test) under the null hypothesis of stationarity are presented in table A1 as well.[12] The last column of table

[10] One exception is Netherlands. Aggregate consumption of that country is unavailable from 1969 to 1979.

[11] See footnote 24 of the article by Davis and Heathcote (2007) for more details of the dataset.

[12] See Denis Kwiatkowski, Peter C.B. Phillips, Peter Schmidt, and Yongcheol Shin (1992).

A1 provides a diagnosis for the stationarity for each variable. See the online appendix for the discussion about the stationarity tests.

While we judge from the stationarity tests that the first differences in the net output of all the 98 countries follow stationary processes, the stationarity (with or without trend) of the current account cannot be accepted for the countries labeled "caution" in the diagnosis and cannot be determined for the countries labeled "mixed." However, for the inter-temporal budget constraint of a country to be satisfied, the country's current account must follow a stationary process with or without trend if the first difference in the net output follows a stationary process.[13] Likewise, if the first difference in the net output follows a stationary process, then the first difference in private credit must follow a stationary process such that the intertemporal budget constraints of individuals are satisfied. In other words, from a theoretical viewpoint, if DZ follows a stationary process (with or without trend), then the variables, CA and DPC, should be stationary. Because we cannot imagine countries that do not take notice of their budget constraints, we have good reason to assume that these variables follow stationary processes.

4 Comparison of the United States and Japan

Eq.(2) is used as the first pass to detect the presence of collateral-based lending. If agents in a country face collateral constraints, there is a positive, linear relationship between the first difference in the land price and the lagged first difference in the private credit. The anticipation of an increase in the land price leads to an increase in private credit.

Figure 1 provides scatter plots of Japan's private credit versus its (real) land price as an example for this relationship. In all of the panels in figure 1, the horizontal line shows the first difference in the land price and the vertical line shows the lagged first difference in private credit. Both panel A and panel B use the land price index of all urban land (DPL1)[14] In the panels, we observe a positive relationship between an increase in the land price and a lagged increase in private credit as predicted by our model. The data points of private credit in 2002 and 2003 are extremely small as seen in panel A and they can be thought of as outliers.[15] In panel B, these two outliers are

[13]This claim is proven by Bharat Trehan and Carl E. Walsh (1991).

[14]Even though we use the land price index of six major cities (DPL2), we obtain a similar result.

[15]The cause of these outliers is probably so-called "internet bubbles," which burst in 2001.

eliminated from our sample: we still see the positive relationship.

[Figure 1 around here]

[Figure 2 around here]

We next examine the United States economy. Figure 2 provides a scatter plot of the United States private credit versus its real land price. In contrast to Japan's case, there is a negative relationship between the two variables, which contradicts the hypothesis of collateral-based lending. This negative relationship is statistically significant (although we do not report this).

Let us now estimate Eq.(3) to test whether the coefficient of Δq_t is equal to zero. In all the ordinary least square (OLS) estimations in table 2, the coefficients of Δq_t are negative and significant for the Japanese economy. These results are consistent with our model. The absolute values of the coefficients when we use the land price index of all urban land are much greater than when we use the land price index of six major cities.

While we obtain the results consistent with collateral-based lending from the OLS estimations, Δq_t could be an endogenous variable because capital inflow possibly pushes up the land price. To address the endogeneity problem, we perform instrumental variable (IV) estimations. We use the lagged first difference of private credit as an instrumental variable because if our model is applicable to a country, the lagged first difference of private credit affects the current account only through Δq_t, as seen in Eqs. (1) and (2).[16] In columns (3) and (7), only the one-period-lagged first difference of private credit is used as an instrumental variable. The coefficients of Δq_t are negative and significant in both cases. Moreover, the F-values for the tests of excluded instruments in the first-stage regressions are greater than 10, implying that there are no symptoms of weak instruments in either case. In columns (4) and (8), we use the one-to-four-period-lagged first differences of private credit as instrumental variables. In both cases, the coefficients of Δq_t are negative and significant as in the other estimations. While the Hansen tests of overidentifying restrictions do not reject the orthogonality conditions in both cases, the F-value for the test of excluded instruments in the first-stage regressions in estimation (8) is less than 10, showing the symptom of weak instruments. However, the p-value of the LM test for the significance

[16] Our estimation period is truncated in 2001. If we include the data points in 2002 and 2003, the IV estimations are weakly identified, probably because of the outliers of private credit in 2002 and 2003.

of the first difference of the land price, which is robust to weak instruments, is 0.013 in estimation (8).[17]

In contrast with Japan, in the OLS estimations for the United States, the coefficients of Δq_t are negative but insignificant. As in the case of Japan, we perform the IV estimations. While there is no symptom of weak instruments in estimation (11), the coefficient of Δq_t is insignificant and positive. Although there is a symptom of weak instruments in estimation (12), the p-value of the LM test for the significance of the first difference of the land price is 0.813. Judging from the results of the United States, a model with collateral constraints cannot be applied to the United States economy.

[Table 1 around here]

Finally, we estimate Eq. (1). The results of the OLS estimation for Eq.(1) are reported in table 2. For the Japanese economy, as in the case in which we use the land price, the coefficients are negative and significant over the whole estimation period. To examine whether there is a structural change we conduct the Chow test, finding that after 1983, borrowers in Japan face collateral constraints, whereas before 1983, borrowers did not face collateral constraints. For the United States, borrowers never face collateral constraints over the whole estimation period. We conduct the Chow test for the United States economy; however, we find no structural changes. One possible reason for the results of the United States is that the United States financial market is fully developed and firms often raise funds by direct finance from capital markets.[18]

5 Estimation Results

In the previous section, we have demonstrated that the Japanese economy is collaterally constrained, whereas the United States economy is not collaterally constrained. In examining countries other than Japan and the United States, we encounter a difficulty in collecting the data for the land prices.

[17] See Keith Finlay and Leandro M. Magnusson (2009) for more information on the LM test.

[18] One might say that a small-open-economy version of the KM model, where the world interest rate is exogenously given, is not appropriate for an investigation of the United States economy. However, the assumption for a small open economy should not be an obstacle to our analysis. This is because, even though we consider a model in which the United States is a large country, Δq_t would correlate with ΔPC_{t-1} in a positive way if borrowers in the United States faced credit constraints.

For many countries, the land price data do not exist, and in other countries where the land price data do exist, the available data points are too few to be estimated.

In contrast with the land price data, the data for private credit are available for many countries; therefore, we provide empirical evidence for 98 countries by estimating Eq.(1), which is associated with private credit. Although we can provide only one kind of empirical evidence, if the coefficient of ΔPC_{t-1} is negative and significant, then we judge that a collateral-based lending is established in a country.

Table A2 in the online appendix provides the empirical results. We estimate Eq.(1) both with and without a constant term. We also conduct the Chow test to investigate a structural change in each country. More concretely, we open a test window from 1970 to 1999 (depending upon the data availability) and conduct the Chow test for each year. If the F value for the Chow test is significant for a year and at a maximum compared to the other years, we regard the year as a breaking point. If the statistical significance of the coefficient of ΔPC_{t-1} changes before and after the breaking point, then we enter the result of the Chow test in table A2. Due to limitations of space, we discuss only countries indicating distinctive results. See table 2, which is extracted from table A2 in the online appendix.

[Table 2 around here]

The United Kingdom

The United Kingdom economy is collaterally constrained over the whole estimation period. However, if we investigate the economy in more detail by conducting the Chow test, we find that there is a breaking point in 1992. In 1992, the Pound Crisis occurred in the United Kingdom. Before the crisis, the coefficient of ΔPC_{t-1} is negative and significant, whereas after the crisis, the coefficient is negative but insignificant. However, we may well judge that the UK economy establishes a collateral-based lending system over the estimation period overall because the coefficient of ΔPC_{t-1} is negative and significant for the whole estimation period.

East Asian Countries

There are three countries, Korea, Malaysia, and Thailand among East Asian countries that exhibit distinctive estimation results. The common experience of these three countries is that they underwent financial crises in 1997. Interestingly, the consequences of the estimations are similar among these three countries. It follows from the Chow tests that there is a breaking point in 1998 for the Korean and Malaysian economies. Likewise, there is a breaking point in 1997 for Thailand's economy.

As is similar to the UK economy, before the crises, these three countries are collaterally constrained, whereas after the crises, they are not. Unlike the UK economy, however, the results do not indicate that they face collateral constraints over the whole period. Although it must be true that financial systems of the three countries changed after the crises, the investigations for each country are beyond the scope of this paper.

Costa Rica and Kenya

Costa Rica and Kenya are interesting cases of our estimations. As can be observed in table 2, the estimation for the whole period shows that the coefficients of ΔPC_{t-1} are insignificant in both countries. However, we identify breaking points for both countries. If we divide the estimation period into the two sub-periods according to their breaking points, then the coefficients of ΔPC_{t-1} in the periods both before and after each breaking point become significant in both countries. From these two examples, we understand the importance of identifying a structural change in an economy.

6 The Origin of Collateral-Based Lending

6.1 Index for Collateral-Based Lending

This section investigates our second question, that is, we detect the origin of the collateral-based lending system. Particularly, we seek an answer to this question in the legal protection of lenders. Strengthened legal protection relaxes credit market imperfections and gives constrained agents opportunities to borrow more easily in the financial market than when legal protection is weak (La Porta at al., 1997, 1998; Fabbri and Menichini, 2004). This is because an improvement of legal protection increases default costs and leads to the resolution of asymmetric information.

Meanwhile, there is a reason why an improvement of legal protection promotes collateral-based lending in an economy. The length of a judicial process is one of the legal enforcement costs associated with protection of lenders. If a trial is very long, lenders face risks of unexpected changes in the value of collateral (Tullio Jappelli, Marco Pagano, and Magda Bianco, 2005). For instance, suppose that legal protection of lenders is so weak in an economy that formalism overgrows in justice and trials take long time (Simeon Djankov, Rafael La Porta, Florencio Lopéz-de-Silanes, and Andrei Shleifer, 2003). If the value of collateral changes during a long trial, the dispute becomes horribly complicated. Therefore, in an economy with weak legal protection of lenders, collateral-based lending hardly develops. We demonstrate this hypothesis below.

We have to make decisions about our investigation. We focus on lending systems in the 1980s and 1990s because by concentrating on these two decades, we can collect as many samples as possible. If we study the 2000s, the number of data points of the index for collateral-based lending is significantly reduced. Similarly, if we study the 1960s and 1970s, the number of data points of legal protection critically decreases as well. The criterion in creating the indices is as follows.[19]

1. If the coefficient of ΔPC_{t-1} in Eq.(1) is negative and significant at the 5% level for the one-sided test in estimation either with or without a constant over the whole estimation period, then 1 is assigned to the indices for both the 1980s and the 1990s. However, as with Belize, if the estimation period for a country starts with 1986 or later, we eliminate it from a sample set for the 1980s. Likewise, as with Germany, if the estimation period for a country ends before 1990, it is eliminated from a sample set for the 1990s.

2. If the coefficient of ΔPC_{t-1} in Eq.(1) is not significantly negative, we proceed to the Chow test in the country. If the coefficient of ΔPC_{t-1} is negative and significant at the 5% level for the one-sided test for more than five years in 1980-1989, then 1 is assigned to the index for the 1980s. Similarly, if the coefficient is significantly negative for more than five years in 1990-1999, then 1 is assigned to the index for the 1990s.

3. If neither of the above two steps assigns 1, then we assign 0 to the indices both for the 1980s and the 1990s.

[19]Although one might argue that we can use the estimated values of the coefficient of ΔPC_{t-1} as the index for collateral-based lending, we cannot do this. This is because CA and ΔZ are not comparable between countries and because our model specifies the different values of coefficients of ΔPC_{t-1} between countries, for example, depending upon the land endowments.

According to the index for collateral-based lending, we report that 47 countries had collateral-based lending systems in the 1980s and 48 countries had them in the 1990s. While it is difficult to check the robustness of our indices, our indices are consistent with the microeconomic empirical findings discussed in the introduction. That is, collateral lending systems are not established in the United States, Italy, or Mexico, but are established in Costa Rica, Japan, and Thailand.

Let us now test the origin of collateral-based lending by estimating the following equation:

$$I_i = \alpha + \beta_1 L_i + X_i \beta_2 + \epsilon_i,$$

where I_i denotes the index for collateral-based lending of country i, L_i is a measure of the quality of legal protection of lenders, X_i is a set of other control variables including a measure of urbanization in 1950, financial openness in the 1980s or the 1990s, and a measure of economic development in 1970, and ϵ_i is an error term. Urbanization probably affects lending systems. Intuitively, as many people come to live in urban areas, information about borrowers is shared among financial intermediaries. Therefore, they can easily screen prospective borrowers if urbanization proceeds, and good borrowers will be more likely to access credit even without collateral. Meanwhile, in an era of financial globalization, external pressure promotes the restructuring of the domestic financial system. To control for this effect on collateral-based lending, we incorporate financial openness in the right-hand side of the estimation equation. Finally, per capita GDP in 1970 is used as a control variable for the degree of economic development, which probably affects the lending systems of a country.

In running regressions, we have to care about an endogeneity problem associated with legal protection. This is because there is a possibility of a reverse causality such that, if a country employs a collateral-based lending system, the government arranges the law supporting the collateral-based lending system. To address this endogeneity problem, we estimate a probit model with endogenous explanatory variables. In estimating this model, we use conditional maximum likelihood estimators.[20]

We adopt legal origins and a measure of human capital as instrumental variables for legal protection. Legal origin theory advocated by La Porta et al. (1997, 1998) tells us that when the common or civil law was introduced in a country via conquest or colonization, not only the rules but also

[20]See Jeffrey Marc Wooldridge (2002, pp.472-477) for details.

human capital and the ideologies of the legal system were transplanted into the country. The protection of property rights in common law countries is stronger than in civil law countries. This theory suggests that legal protection as an institution in a country is affected by legal origins. In addition to legal origins, we assume that human capital accumulation from 1960 to 1980 or to 1990 positively affects the development of a legal system of a country.

6.2 Data

We use "Chain Area 2" from the database of James D. Gwartney, Joshua C. Hall, and Robert Lawson (2010) as a measure of legal protection. This measure reflects the rule of law, security of property rights, an independent judiciary, and an impartial court system. We collected the indices of 1980 and of 1990 entered in "Chain Area 2" of the database. For robustness checks for our results, we use the "rule of law," assembled from the database of Daniel Kaufmann, Aart Kraay, and Massimo Mastruzzi (2010), as a measure of legal protection as well. This measure is a weighted average of variables, such as individuals' perceptions of the effectiveness and predictability of the judiciary and the enforcement of contracts. We assembled the indices of 1996 and of 1998 entered in the sheet of "rule of law."

The measure of urbanization was taken from the database produced by the United Nations (2010), the Department of Economic and Social Affairs, Population Division. We use "Percentage of Population Residing in Urban Areas" in File 2 of the database of "World Urbanization Prospects: The 2009 Revision." To avoid an endogeneity problem associated with this measure, we use the index of 1950. As a measure of financial openness, we use the Chinn-Ito index, which is a *de jure* measure of capital account openness index developed by Menzie D. Chinn and Hiro Ito (2008). The Chinn-Ito index reflects capital control policies and measures the intensity of capital controls. To produce measures for the financial openness of the 1980s and 1990s, we averaged the data points from 1980 to 1989 and from 1990 to 1999. Because capital control policies are implemented without targeting specific lending systems, we regard the Chinn-Ito index as exogenous.

As a measure of economic development in 1970, we collected the real gross domestic product per capita (current price) in 1970 from the Penn World Table 6.3, produced by Alan Heston, Roberst Summers, and Bettina Aten (2009). The data for legal origins were gathered from Rafael La Porta, Florencio Lopéz-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1999).

As a measure of human capital, we assembled the data for "Average Year of Total Schooling" as in 1960 from the full dataset of "Population Aged 25 and Over" produced by Robert J. Barro and Jong-Wha Lee (2010). The "European settler mortality" rates were collected from Daron Acemoglu, Simon Johnson, and James A. Robinson (2001). These mortality rates are of soldiers, bishops, and sailors who settled in colonies from the seventeen to nineteenth centuries.

6.3 Results

Table 3 reports the results of the probit estimation without instrumental variables. All the regressions in the table indicate that the coefficients of legal protection in 1980s and in 1990s are positive and significant at the conventional significance level. This implies that good legal protection promotes a collateral-based lending system. In other words, if an economy is endowed with good legal protection of lenders, they can access credit as long as borrowers hold collateral.

In most regressions, the coefficients of urbanization are negative and significant. This consequence may be caused by most people coming to live in urban areas, in which case information about borrowers is commonly used by financial intermediaries. As a result, these financial intermediaries can easily screen prospective borrowers from a pool of potential borrowers. As urbanization proceeds, prospective borrowers will access credit even without collateral. Financial openness seems to negatively affect collateral-based lending; however, this relationship is not significant. The degree of development does not enter significantly in any of the regressions, although it seems to positively affect collateral-based lending.

[Table 3 around here]

The results of table 3 might be subject to an endogeneity problem. This is because if an economy exhibits a germ of collateral-based lending, the government may try to support the lending system by enacting laws that accommodate the system. Therefore, we also estimate a probit model with endogenous explanatory variables. For the estimation, the instrumental variables are the legal origins and the average years of total schooling in 1960 (School 60, henceforth), which is a proxy for human capital in 1980s and 1990s.

[Table 4 around here]

Table 4 reports the results of probit estimation with instrumental variables. It provides similar results to those in table 3, except for the insignificance of legal protection in column (8). This implies that the results of table 3 are robust. For the validity of instrumental variables, the J tests of overidentifying restrictions do not reject the orthogonality conditions in all estimations.[21] The F-values for the tests of excluded instruments in the first-stage regressions are greater than 10 for four cases out of eight, implying that in those four cases there are no symptoms of weak instruments.[22] Therefore, for these four cases, the instruments are considered to be valid. Although the F-values for the tests of excluded instruments in the first-stage regressions are less than 10, the LM tests, which are robust to weak instruments, indicate the significance of the coefficients of legal protection, except for the estimation in columns (7) and (8).

We infer from our estimation that good legal protection of lenders is an important institutional factor for an economy to establish a collateral-based lending system. Our estimation also indicates that urbanization weakens a collateral-based lending system.

6.4 Robustness

6.4.1 European Settler Mortality as an Instrument

A simultaneous equation model is sometimes sensitive to the choice of instrumental variables. For a robustness check, we also use the "European settler mortality" rate of Acemoglu et al. (2001) as an instrumental variable for legal protection. They propose a theory of institutional differences among countries colonized by Europeans. According to their theory, different colonization policies created different institutions. The feasibility of settlement of colonized places determined the colonization strategy. For instance, if disease in a location undermined European settlement, Europeans did not settle in that place. Instead, they were more likely to form an extractive system in those places. By contrast, if European settlers did not encounter significant disease-related impediments, they transplanted good institutions protecting property rights into these places. In these cases, the colonial state and institutions continue up to the present day. This theory supports use of the early mortality rate as an instrumental variable for the legal protection of lenders.

[21]See Keith Finlay and Leandro M. Magnusson (2009) for more information on the J test.

[22]The F-values greater than 10 satisfy the "rule of thumb" proposed by Douglas Staiger and James H. Stock (1997).

The number of countries for which we can obtain the data for "European settler mortality" is limited, and our observations are at most 52. As seen in table 5, the estimation results are similar to those of table 3. Although all the F-values for the tests of excluded instruments are less than 10, the Anderson-Rubin (AR) tests for the significance of an endogenous variable, which are robust to weak instruments, report that legal protection enters significantly in all cases.

[Table 5 around here]

6.4.2 Another Measure of Legal Protection

We use another measure of legal protection of lenders, which is the "rule of law" created by Kaufmann et al. (2010). Unfortunately, the "rule of law" is available only from 1996 onward. Therefore, our estimation focuses only on the 1990s. We assembled the data for the "rule of law" of 1996 and 1998.

Table 6 indicates that all of the coefficients of legal protection except for one case are positive and significant at the conventional significance level. The signs of the coefficients and the significance of urbanization are almost the same as those of the previous regressions. All the F-values for the tests of excluded instruments are greater than 10, implying that there are no symptoms of weak instruments. The J tests do not reject the orthogonality conditions in any of the regressions.

[Table 6 around here]

7 Concluding Remarks

We have used a small-open-economy version of Nobuhiro Kiyotaki and John Moore's model to judge whether a collateral-based lending system is embedded in an economy. If Kiyotaki and Moore's model is statistically accepted in a country, we consider that the country establishes a collateral-based lending system. From our estimation, we find that collateral-based lending systems are embedded in approximately half of the 98 countries.

This paper could be a caveat against the reckless use of a model with collateral constraints. Researchers often presume collateral constraints when investigating macroeconomic phenomena. However, if a collateral-based lending system is not established in an economy, we may deduce inadequate policy implications from a theoretical model with collateral constraints.

Moreover, we have investigated the origin of collateral-based lending systems. We find that the legal protection of lenders supports the establishment of collateral-based lending systems. This result is robust without being subject to an endogeneity problem associated with the legal protection of lenders. We also find that urbanization negatively affects the establishment of collateral-based lending systems. This is possibly because if people come to live in urban areas, information about borrowers is commonly used by financial intermediaries and thus can easily screen potential borrowers. Consequently, prospective borrowers will access credit, even without collateral. Of course, this is a possible hypothesis, and we need a more elaborate analysis on this issue.

Appendix

Model

A country is assumed to be a small open economy facing a world interest rate. The economy consists of savers and borrowers. Borrowers are collaterally constrained. The total population in the economy is normalized to one and the ratio of borrowers to savers is λ:$1-\lambda$, where $\lambda \geq 0$ is a constant. Each borrower is identical in the sense that he/she has the same preference and the same technology. Likewise, each saver is identical in the same sense.

Each borrower is endowed with a linear production technology, $y_{t+1} = ax_t$, whose input is land. Here, a, x_t, and y_{t+1} represent a constant productivity parameter, land held by a borrower at time t, and his/her output at time $t+1$, respectively. While a borrower borrows resources from the financial market, he/she faces a credit constraint associated with the value of collateral at each time.

Each saver is endowed with two kinds of production technologies. While the two production technologies create the same output, their inputs are different. One uses land x_t^* as input:

$$G_1(x_t^*),$$

where $G_1' > 0$ and $G_1'' < 0$. G_1 satisfies Inada conditions: $\lim_{x^* \to 0} G_1'(.) = \infty$, $\lim_{x^* \to \infty} G_1'(.) = 0$ and $G_1(0) = 0$. The other technology uses capital k_t^* as input:

$$G_2(k_t^*),$$

where $G_2' > 0$ and $G_2'' < 0$. G_2 satisfies Inada conditions as well. Following Kiyotaki and Moore (1997), technical conditions on the parameters are imposed:

$$a > R\beta a > G_1'((1 - R\beta)\bar{X}/(1 - \lambda)), \tag{4}$$

where $\bar{X}$ is the total amount of land and $R > 1$ is the world interest rate, which is exogenously given.[23] $\beta \in (0, 1)$ is the subjective discount rate, which is common between borrowers and savers. By Eq.(4), we exclude economically meaningless solutions of the model. Because each saver is endowed with the two kinds of technologies, his output at time $t + 1$ is given by:

$$y_{t+1}^* = G_1(x_t^*) + G_2(k_t^*).$$

The instantaneous utility functions of both types of agents are assumed to be identical; specifically, these are given by $\ln c_t + \ln g_t$ and $\ln c_t^* + \ln g_t$ where c and c^* are the consumption of a borrower and a saver, respectively. g is the total government expenditure, which is exogenously determined by the government; accordingly, we can omit $\ln g$ from the maximization problems of agents.

A borrower maximizes his lifetime utility as follows:

$$\max \sum_{t=0}^{\infty} \beta^t \ln c_t \tag{5}$$

$$\text{s.t.} \quad c_t + q_t(x_t - x_{t-1}) + Rb_{t-1} = (1 - \tau)ax_{t-1} + b_t, \tag{6}$$

$$b_t \leq R^{-1} q_{t+1} x_t, \tag{7}$$

where Eqs.(6) and (7) are the flow budget constraint and the credit constraint, respectively. b is debt if positive or savings if negative, q is the land price, and τ is the tax rate imposed on the output. The online appendix proves that there exists time T, such that from time T onward, credit constraints given by Eq.(7) are always binding. Henceforth, we focus on a case where the credit constraints are always binding.

[23]For simplicity, it has been assumed that each borrower is endowed with only one production technology, whose input is land. One could imagine that while each borrower can access another production technology as savers, which is linear with respect to capital, this productivity is extremely low compared with the world interest rate.

The first-order conditions for a borrower are given by:

$$\frac{1}{c_t} - \beta R \frac{1}{c_{t+1}} - \phi_t = 0 \tag{8}$$

$$-\frac{q_t}{c_t} + \beta[(1-\tau)a + q_{t+1}]\frac{1}{c_{t+1}} + R^{-1}q_{t+1}\phi_t = 0, \tag{9}$$

where ϕ_t is a co-state variable of the credit constraint at time t. The necessary and sufficient conditions for the optimality of this maximization problem consist of Eqs.(8) and (9) as well as the transversality conditions, $\lim_{t\to\infty} R^{-t}b_t{=}\lim_{t\to\infty} = \beta^t(q_t x_t/c_t) = 0$.

Likewise, a saver's maximization problem is given by:

$$\max \sum_{t=0}^{\infty} \beta^t \ln c_t^* \tag{10}$$

$$\begin{aligned} \text{s.t.} \quad & c_t^* + q_t(x_t^* - x_{t-1}^*) + I_t^* + Rb_{t-1}^* \\ & = (1-\tau)[G_1(x_{t-1}^*) + G_2(k_{t-1}^*)] + b_t^*, \end{aligned} \tag{11}$$

where $I_t^* = k_t^* - (1-\delta)k_{t-1}^*$.

The first-order conditions for a saver are given by:

$$c_{t+1}^* = \beta R c_t^* \tag{12}$$

$$\frac{(1-\tau)G_1'(x_t^*)}{u_t} = R \tag{13}$$

$$(1-\tau)G_2'(k_t^*) = R + \delta - 1, \tag{14}$$

where $u_t = q_t - q_{t+1}/R$. Eq.(12) is the Euler equation, and Eq.(13) and Eq.(14) are the intra-temporal optimality conditions in the land market and in the capital market, respectively.[24] The necessary and sufficient conditions for the optimality of this maximization problem consist of Eqs.(12)-(14) as well as the transversality conditions, $\lim_{t\to\infty} R^{-t}b_t^*{=}\lim_{t\to\infty} = \beta^t(q_t x_t^*/c_t^*) = 0$.

Because Eq.(7) is binding, the budget constraint of a borrower, Eq.(6), is reduced to:

$$c_t + u_t x_t = (1-\tau)a x_{t-1}. \tag{15}$$

[24]To be accurate, to ensure that all the savers remain savers over their lifetimes, the assets held by savers in the steady state, $-\hat{b}^*$, must be greater than zero. As seen in the later, $-\hat{b}^*$ is given by $-\hat{b}^*{=}[\delta\hat{k}^* - (1-\tau)(G_1(\hat{x}^*) + G_2(\hat{k}^*))]/(R-1)$, where $\hat{x}^* = G_1'^{-1}(R\beta a)$ and $\hat{k}^* = G_2'^{-1}((R+\delta-1)/(1-\tau))$ are the land and capital stocks held by a saver in the steady state, respectively. We impose the parameter conditions so that $-\hat{b}^* > 0$.

From Eqs.(8) and (9), we obtain a new Euler equation:

$$c_{t+1} = \frac{(1-\tau)a\beta}{u_t} c_t. \tag{16}$$

From Eqs.(15) and (16), the optimal consumption is obtained as follows:

$$c_t = (1-\beta)[(1-\tau)ax_{t-1} + q_t x_{t-1} - Rb_{t-1}] = (1-\beta)(1-\tau)ax_{t-1}. \tag{17}$$

From Eqs.(13), (15), and (17), we obtain a dynamical system with respect to x_t as follows:

$$G_1'\Big(\frac{\bar{X} - \lambda x_t}{1-\lambda}\Big)x_t = R\beta a x_{t-1}.$$

Because $R\beta a > G_1'(\bar{X}/(1-\lambda))$, this dynamical system has a unique non-trivial steady state $\hat{x}$, which is an inner point. The steady sate is stable because the linear approximation of the dynamical system is $x_t - \hat{x} = \frac{\beta Ra}{\beta Ra - \frac{\lambda}{1-\lambda}\hat{G}_1''\hat{x}}(x_{t-1} - \hat{x})$, where $|\frac{\beta Ra}{\beta Ra - \frac{\lambda}{1-\lambda}\hat{G}_1''\hat{x}}| < 1$. Additionally, it can be shown that the equilibrium sequences of all variables converging to their steady states satisfy the transversality conditions.[25]

Because the lifetime utility is log-linear, the consumption function of a saver is derived as follows:

$$c_t^* = (1-\beta)[(1-\tau)y_t^* - I_t^* + q_t x_{t-1}^* - Rb_{t-1}^* + \sum_{j=0}^{\infty} R^{-j}\pi_{t+j}], \tag{18}$$

where $\pi_t = (1/R)((1-\tau)y_{t+1}^* - I_{t+1}^*) - u_t x_t^*$.

To derive the current account dynamics, we aggregate the consumption functions for all the agents. From Eqs.(17) and (18), the aggregate consumption function is given by:

$$C_t = (1-\beta)[Z_t + q_t\bar{X} + RF_{t-1} + (1-\lambda)\sum_{j=0}^{\infty} R^{-j}\pi_{t+j}], \tag{19}$$

where $C_t = \lambda c_t + (1-\lambda)c_t^*$, $Z_t = (1-\tau)[\lambda y_t + (1-\lambda)y_t^*] - (1-\lambda)I_t^*$, and $F_{t-1} = -(\lambda b_{t-1} + (1-\lambda)b_{t-1}^*)$. Here, we note that F_{t-1} is the net foreign asset held by the country at time $t-1$. The first difference of Eq.(19) is obtained as follows:

$$\Delta C_t = (1-\beta)[\Delta Z_t + \Delta q_t\bar{X} + R\Delta F_{t-1} + (1-\lambda)\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j}]. \tag{20}$$

[25]While it is complicated to investigate the equilibrium sequence $\{q_t\}$, it can be shown that $\{q_t\}$ converges to $\hat{q} = \frac{a(1-\tau)}{R-1}$.

By linearizing $\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j}$ around the steady state, we have $\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j} = -\hat{x}^*\Delta q_t$ where $\hat{x}^*$ is the land held by a saver in the steady state. By using this equation, Eq.(20) is reduced to:

$$\Delta C_t = (1-\beta)[\Delta Z_t + (\bar{X} - (1-\lambda)\hat{x}^*)\Delta q_t + R\Delta F_{t-1}]. \tag{21}$$

Meanwhile, it follows from the national income identity that:[26]

$$CA_t = RCA_{t-1} + \Delta Z_t - \Delta C_t, \tag{22}$$

where $CA_t = \Delta F_t$ is the current account at time t. From Eqs.(21) and (22), we obtain a dynamic equation for the current account:

$$CA_t = \beta R\, CA_{t-1} + \beta\Delta Z_t - (1-\beta)(\bar{X} - (1-\lambda)\hat{x}^*)\Delta q_t. \tag{23}$$

The closed-form expression of Eq.(23) is the same as the one Kunieda and Shibata (2005) derive.

Linearinzing $Rb_t = q_{t+1}x_t$ around the steady sate, we have:

$$R(b_t - \hat{b}) = \hat{x}(q_{t+1} - \hat{q}) + \hat{q}(x_t - \hat{x}).$$

By taking the first difference of this equation, it follows that:

$$R\Delta b_t = \hat{x}\Delta q_{t+1} + \hat{q}\Delta x_t. \tag{24}$$

Because $\bar{X} = \lambda x_t + (1-\lambda)x_t^*$, Eq.(23) becomes:

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\lambda\hat{x}\Delta q_t. \tag{25}$$

Because we have $x_t - \hat{x} = \Phi(x_{t-1} - \hat{x})$ around the steady state where $\Phi := \frac{\beta Ra}{\beta Ra - \frac{\lambda}{1-\lambda}\hat{G}_1''\hat{x}}$, it follows that

$$\Delta x_t = \Phi\Delta x_{t-1}$$

and thus:

$$\Delta x_t = \Phi^{t-1}\Delta x_1. \tag{26}$$

From Eq.(13), we have $(1-\tau)G_1'(\frac{\bar{X}-\lambda x_t}{1-\lambda}) = Rq_t - q_{t+1}$, which is expanded around the steady state as follows:

$$-\frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''(x_t - \hat{x}) = R(q_t - \hat{q}) - (q_{t+1} - \hat{q}),$$

[26] We should note that the national income identity is $Z_t + RF_{t-1} = F_t + C_t$.

where $\hat{G}_1'' = G_1''(\hat{x}^*)$. From this, we obtain:

$$\Delta q_{t+1} = R\Delta q_t + \frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''\Delta x_t. \tag{27}$$

By substituting Eq.(26) into Eq.(27), we have:

$$\Delta q_{t+1} = R\Delta q_t + \frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''\Phi^{t-1}\Delta x_1. \tag{28}$$

The solution for Eq.(28) is given by:

$$\Delta q_t = (\frac{\Delta q_1}{\Phi} - \lambda\tilde{\Phi})\Phi R^{t-1} + \lambda\tilde{\Phi}\Phi^t, \tag{29}$$

where $\tilde{\Phi} = \frac{(1-\tau)\hat{G}_1''\Delta x_1}{(1-\lambda)(\Phi^2 - R\Phi)}$. It must hold that $\Delta q_1 = \lambda\tilde{\Phi}\Phi$ so that the transversality conditions can be satisfied. Therefore, we obtain:

$$\Delta q_t = \lambda\tilde{\Phi}\Phi^t. \tag{30}$$

From Eqs.(26) and (30), we have $\Delta x_t = \frac{\Delta x_1}{\lambda\tilde{\Phi}\Phi^2}\Delta q_{t+1}$. From the last equation and Eq.(24), we obtain the following:

$$\hat{x}\Delta q_{t+1} = \frac{R\lambda\tilde{\Phi}\Phi^2\hat{x}}{\lambda\tilde{\Phi}\Phi^2\hat{x} + \hat{q}\Delta x_1}\Delta b_t. \tag{31}$$

Substituting Eq.(31) into Eq.(25), we have:

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\lambda^2\Psi\hat{x}\Delta b_{t-1}, \tag{32}$$

where $\Psi := \frac{R\tilde{\Phi}\Phi^2}{\lambda\tilde{\Phi}\Phi^2\hat{x} + \hat{q}\Delta x_1}$. Because the increase in loans to borrowers contributes to the increase in the aggregate private credit, we have $\lambda\Delta b_t := \Delta PC_t$. By substituting the last into (32), we obtain:

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\Psi\lambda\hat{x}\Delta PC_{t-1}. \tag{33}$$

From Eq.(31), we have:

$$\Delta q_{t+1} = \Psi\Delta PC_t. \tag{34}$$

As seen in Eq.(33), if there are no collaterally constrained agents, i.e., $\lambda = 0$, then the effect of ΔPC_{t-1} on the current account degenerates. Eq.(33) can be used to examine whether a theoretical model with collateral constraints is applicable to an economy.

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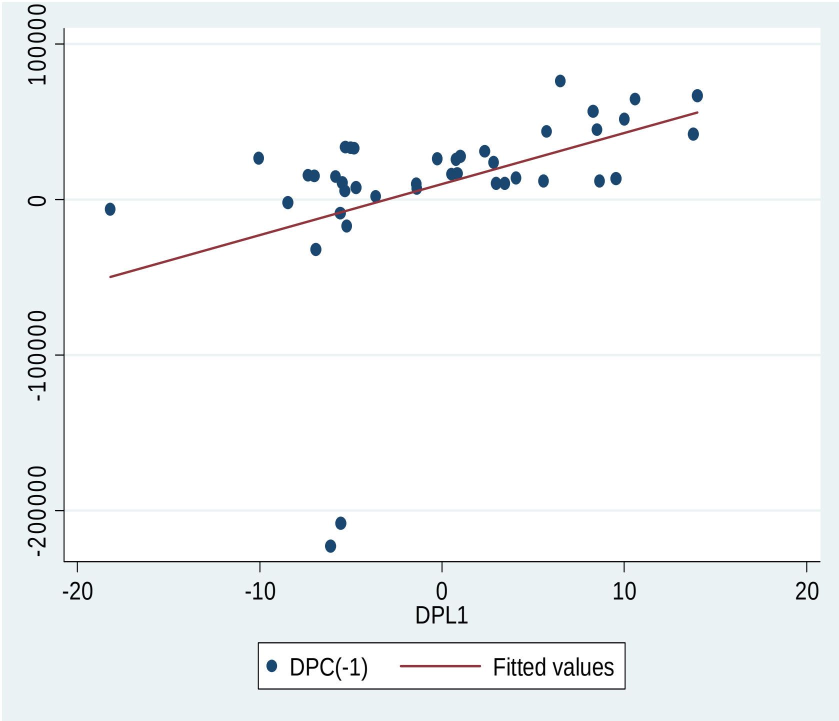
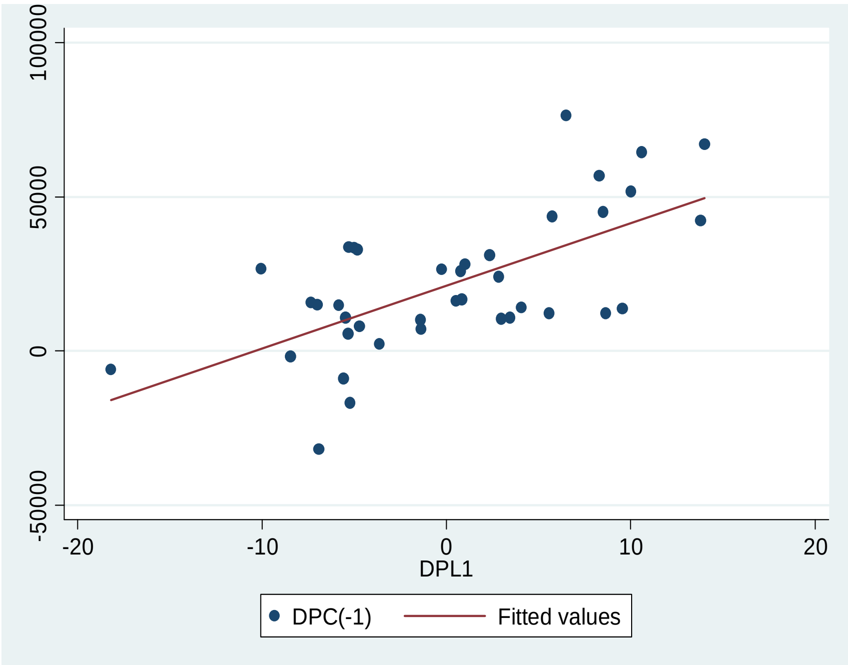


Panel A



Panel B

Figure 1 Land Price versus Private Credit (Japan)

Notes. The horizontal axes show the first difference in the land price and the vertical axes show the lagged first difference in private credit. In the Japanese economy, the relationship between the first difference in land price and the lagged first difference in private credit is consistent with Kiyotaki and Moore's (1997) model. In both Panel A and Panel B, we use the land price index of all urban land (DPL1). The outliers of 2002 and 2003 are eliminated from the sample in Panel B.

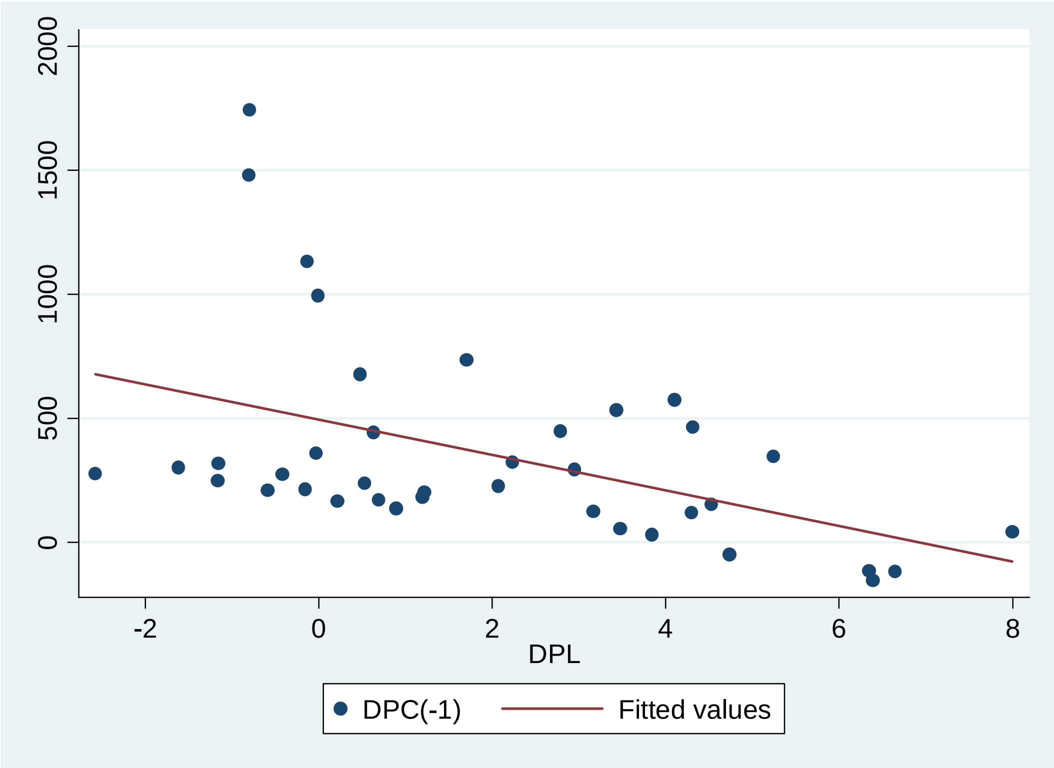


Figure 2 Land Price versus Private Credit (USA)

The horizontal axis shows the first difference in the land price and the vertical axis shows the lagged first difference in private credit. In the US economy, the relationship between the first difference in land price and the lagged first difference in private credit is not consistent with Kiyotaki and Moore's (1997) model.

Table 1 Estimation Results (Current Account/Land Price)

			Dependent Variable: Current Account (CA)							
Japan		Estimation Periods (Obs.)	CA(−1)	DZ	DPL1	DPL2	CONS	First stage F	Hansen test	R−squared
(1)	OLS	1967−2007 (41)	0.982a	0.347a	−191a		−1118			0.874
			(0.068)	(0.107)	(64.1)		(1152)			
(2)	OLS	1967−2007 (41)	0.930a	0.263a	−179a					0.951
			(0.046)	(0.063)	(65.8)					
(3)	IV	1967−2001 (35)	0.889a	0.311a	−119b		−630	22.5		
			(0.055)	(0.095)	(71.5)		(941)			
(4)	IV	1969−2001 (33)	0.873a	0.339a	−159b		−550	14.8	0.773	
			(0.060)	(0.106)	(77.0)		(1038)			
(5)	OLS	1967−2007 (41)	1.013a	0.294a		−52.4a	1080			0.865
			(0.068)	(0.096)		(15.5)	(1124)			
(6)	OLS	1967−2007 (41)	0.961a	0.215a		−48.2a				0.947
			(0.044)	(0.049)		(14.3)				
(7)	IV	1967−2002 (35)	0.899a	0.293a		−42.7b	−659	16.9		
			(0.053)	(0.092)		(23.3)	(966)			
(8)	IV	1969−2001 (33)	0.882a	0.315a		−55.5b	−540	5.96	0.781	
			(0.055)	(0.100)		(25.9)	(10.52)			
USA			CA(−1)	DZ	DPL		CONS			R−squared
(9)	OLS	1961−2000 (40)	0.856a	−0.189	−1.984		8.711a			0.802
			(0.081)	(0.133)	(3.270)		(16.19)			
(10)	OLS	1961−2000 (40)	0.851a	−0.142	−1.308					0.872
			(0.079)	(0.069)	(2.706)					
(11)	IV	1962−2000 (39)	0.837a	−0.176	3.029		−4.122	12.6		
			(0.093)	(0.136)	(5.777)		(21.11)			
(12)	IV	1965−2000 (36)	0.775a	−0.196	5.074		−13.74	5.45	0.236	
			(0.116)	(0.136)	(5.955)		(23.15)			

Notes. The dependent variable is the current account (CA). Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the one−sided test, respectively. In the estimation for Japan, DPL1 shows the first difference in the land price index of all urban land, and DPL2 shows the first difference in the land price index of six major cities. The results of the instrumental variable (IV) estimations are presented in columns (3)−(4), (7)−(8), and (11)−(12), In columns (3), (7), and (11), the one−period−lagged first difference of private credit is used for the instrumental variable, and the IV estimations are just identified. In columns (4), (8), and (12), the one−to−four−period−lagged first differences are used for the instrumental variables. In columns (8) and (12), The F−values for the tests of excluded instruments in the first−stage regressions are less than 10, and the estimations show the symptoms of weak instruments; however, the p−values of the LM tests for the significance of the coefficients of the first difference of the land price, which are robust to weak instruments, are 0.013 and 0.813, respectively. Therefore, the coefficient of the first difference of the land price in Japan is significantly positive, whereas that in the United States is insignificant.

Table 2 OLS Estimation (The Current Account/Private Credit)

country Breaking year [P-value of the Chow test]	Estimation periods (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
United Kingdom	1962-2007 (46)	0.623a	-0.089a	0.217	-2.054	0.737
1992		(0.097)	(0.024)	(0.144)	(1.515)	
[0.0372]	1962-1991 (30)	0.572a	-0.143a	0.421a	-2.038	0.859
		(0.093)	(0.023)	(0.012)	(1.310)	
	1992-2007 (16)	0.573a	-0.018	0.167	-7.034	0.443
		(0.093)	(0.037)	(0.193)	(5.427)	
	1962-2007 (46)	0.633a	-0.097a	0.126		0.811
		(0.100)	(0.023)	(0.114)		
	1962-1991 (30)	0.577a	-0.151a	0.315a		0.868
		(0.099)	(0.025)	(0.105)		
	1992-2007 (16)	0.691a	-0.040	0.076		0.815
		(0.247)	(0.035)	(0.202)		
Japan	1962-2007 (46)	0.997a	-0.016a	0.275a	-700	0.879
1983		(0.055)	(0.004)	(0.088)	(876)	
[0.0016]	1962-1982 (21)	0.025	0.040	0.413a	-1958b	0.649
		(0.250)	(0.035)	(0.086)	(853)	
	1983-2007 (35)	0.947a	-0.015a	0.337b	133	0.709
		(0.183)	(0.005)	(0.197)	(3193)	
	1962-2007 (46)	0.965a	-0.016a	0.218a		0.946
		(0.040)	(0.004)	(0.046)		
	1962-1982 (21)	0.195	-0.008	0.269a		0.629
		(0.240)	(0.027)	(0.051)		
	1983-2007 (35)	0.954a	-0.015a	0.343a		0.974
		(0.045)	(0.005)	(0.087)		
USA	1962-2007 (46)	0.996a	0.023	-0.165	-1.482	0.903
		(0.077)	(0.026)	(0.158)	(13.6)	
	1962-2007 (46)	0.996a	0.023	-0.174		0.942
		(0.076)	(0.026)	(0.104)		
Korea	1973-2007 (35)	0.686a	0.042	0.623b	-6026b	0.522
1998		(0.096)	(0.088)	(0.280)	(2854)	
[0.0000]	1973-1997 (25)	0.850a	-0.264a	0.923a	-3972a	0.823
		(0.139)	(0.042)	(0.131)	(1275)	
	1998-2007 (10)	-0.149	0.213	0.385	16944	0.563
		(0.254)	(0.083)	(0.568)	(10386)	
	1973-2007 (35)	0.626a	0.019	0.307b		0.510
		(0.101)	(0.082)	(0.129)		
	1973-1997 (25)	0.880a	-0.289a	0.739a		0.771
		(0.139)	(0.044)	(0.101)		
	1998-2007 (10)	0.192	0.232	1.030a		0.854
		(0.187)	(0.090)	(0.378)		

Notes. The dependent variable is the current account. If the coefficient of DPC(-1) is positive and significant, then a collateral-based lending system is embedded in the country. Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the one-sided test, respectively. The breaking years of the Chow test are under country names (if any), and the values in square brackets are the p-values of the test.

Table 2 (Continued)

country Breaking year [P-value of the Chow test]	Estimation periods (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Costta Rica	1962-2001 (40)	0.890a	-0.204	0.085b	-26.8b	0.786
1987		(0.075)	(0.156)	(0.037)	(11.0)	
[0.0000]	1962-1986 (25)	0.963a	-0.695a	0.422a	-17.5b	0.919
		(0.050)	(0.167)	(0.097)	(8.318)	
	1987-2001 (15)	-0.082	-0.382b	0.038	-248a	0.414
		(0.212)	(0.182)	(0.034)	(39.5)	
	1962-2001 (40)	1.052a	-0.099	0.142a		0.955
		(0.058)	(0.167)	(0.054)		
	1962-1986 (25)	1.057a	-0.771a	0.378a		0.973
		(0.046)	(0.180)	(0.093)		
	1987-2001 (15)	1.100a	0.035	0.096b		0.950
		(0.086)	(0.222)	(0.053)		
Kenya	1966-2006 (41)	0.655a	-0.879	-0.235	-22100	0.578
1994		(0.185)	(0.561)	(0.338)	(12102)	
[0.0000]	1966-1993 (28)	0.561a	-1.640a	0.305a	-12083	0.686
		(0.110)	(0.525)	(0.104)	(5985)	
	1994-2006 (13)	0.355	-1.465b	-0.513	-87059	0.680
		(0.354)	(0.723)	(0.204)	(39084)	
	1966-2006 (41)	0.806a	-0.895	-0.271		0.792
		(0.128)	(0.705)	(0.349)		
	1966-1993 (28)	0.700a	-1.929a	0.303a		0.899
		(0.088)	(0.542)	(0.114)		
	1994-2006 (13)	0.837a	0.178	-0.904		0.863
		(0.175)	(0.511)	(0.246)		
Malaysia	1962-2007 (46)	0.862a	0.069	0.885a	-4145a	0.953
1998		(0.062)	(0.115)	(0.218)	(1255)	
[0.0000]	1962-1997 (26)	0.895a	-0.121a	0.717a	-2037a	0.795
		(0.124)	(0.029)	(0.163)	(830)	
	1998-2007 (20)	0.789a	0.466	0.464b	3631	0.953
		(0.070)	(0.151)	(0.193)	(3963)	
	1962-2007 (46)	0.847a	0.006	0.789a		0.949
		(0.072)	(0.113)	(0.235)		
	1962-1997 (26)	0.867a	-0.162a	0.589a		0.787
		(0.148)	(0.030)	(0.136)		
	1998-2007 (20)	0.823a	0.476	0.523b		0.993
		(0.047)	(0.130)	(0.209)		
Thailand	1968-2007 (40)	0.828a	-0.082	1.042a	-86.5a	0.842
1997		(0.142)	(0.071)	(0.185)	(15.3)	
[0.0029]	1968-1996 (29)	0.577a	-0.237a	0.576a	-52.1a	0.927
		(0.152)	(0.060)	(0.142)	(16.7)	
	1997-2007 (11)	0.891a	0.035	1.101a	-86.7	0.633
		(0.258)	(0.117)	(0.304)	(72.5)	
	1968-2007 (40)	0.751a	-0.116	0.672a		0.756
		(0.151)	(0.088)	(0.168)		
	1968-1996 (29)	0.841a	-0.187a	0.372a		0.935
		(0.132)	(0.068)	(0.129)		
	1997-2007 (11)	0.687a	0.001	0.852a		0.842)
		(0.189)	(0.110)	(0.188)		

Table 3 Probit Estimation

	Collateral based lending 80				Collateral based lending 90			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Legal protection 80	0.322a	0.338a	0.308a	0.320a				
	(0.091)	(0.098)	(0.091)	(0.095)				
Legal protection 90					0.207a	0.243a	0.159c	0.195b
					(0.076)	(0.088)	(0.084)	(0.089)
Urban 50	−0.024a	−0.022b	−0.026b	−0.025c	−0.011c	−0.008	−0.021b	−0.019b
	(0.008)	(0.009)	(0.012)	(0.013)	(0.007)	(0.007)	(0.009)	(0.009)
Financial openness 80		−0.055		−0.051				
		(0.145)		(0.147)				
Financial openness 90						−0.127		−1.172
						(0.153)		(0.175)
Log of GDP per capita 70			0.096	0.137			0.372	0.470
			(0.329)	(0.347)			(0.280)	(0.311)
Constant	−0.742c	−0.896c	−1.275	−1.654	−0.826b	−1.106b	−2.825c	−3.725c
	(0.444)	(0.517)	(1.951)	(2.095)	(0.390)	(0.492)	(1.610)	(1.938)
P−value of the Wald test	0.001	0.006	0.004	0.012	0.024	0.079	0.033	0.056
Observations	65	62	65	62	80	78	80	78

Notes. The dependent variable is an index for collateral−based lending. Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the two−sided test, respectively. The null hypothesis of the Wald test is that all the coefficients are zero.

Table 4 Probit Estimation with Instruments

	Collateral based lending 80				Collateral based lending 90			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Legal protection 80	0.463a	0.487a	0.513a	0.519a				
	(0.138)	(0.149)	(0.147)	(0.192)				
Legal protection 90					0.314a	0.348b	0.289c	0.275
					(0.109)	(0.148)	(0.157)	(0.186)
Urban 50	−0.034a	−0.031a	−0.030b	−0.028b	−0.019b	−0.012	−0.022b	−0.020b
	(0.010)	(0.010)	(0.012)	(0.013)	(0.008)	(0.008)	(0.009)	(0.009)
Financial openness 80		−0.108		−0.116				
		(0.149)		(0.148)				
Financial openness 90						−0.220		−0.224
						(0.183)		(0.193)
Log of GDP per capita 70			−0.216	−0.136			0.126	0.357
			(0.409)	(0.416)			(0.381)	(0.370)
Constant	−1.152b	−1.405b	−0.034	−0.708	−1.163b	−1.512b	−1.804	−3.335c
	(0.580)	(0.690)	(2.227)	(2.288)	(0.519)	(0.756)	(1.901)	(1.992)
First stage F statistic	27.5	8.05	10.2	4.05	21.14	16.18	8.17	7.83
LM test	p=0.012	p=0.020	p=0.026	p=0.042	p=0.017	p=0.036	p=0.113	p=0.171
J test	p=0.695	p=0.490	p=0.766	p=0.529	p=0.652	p=0.579	p=0.665	p=0.660
Observations	64	61	64	61	78	76	78	78

Notes. The dependent variable is an index for collateral−based lending. The conditional maximum−likelihood estimators are used. Instrumental variables are legal origin (France, Germany, and Scandinavians) and School 60. Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the two−sided test, respectively. The first−stage F statistic is for a test of excluded instrumental variables in the first−satge regressions. The LM test for the significance of an endogenous variable is robust to weak instruments. The J test is a test of the overidentifying restrictions. ``p=″ is the p−value for a test.

Table 5 Probit Estimation with Instruments

	Collateral based lending 80				Collateral based lending 90			
Legal protection 80	0.745a	0.781a	0.747a	0.785a				
	(0.070)	(0.073)	(0.067)	(0.069)				
Legal protection 90					0.660a	0.696a	0.676a	0.705a
					(0.066)	(0.065)	(0.060)	(0.068)
Urban 50	−0.051a	−0.044a	−0.046a	−0.036b	−0.032a	−0.022a	−0.017c	−0.007
	(0.006)	(0.007)	(0.013)	(0.014)	(0.007)	(0.007)	(0.010)	(0.009)
Financial openness 80		−0.263		−0.277				
		(0.188)		(0.179)				
Financial openness 90						−0.411b		−0.374b
						(0.182)		(0.169)
Log of GDP per capita 70			−0.181	−0.274			−0.626b	−0.630b
			(0.422)	(0.424)			(0.288)	(0.264)
Constant	−2.190a	−2.651a	−1.126	−1.065	−2.436a	−2.902a	1.230	0.849
	(0.367)	(0.530)	(2.518)	(2.522)	(0.335)	(0.430)	(1.812)	(1.623)
First stage F statistic	6.87	6.19	4.35	3.56	3.52	1.19	0.87	0.10
AR test	p=0.005	p=0.006	p=0.007	p=0.008	p=0.001	p=0.001	p=0.003	p=0.003
Observations	42	42	42	42	52	52	52	52

Notes. The dependent variable is an index for collateral-based lending. The conditional maximum-likelihood estimators are used. The mortality rate of settlers is used as an instrumental variable. Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the two-sided test, respectively. The first stage F statistic is for a test of excluded instrumental variables in the first-satge regressions. The Anderson-Rubin (AR) test for the significance of an endogenous variable is robust to weak instruments. ``p=" is the p-value for a test.

Table 6 Probit Estimation with Instruments

	Collateral based lending 90				Collateral based lending 90			
Legal protection 96	0.778a	0.677b	0.711b	0.537				
	(0.274)	(0.307)	(0.350)	(0.373)				
Legal protection 98					0.784a	0.836b	0.758b	0.718c
					(0.279)	(0.339)	(0.387)	(0.413)
Urban 50	−0.020b	−0.016c	−0.029b	−0.021b	−0.021b	−0.016	−0.022b	−0.020b
	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)
Financial openness 80		−0.027		−0.038				
		(0.116)		(0.125)				
Financial openness 90						−0.157		−0.191
						(0.145)		(0.163)
Log of GDP per capita 70			0.140	0.286			0.043	0.262
			(0.307)	(0.309)			(0.340)	(0.351)
Constant	0.429	0.308	−0.446	−1.493	0.497	0.387	0.222	−1.282
	(0.285)	(0.299)	(1.989)	(2.000)	(0.314)	(0.332)	(2.280)	(2.357)
First stage F statistic	21.84	20.32	11.32	10.59	24.10	16.25	10.26	10.15
LM test	p=0.013	p=0.041	p=0.062	p=0.161	p=0.015	p=0.027	p=0.073	p=0.106
J test	p=0.820	p=0.918	p=0.822	p=0.930	p=0.757	p=0.687	p=0.757	p=0.744
Observations	85	80	85	80	85	83	85	83

Notes. The dependent variable is an index for collateral-based lending. The conditional maximum-likelihood estimators are used. Instrumental variables are legal origin (France, Germany, and Scandinavians) and School 60. Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the two-sided test, respectively. The first stage F statistic is for a test of excluded instrumental variables in the first satge regressions. The LM test for the significance of an endogenous variable is robust to weak instruments. The J test is a test of the overidentifying restrictions. ``p=" is the p-value for a test.

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Binding Credit Constraint

The claim that there exists T such that from time T onwards, Eq.(7) is always binding is proven taking two steps. Step 1 claims that each borrower faces credit constraints at least once over his lifetime. Step 2 claims that if a borrower faces a credit constraint at time T, then the credit constraints are binding from T onward.

First, step 1 is proven by contradiction. Suppose that Eq.(7) is never binding. Then $\phi_t = 0$ for all t, and thus the Euler equation for a borrower becomes:

$$c_{t+1} = \beta R c_t, \tag{35}$$

and the dynamic equation for the land price is given by:

$$q_{t+1} = Rq_t - a(1-\tau). \tag{36}$$

From Eq.(36) and the transversality condition, q_t must be constant for all $t \geq 0$ and is given by:

$$q_t = \frac{a(1-\tau)}{R-1}.$$

From this, Eq.(13) is reduced to:

$$G_1'(x_t^*) = a,$$

which implies that x_t and x_t^* become constant as well. Then the budget constraint (6) becomes:

$$c_t + Rb_{t-1} = a(1-\tau)\tilde{x} + b_t, \tag{37}$$

where $\tilde{x} := \bar{X}/\lambda - (1-\lambda)G_1'^{-1}(a)/\lambda$. From Eqs.(27), (29) and the transversality condition, we can obtain the dynamics of b_t as follows:

$$b_t = \frac{\beta c_0}{\beta - 1}(\beta R)^t + \frac{a(1-\tau)\tilde{x}}{R-1},$$

where c_0 is the initial value of consumption. Because $\beta < 1$ and $R\beta < 1$, b_t is increasing and converges to $a(1-\tau)\tilde{x}/(R-1)$. However, this is a contradiction because the right-hand side of Eq.(7) is equal to $a(1-\tau)\tilde{x}/R(R-1) < a(1-\tau)\tilde{x}/(R-1)$.

Next, we will show step 2. Suppose that the claim of step 2 does not hold. More concretely, suppose that Eq.(7) is not binding at time t when it is binding at time $t-1$. In this case, we have the Euler equations at time $t-1$ and t, respectively, as follows:

$$c_t = \frac{(1-\tau)a\beta}{u_{t-1}} c_{t-1} \tag{38}$$

$$c_{t+1} = \beta R c_t, \tag{39}$$

which implies that u_t becomes constant and is given by $\tilde{u} := (1-\tau)a/R$. From Eq.(13), x_t^* and x_t become constant as well and are given by $\tilde{x}^* := G_1'^{-1}(a)$ and $\tilde{x} := \bar{X}/\lambda - (1-\lambda)G_1'^{-1}(a)/\lambda$, respectively.

Because the first equality of Eq.(17) holds whether Eq.(7) is binding or not, it follows from Eq.(17), Eq.(39) and $q_{t+1} = Rq_t - (1-\tau)a$ that $b_t = q_t\tilde{x} - \beta a(1-\tau)x_{t-1}$. From the last, however, we have:

$$\begin{aligned} Rb_t - q_{t+1}\tilde{x} &= (1-\tau)a/\lambda(\lambda\tilde{x} - \beta R\lambda x_{t-1}) \\ &> (1-\tau)a/\lambda(\lambda\tilde{x} - \beta R\bar{X}) \\ &= (1-\tau)(1-\lambda)a/\lambda((1-\beta R)\bar{X}/(1-\lambda) - G_1'^{-1}(a)) > 0, \end{aligned}$$

where the last inequality comes from Eq.(4). This is a contradiction. From mathematical induction, we have a desired conclusion. □

Tests for the Stationarity

In the diagnosis for the stationarity tests in table A1 in the unpublished appendix, "pass" means that the hypothesis of no unit root is accepted both by the DF test without trend and by the KPSS test without trend, or both by the DF test with trend and by the KPSS test with trend. "Mixed" means that the hypothesis of no unit root is accepted either by the DF test without trend or by the KPSS test without trend, or either by the DF test with trend or by the KPSS test with trend. "Caution" means that none of the tests accepts the hypothesis of no unit root.

Because we cannot discuss the results for the stationarity tests country by country due to space constraints, we briefly comment on the results in order. First, for the first difference in the net output, 91 cases out of 98 cases are labeled "pass," while seven cases are labeled "mixed." However, for six out of these seven "mixed" cases, the DF test with trend or without trend rejects the null hypothesis of a unit root at the 0.1% significance level. Then we judge that the first differences in the net output of these countries follow stationary processes with or without trend. For Central Africa, which is the last case, the p-value for the DF test without trend is 8%, and neither the KPSS test with trend nor the one without trend rejects the null hypothesis of no unit root. Then, we also judge that the first difference in the net output of Central Africa follows a stationary process.

For the first difference in private credit, 24 cases out of 98 cases are labeled "pass," 73 cases are labeled "mixed," and one case is labeled "caution." The one "caution" case is that of India. Due to industrialization, the private credit of India has increases since the late 1990s. The non-stationarity of the first difference in private credit is caused by this boost. India might have experienced a structural change for the process of its private credit in the late 1990s. If a time series includes a structural change, the DF test hardly rejects the null hypothesis.

The stationarity of the first differences in private credit for the 73 "mixed" cases cannot be determined. However, if the first difference in private credit follows a unit root process and the first difference in the net output is stationary in a country, then the inter-temporal budget constraints of agents in the country do not hold. Therefore, we reasonably assume that the first difference in private credit follows a stationary process.

For the current account, 16 cases out of 98 cases are labeled "pass," 75 cases are labeled "mixed," and six cases are labeled "caution." These six "caution" cases are those of Algeria, Grenada, Honduras, Jamaica, Madagascar, and Malaysia. These six countries are categorized into two groups. One is a group for which the current account suddenly started to increase in the mid 1990s, and the other is a group for which the current account suddenly started to decrease in the mid 1990s. The first group includes Algeria and Malaysia and the second group consists of Grenada, Honduras, Jamaica, and Madagascar. Due to the structural change for the current account, the null hypothesis of stationarity cannot be accepted. The phenomena appearing in these six countries have likely been the result of financial globalization since the mid 1990s.

The stationarity (with or without trend) of the current account cannot be accepted in the "caution" countries and cannot be determined in the "mixed" countries. However, for the inter-temporal budget constraint of a country to be satisfied, the country's current account must follow a stationary process with or without trend. The current account should be adjusted in the future so that the feasibility condition in a country holds.

In sum, from a theoretical viewpoint, if DZ follows a stationary process (with or without trend), then the variables, CA and DPC, must follow stationary processes.

Tables

[Table A1 around here]
[Table A2 around here]

Table A1. Tests for stationarity. The null hypothesis of the DF test is that the time series has a unit root, for which the Mackinnon approximate p-values are entered. The null hypothesis of the KPSS test is that the time series does not have a unit root, for which the test statistics are entered. a and b indicate significance at the 1% and 5% level for the KPSS test, respectively. In the column of diagnosis, "pass" means that the hypothesis of no unit root is accepted both by the DF test without trend and by the KPSS test without trend, or both by the DF test with trend and by the KPSS test with trend. "Mixed" means that the hypothesis of no unit root is accepted either by the DF test without trend or by the KPSS test without trend, or either by the ADF test with trend or by the KPSS test with trend. "Caution" means that none of the tests accepts the hypothesis of no unit root.

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend 5% significance level: 0.463	The KPSS test with trend 5% significance level: 0.146	diagnosis
United Kingdom	CA (47)	0.2539	0.2093	0.525b	0.0416	mixed
	DPC (45)	0.5146	0.2817	0.578b	0.0572	mixed
	DZ (46)	0.0000	0.000	0.486b	0.0839	pass
Greece	CA (41)	0.1167	0.3428	0.213	0.161b	mixed
	DPC (39)	0.3219	0.5756	0.147	0.103	mixed
	DZ (40)	0.0000	0.0000	0.111	0.095	pass
Japan	CA (47)	0.9244	0.3286	0.842b	0.0854	mixed
	DPC (45)	0.0450	0.1156	0.256	0.130	pass
	DZ (46)	0.0005	0.0003	0.413	0.0935	pass
	DLP1(41)	0.1219	0.2123	0.340	0.0656	mixed
	DLP2 (41)	0.1272	0.3520	0.133	0.0651	mixed
United States	CA (47)	0.9123	0.3916	0.813a	0.123	mixed
	DPC (45)	0.3061	0.1282	0.650b	0.138	mixed
	DZ (46)	0.0005	0.0004	0.509b	0.0749	pass
	DLP	0.1949	0.5140	0.189	0.186b	mixed
Korea	CA (36)	0.0628	0.0286	0.547b	0.072	pass
	DPC (34)	0.5800	0.9692	0.248	0.162b	mixed
	DZ (35)	0.0031	0.0044	0.402	0.125	pass
Australia	CA (37)	0.7718	0.0842	0.750a	0.0981	mixed
	DPC (37)	0.9307	0.4884	0.757a	0.136	mixed
	DZ (37)	0.0000	0.0000	0.640b	0.112	pass
Canada	CA (47)	0.4022	0.6293	0.234	0.148b	mixed
	DPC (45)	0.0028	0.0015	0.592b	0.142	pass
	DZ (46)	0.0000	0.0001	0.201	0.0676	pass
Botswana	CA (32)	0.5587	0.0776	0.691b	0.0715	mixed
	DPC (30)	0.4644	0.5172	0.425	0.0615	mixed
	DZ (31)	0.0000	0.0000	0.258	0.0939	pass
India	CA (36)	0.0070	0.0362	0.115	0.0923	pass
	DPC (36)	0.9991	1.000	0.560b	0.177b	caution
	DZ (36)	0.7383	0.0000	0.708b	0.165b	mixed
Austria	CA (37)	0.0320	0.0669	0.218	0.0756	pass
	DPC (35)	0.1114	0.1627	0.416	0.0596	mixed
	DZ (36)	0.0000	0.0000	0.121	0.096	pass

Table A1 (Continued)

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Burundi	CA (36)	0.2108	0.3006	0.504b	0.0768	mixed
	DPC (34)	0.0198	0.0941	0.0383	0.0379	pass
	DZ (35)	0.0000	0.0000	0.123	0.0775	pass
Belgium	CA (37)	0.9819	0.9713	0.423	0.199b	mixed
	DPC (35)	0.0091	0.0203	0.351	0.127	pass
	DZ (36)	0.0000	0.0000	0.12	0.104	pass
BurkinaFaso	CA (36)	0.7606	0.7384	0.395	0.119	mixed
	DPC (34)	0.396	0.6410	0.191	0.124	mixed
	DZ (35)	0.0000	0.0000	0.458	0.0615	pass
Bahrain	CA (20)	0.7698	0.9023	0.298	0.164b	mixed
	DPC (18)	0.2490	0.5075	0.174	0.0655	mixed
	DZ (19)	0.0034	0.0024	0.311	0.0872	pass
Belize	CA (22)	0.6588	0.9795	0.463b	0.0825	mixed
	DPC (20)	0.5109	0.9733	0.177	0.0909	mixed
	DZ (21)	0.0000	0.0000	0.191	0.0729	pass
Bolivia	CA (23)	0.6697	0.9033	0.165	0.158b	mixed
	DPC (21)	0.4244	0.6529	0.192	0.122	mixed
	DZ (22)	0.0000	0.0000	0.435	0.0959	pass
Barbados	CA (23)	0.1773	0.1920	0.442	0.108	mixed
	DPC (21)	0.0011	0.0166	0.217	0.0829	pass
	DZ (22)	0.0007	0.0064	0.147	0.114	pass
Bhutan	CA (22)	0.2104	0.2825	0.397	0.128	mixed
	DPC (20)	0.9041	0.7728	0.467b	0.138	mixed
	DZ (21)	0.0137	0.0986	0.081	0.0677	pass
Central Africa	CA (20)	0.0626	0.0560	0.445	0.109	mixed
	DPC (18)	0.5659	0.5059	0.351	0.108	mixed
	DZ (19)	0.0779	0.1819	0.226	0.115	mixed
Switzerland	CA (27)	0.9458	0.5011	0.687b	0.0724	mixed
	DPC (27)	0.5383	0.9088	0.195	0.102	mixed
	DZ (27)	0.0297	0.1481	0.153	0.142	pass
Chile	CA (33)	0.6015	0.8536	0.162	0.15	mixed
	DPC (31)	0.9899	0.9875	0.529b	0.115	mixed
	DZ (32)	0.0020	0.0004	0.469b	0.11	pass
Côte d'Ivoire	CA (46)	0.0965	0.0740	0.556b	0.0806	mixed
	DPC (44)	0.2168	0.3183	0.365	0.111	mixed
	DZ (45)	0.0000	0.0001	0.0432	0.0413	pass

Table A1 (Continued)

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Cameroon	CA (37)	0.0166	0.0134	0.419	0.0997	pass
	DPC (35)	0.2033	0.4671	0.226	0.111	mixed
	DZ (36)	0.0000	0.0003	0.138	0.138	pass
Colombia	CA (20)	0.3559	0.6997	0.132	0.112	mixed
	DPC (20)	0.0829	0.0812	0.39	0.0532	mixed
	DZ (20)	0.0036	0.0254	0.0836	0.0843	pass
Costta Rica	CA (41)	0.6383	0.0413	0.751a	0.0988	pass
	DPC (39)	0.5329	0.6445	0.322	0.149b	mixed
	DZ (40)	0.0000	0.0000	0.292	0.0823	pass
Cyprus	CA (47)	0.6169	0.4876	0.496b	0.114	mixed
	DPC (45)	0.7547	0.1820	0.754a	0.112	mixed
	DZ (46)	0.0000	0.0000	0.556b	0.077	pass
Germany	CA (29)	0.6618	0.8560	0.124	0.0779	mixed
	DPC (27)	0.0889	0.2988	0.0356	0.0356	mixed
	DZ (28)	0.0413	0.1742	0.0921	0.095	pass
Dominica	CA (25)	0.1823	0.0125	0.436	0.183	pass
	DPC (23)	0.5132	0.7765	0.18	0.176	mixed
	DZ (24)	0.0000	0.0001	0.407	0.16	pass
Denmark	CA (37)	0.5635	0.2247	0.742a	0.126	mixed
	DPC (37)	0.0353	0.0341	0.417	0.109	pass
	DZ (37)	0.0000	0.0000	0.0995	0.0857	pass
Dominican Republic	CA (27)	0.9704	0.6397	0.651b	0.131	mixed
	DPC (27)	0.1084	0.3393	0.0909	0.091	mixed
	DZ (27)	0.0000	0.0001	0.327	0.078	pass
Algeria	CA (27)	0.9666	0.8649	0.509b	0.179b	caution
	DPC (25)	0.1652	0.4298	0.161	0.153b	mixed
	DZ (26)	0.0012	0.0018	0.346	0.13	pass
Ecuador	CA (39)	0.0006	0.0016	0.267	0.0795	pass
	DPC (37)	0.0620	0.1729	0.16	0.0802	mixed
	DZ (38)	0.0003	0.0015	0.195	0.0879	pass
Egypt	CA (47)	0.1786	0.4615	0.421	0.191b	mixed
	DPC (45)	0.4125	0.7678	0.396	0.0617	mixed
	DZ (46)	0.0000	0.0000	0.67b	0.0955	pass
Spain	CA (25)	0.3468	0.8224	0.188	0.0969	mixed
	DPC (23)	0.5010	0.7778	0.0999	0.0649	mixed
	DZ (24)	0.0278	0.0812	0.387	0.0708	pass

Table A1 (Continued)

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Ethiopia	CA (34)	0.9936	0.9430	0.678b	0.138	mixed
	DPC (32)	0.6470	0.7445	0.278	0.124	mixed
	DZ (33)	0.0000	0.0000	0.276	0.115	pass
Finland	CA (39)	0.9062	0.9478	0.273	0.146b	mixed
	DPC (37)	0.4888	0.7957	0.104	0.101	mixed
	DZ (38)	0.0000	0.0000	0.32	0.11	pass
Fiji	CA (35)	0.8395	0.9530	0.206	0.143	mixed
	DPC (33)	0.0931	0.3233	0.0569	0.0574	mixed
	DZ (34)	0.0000	0.0000	0.135	0.0648	pass
France	CA (37)	0.8512	0.9952	0.241	0.14	mixed
	DPC (35)	0.1119	0.3651	0.12	0.112	mixed
	DZ (36)	0.0000	0.0000	0.125	0.0513	pass
Gabon	CA (37)	0.4430	0.1262	0.613b	0.132	mixed
	DPC (35)	0.0873	0.2206	0.194	0.0963	mixed
	DZ (36)	0.0000	0.0000	0.27	0.0952	pass
Ghana	CA (33)	0.5349	0.3349	0.448	0.195b	mixed
	DPC (31)	0.0911	0.2961	0.0975	0.0965	mixed
	DZ (32)	0.0000	0.0000	0.117	0.0851	pass
Grenada	CA (20)	0.8719	0.4105	0.552b	0.156b	caution
	DPC (20)	0.2240	0.5398	0.0854	0.0735	mixed
	DZ (20)	0.0249	0.1407	0.0566	0.0572	pass
Guatemala	CA (26)	0.9826	0.8004	0.587b	0.142	mixed
	DPC (26)	0.0002	0.0002	0.319	0.116	pass
	DZ (26)	0.0000	0.0003	0.149	0.107	pass
Honduras	CA (47)	0.9991	1.0000	0.800a	0.162b	caution
	DPC (45)	0.0106	0.0330	0.316	0.107	pass
	DZ (46)	0.0000	0.0000	0.108	0.0748	pass
Hungary	CA (24)	0.1684	0.5573	0.288	0.097	mixed
	DPC (22)	0.3319	0.6109	0.179	0.126	mixed
	DZ (23)	0.0282	0.0130	0.331	0.107	pass
Indonesia	CA (26)	0.0198	0.0997	0.0631	0.0648	pass
	DPC (24)	0.1362	0.3827	0.111	0.0738	mixed
	DZ (25)	0.0077	0.0033	0.397	0.0652	pass
Ireland	CA (38)	0.5132	0.8893	0.223	0.188b	mixed
	DPC (36)	0.9968	0.9962	0.566b	0.144	mixed
	DZ (37)	0.1613	0.0020	0.71b	0.175b	mixed

Table A1 (Continued)

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Iceland	CA (36)	0.9984	1.0000	0.455	0.174b	mixed
	DPC (33)	1.0000	1.0000	0.455	0.176b	mixed
	DZ (36)	0.0000	0.0000	0.121	0.062	pass
Israel	CA (33)	0.3074	0.2403	0.353	0.179b	mixed
	DPC (31)	0.2546	0.2820	0.466b	0.0894	mixed
	DZ (32)	0.0000	0.0000	0.263	0.113	pass
Italy	CA (34)	0.5385	0.4715	0.443	0.165b	mixed
	DPC (32)	0.3467	0.6646	0.0979	0.0918	mixed
	DZ (33)	0.0000	0.0000	0.334	0.0689	pass
Jamaica	CA (37)	0.9917	0.9488	0.704a	0.188b	caution
	DPC (37)	0.0073	0.0428	0.0704	0.0694	pass
	DZ (37)	0.0000	0.0000	0.152	0.0782	pass
Jordan	CA (27)	0.0837	0.2897	0.144	0.0761	mixed
	DPC (25)	0.2172	0.4990	0.102	0.0779	mixed
	DZ (26)	0.0074	0.0434	0.0814	0.0763	pass
Kenya	CA (42)	0.0738	0.0864	0.571b	0.0505	mixed
	DPC (40)	0.0051	0.0195	0.197	0.0491	pass
	DZ (41)	0.0000	0.0000	0.0795	0.075	pass
St. Kitts and Nevis	CA (27)	0.2211	0.0947	0.61b	0.0993	mixed
	DPC (25)	0.1080	0.3291	0.145	0.14	mixed
	DZ (26)	0.0000	0.0002	0.143	0.105	pass
Kuwait	CA (33)	0.0847	0.2872	0.171	0.172b	mixed
	DPC (28)	0.3431	0.5240	0.231	0.115	mixed
	DZ (32)	0.0000	0.0000	0.335	0.0933	pass
St. Lucia	CA (23)	0.8343	0.6592	0.531b	0.143	mixed
	DPC (21)	0.7785	0.9615	0.134	0.0823	mixed
	DZ (22)	0.0000	0.0001	0.185	0.145	pass
Sri Lanka	CA (47)	0.8063	0.0801	0.857a	0.101	mixed
	DPC (45)	0.0241	0.0346	0.381	0.0641	mixed
	DZ (46)	0.0000	0.0000	0.511b	0.0745	pass
Lesotho	CA (23)	0.8538	0.9949	0.622b	0.135	mixed
	DPC (22)	0.0380	0.0820	0.101	0.0898	pass
	DZ (22)	0.0000	0.0001	0.367	0.0955	pass
Luxembourg	CA (28)	0.1591	0.3152	0.374	0.0692	mixed
	DPC (24)	0.2373	0.2023	0.367	0.0955	mixed
	DZ (28)	0.0001	0.0000	0.359	0.106	pass

Table A1 (Continued)

Country	variable (Obs.)	DF test without trend	DF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Morocco	CA (47)	0.2168	0.4870	0.194	0.198b	mixed
	DPC (45)	0.2038	0.1430	0.564b	0.0807	mixed
	DZ (46)	0.0000	0.0000	0.12	0.0432	pass
Madagascar	CA (42)	0.9237	0.7297	0.621b	0.151b	caution
	DPC (40)	0.0092	0.0495	0.124	0.0868	pass
	DZ (38)	0.0000	0.0000	0.258	0.032	pass
Mexico	CA (29)	0.3186	0.3370	0.332	0.0659	mixed
	DPC (27)	0.0252	0.1113	0.0781	0.0711	pass
	DZ (28)	0.0012	0.0010	0.342	0.12	pass
Mali	CA (19)	0.0205	0.0420	0.299	0.0855	pass
	DPC (17)	0.2475	0.7739	0.308	0.10	mixed
	DZ (18)	0.0186	0.0670	0.244	0.0671	pass
Malta	CA (46)	0.0162	0.0054	0.667b	0.0963	pass
	DPC (44)	0.4794	0.3464	0.657b	0.094	mixed
	DZ (45)	0.0000	0.0000	0.364	0.0774	pass
Mauritius	CA (44)	0.0788	0.1470	0.321	0.0568	mixed
	DPC (42)	0.0591	0.0133	0.77a	0.488a	mixed
	DZ (43)	0.0000	0.0000	0.659b	0.0685	pass
Malawi	CA (24)	0.9974	0.9956	0.475b	0.12	mixed
	DPC (22)	0.2841	0.4176	0.202	0.0503	mixed
	DZ (23)	0.0000	0.0000	0.085	0.0463	pass
Malaysia	CA (47)	0.9865	0.9812	0.463b	0.188b	caution
	DPC (45)	0.0345	0.0446	0.465	0.0562	pass
	DZ (46)	0.0024	0.0000	0.714b	0.189b	mixed
Netherlands	CA (38)	0.8370	0.1812	0.749a	0.141	mixed
	DPC (36)	0.3764	0.3905	0.419	0.0733	mixed
	DZ (37)	0.0002	0.0015	0.146	0.134	pass
Niger	CA (34)	0.7705	0.7062	0.44	0.123	mixed
	DPC (33)	0.0511	0.1513	0.245	0.108	mixed
	DZ (34)	0.0000	0.0000	0.144	0.0604	pass
Nigeria	CA (43)	0.0001	0.0003	0.329	0.357	pass
	DPC (41)	0.0002	0.0016	0.0824	0.0799	pass
	DZ (42)	0.0000	0.0000	0.0567	0.0565	pass
Norway	CA (46)	0.0108	0.0001	0.654	0.177	pass
	DPC (44)	0.1750	0.2271	0.311	0.0973	mixed
	DZ (45)	0.0000	0.0000	0.389	0.11	pass

Table A1 (Continued)

Country	variable (Obs.)	ADF test without trend	ADF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Nepal	CA (32)	0.7860	0.0052	0.755a	0.166b	mixed
	DPC (30)	0.2111	0.1253	0.594b	0.0589	mixed
	DZ (31)	0.0000	0.0000	0.13	0.129	pass
New Zealand	CA (47)	0.5008	0.1028	0.734a	0.0819	mixed
	DPC (45)	0.1469	0.0062	0.834a	0.111	pass
	DZ (46)	0.0000	0.0000	0.30	0.115	pass
Pakistan	CA (37)	0.5504	0.7322	0.237	0.048	mixed
	DPC (37)	0.2557	0.1415	0.548b	0.135	mixed
	DZ (37)	0.0027	0.0003	0.591b	0.102	pass
Panama	CA (47)	0.0255	0.0778	0.146	0.0751	pass
	DPC (45)	0.1926	0.2682	0.39	0.0684	mixed
	DZ (46)	0.0004	0.0000	0.674b	0.153b	mixed
Philippines	CA (37)	0.9986	0.9969	0.409	0.172b	mixed
	DPC (37)	0.1342	0.3846	0.0662	0.0663	mixed
	DZ (37)	0.0343	0.0010	0.582b	0.178b	mixed
Papua New Guinea	CA (30)	0.0462	0.0385	0.283	0.0835	pass
	DPC (28)	0.1771	0.2212	0.264	0.0968	mixed
	DZ (29)	0.0000	0.0005	0.292	0.517a	pass
Poland	CA (26)	0.4920	0.2001	0.409	0.0949	mixed
	DPC (24)	0.0000	0.0000	0.276	0.102	pass
	DZ (25)	0.0000	0.0000	0.402	0.109	pass
Portugal	CA (37)	0.5800	0.1825	0.764a	0.129	mixed
	DPC (35)	0.3827	0.5908	0.204	0.126	mixed
	DZ (36)	0.0000	0.0000	0.279	0.0858	pass
Paraguay	CA (45)	0.2033	0.3905	0.348	0.0565	mixed
	DPC (43)	0.0161	0.0709	0.104	0.978	pass
	DZ (44)	0.0000	0.0000	0.357	0.0799	pass
Rwanda	CA (35)	0.8814	0.0005	0.618b	0.116	mixed
	DPC (31)	0.0217	0.0937	0.264	0.115	pass
	DZ (33)	0.0005	0.0039	0.284	0.148b	pass
Saudi Arabia	CA (35)	0.9115	0.9604	0.327	0.191b	mixed
	DPC (33)	0.6531	0.8335	0.235	0.140	mixed
	DZ (34)	0.0000	0.0000	0.222	0.141	pass
Senegal	CA (32)	0.0753	0.1457	0.219	0.114	mixed
	DPC (30)	0.0818	0.2568	0.229	0.0723	mixed
	DZ (31)	0.0004	0.0011	0.204	0.185b	pass

Table A1 (Continued)

Country	variable (Obs.)	ADF test without trend	ADF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Singapore	CA (27)	0.9892	0.4803	0.675b	0.104	mixed
	DPC (27)	0.2910	0.6658	0.14	0.143	mixed
	DZ (27)	0.0055	0.0000	0.526b	0.132	pass
Sierra Leone	CA (39)	0.5180	0.8400	0.09	0.093	mixed
	DPC (37)	0.0068	0.0407	0.148	0.114	pass
	DZ (38)	0.0000	0.0000	0.149	0.124	pass
Suriname	CA (29)	0.3431	0.8033	0.102	0.091	mixed
	DPC (27)	0.1524	0.4605	0.342	0.0547	mixed
	DZ (28)	0.0000	0.0000	0.132	0.0814	pass
Sweden	CA (41)	0.8346	0.7200	0.446	0.153	mixed
	DPC (39)	0.2454	0.4703	0.218	0.132	mixed
	DZ (40)	0.0000	0.0000	0.333	0.106	pass
Swaziland	CA (35)	0.3351	0.7826	0.279	0.0939	mixed
	DPC (33)	0.4341	0.6408	0.197	0.0792	mixed
	DZ (34)	0.0000	0.0000	0.303	0.0707	pass
Seychelles	CA (22)	0.7818	0.8722	0.26	0.0878	mixed
	DPC (20)	0.9219	0.0828	0.359	0.165b	mixed
	DZ (21)	0.0000	0.0000	0.0965	0.0955	pass
Syrian Arab Republic	CA (43)	0.7063	0.8054	0.265	0.183b	mixed
	DPC (41)	0.9934	0.9943	0.514b	0.102	mixed
	DZ (42)	0.0000	0.0000	0.405	0.118	pass
Togo	CA (36)	0.2302	0.0549	0.558b	0.132	mixed
	DPC (34)	0.0245	0.0791	0.201	0.0679	pass
	DZ (35)	0.0000	0.0000	0.136	0.0624	pass
Thailand	CA (41)	0.2663	0.4074	0.248	0.13	mixed
	DPC (39)	0.3416	0.6841	0.0977	0.0886	mixed
	DZ (40)	0.0000	0.0000	0.479b	0.062	pass
Trinidad and Tobago	CA (41)	0.0015	0.0084	0.154	0.0694	pass
	DPC (39)	0.4208	0.7542	0.161	0.119	mixed
	DZ (40)	0.0002	0.0020	0.0995	0.0915	pass
Turkey	CA (20)	0.0901	0.2467	0.13	0.0952	mixed
	DPC (18)	0.8485	0.9142	0.302	0.103	mixed
	DZ (19)	0.0000	0.0001	0.0851	0.0693	pass
Uganda	CA (24)	0.9977	0.9425	0.602b	0.141	mixed
	DPC (22)	0.1128	0.0196	0.539	0.125	pass
	DZ (23)	0.0000	0.0000	0.284	0.072	pass

Table A1 (Continued)

Country	variable (Obs.)	ADF test without trend	ADF test with trend	The KPSS test without trend The 5% significance level: 0.463	The KPSS test with trend The 5% significance level: 0.146	diagnosis
Uruguay	CA (31)	0.0491	0.1783	0.141	0.126	pass
	DPC (29)	0.0356	0.1498	0.132	0.085	pass
	DZ (30)	0.0000	0.0000	0.241	0.273a	pass
St. Vincent	CA (28)	0.2317	0.1812	0.437	0.0912	mixed
and the Grenadines	DPC (26)	0.3325	0.7529	0.221	0.114	mixed
	DZ (27)	0.0000	0.0000	0.0978	0.0939	pass
Venezuela	CA (34)	0.0067	0.0083	0.379	0.167	pass
	DPC (34)	0.3280	0.7343	0.238	0.193	mixed
	DZ (34)	0.0000	0.0000	0.174	0.111	pass
South Africa	CA (45)	0.5225	0.7328	0.233	0.116	mixed
	DPC (43)	0.0987	0.0633	0.664b	0.129	mixed
	DZ (44)	0.0000	0.0000	0.612b	0.151b	mixed

Table A2. OLS Estimations (The Current Account/Private Credit). Robust standard errors are in parentheses. a, b, and c indicate the 1%, 5%, and 10% significance levels for the one-sided test, respectively. The breaking years of the Chow test are under country names (if any), and the values in square brackets are the p-values of the test. Years under estimation periods (if any) are missing years for the estimation.

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
United Kingdom	1962-2007 (46)	0.623a	-0.089a	0.217	-2.054	0.737
1992		(0.097)	(0.024)	(0.144)	(1.515)	
[0.0372]	1962-1991 (30)	0.572a	-0.143a	0.421a	-2.038	0.859
		(0.093)	(0.023)	(0.012)	(1.310)	
	1992-2007 (16)	0.573a	-0.018	0.167	-7.034	0.443
		(0.093)	(0.037)	(0.193)	(5.427)	
	1962-2007 (46)	0.633a	-0.097a	0.126		0.811
		(0.100)	(0.023)	(0.114)		
	1962-1991 (30)	0.577a	-0.151a	0.315a		0.868
		(0.099)	(0.025)	(0.105)		
	1992-2007 (16)	0.691a	-0.040	0.076		0.815
		(0.247)	(0.035)	(0.202)		
Greece	1962-2001 (40)	0.749a	-0.356	0.731	-950a	0.762
1995		(0.009)	(0.226)	(0.195)	(270)	
[0.0001]	1962-1994 (33)	0.843a	-0.328b	0.039	-384b	0.820
		(0.092)	(0.160)	(0.135)	(154)	
	1995-2001 (7)	2.820a	2.136	2.883a	-5125a	0.972
		(0.375)	(0.496)	(0.339)	(838)	
	1962-2001 (40)	0.952a	-0.490	0.592		0.875
		(0.076)	(0.331)	(0.235)		
	1962-1994 (33)	0.932a	-0.349b	-0.094		0.951
		(0.080)	(0.167)	(0.139)		
	1995-2001 (7)	0.610b	-0.977b	0.857		0.822
		(0.238)	(0.411)	(0.462)		
Japan	1962-2007 (46)	0.997a	-0.016a	0.275a	-700	0.879
1983		(0.055)	(0.004)	(0.088)	(876)	
[0.0016]	1962-1982 (21)	0.025	0.040	0.413a	-1958b	0.649
		(0.250)	(0.035)	(0.086)	(853)	
	1983-2007 (35)	0.947a	-0.015a	0.337b	133	0.709
		(0.183)	(0.005)	(0.197)	(3193)	
	1962-2007 (46)	0.965a	-0.016a	0.218a		0.946
		(0.040)	(0.004)	(0.046)		
	1962-1982 (21)	0.195	-0.008	0.269a		0.629
		(0.240)	(0.027)	(0.051)		
	1983-2007 (35)	0.954a	-0.015a	0.343a		0.974
		(0.045)	(0.005)	(0.087)		
USA	1962-2007 (46)	0.996a	0.023	-0.165	-1.482	0.903
		(0.077)	(0.026)	(0.158)	(13.6)	
	1962-2007 (46)	0.996a	0.023	-0.174		0.942
		(0.076)	(0.026)	(0.104)		
Korea	1973-2007 (35)	0.686a	0.042	0.623b	-6026b	0.522
1998		(0.096)	(0.088)	(0.280)	(2854)	
[0.0000]	1973-1997 (25)	0.850a	-0.264a	0.923a	-3972a	0.823
		(0.139)	(0.042)	(0.131)	(1275)	
	1998-2007 (10)	-0.149	0.213	0.385	16944	0.563
		(0.254)	(0.083)	(0.568)	(10386)	
	1973-2007 (35)	0.626a	0.019	0.307b		0.510
		(0.101)	(0.082)	(0.129)		
	1973-1997 (25)	0.880a	-0.289a	0.739a		0.771
		(0.139)	(0.044)	(0.101)		
	1998-2007 (10)	0.192	0.232	1.030a		0.854
		(0.187)	(0.090)	(0.378)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	stimation periods (Obs	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Australia	1970-2007 (37)	0.802a	-0.252a	0.937a	-7.636a	0.900
		(0.072)	(0.048)	(0.162)	(1.327)	
	1970-2007 (37)	1.057a	-0.177a	0.660a		0.9481
		(0.089)	(0.058)	(0.148)		
Canada	1962-2007 (46)	0.848a	-0.002	0.426a	-5.736a	0.835
		(0.065)	(0.009)	(0.159)	(2.393)	
	1962-2007 (46)	0.944a	-0.022b	0.237a		0.808
		(0.060)	(0.010)	(0.091)		
Botswana	1977-2007 (31)	0.780a	0.561	0.911a	-27.7	0.882
		(0.079)	(0.598)	(0.103)	(137)	
	1977-2007 (31)	0.775a	0.533	0.908a		0.932
		(0.079)	(0.560)	(0.091)		
India	1971-2006 (36)	0.431a	-0.354b	0.205b	-185a	0.316
1989		(0.138)	(0.175)	(0.103)	(58.0)	
[0.0031]	1971-1988 (18)	0.082	0.390	-0.926	-183b	0.429
		(0.164)	(0.445)	(0.195)	(82.5)	
	1989-2006 (18)	0.403b	-0.600a	0.535a	-493a	0.650
		(0.159)	(0.128)	(0.104)	(154)	
	1971-2006 (36)	0.670a	-0.331	0.104		0.574
		(0.111)	(0.215)	(0.124)		
	1971-1988 (18)	0.229	-0.322	-0.965		0.748
		(0.256)	(0.427)	(0.233)		
	1989-2006 (18)	0.641a	-0.354	0.123		0.604
		(0.153)	(0.225)	(0.131)		
Austria	1962-1997 (36)	0.543a	-0.055	0.329b	-13.3a	0.417
		(0.201)	(0.077)	(0.187)	(5.02)	
	1962-1997 (36)	0.596a	-0.165b	0.235		0.551
		(0.225)	(0.084)	(0.207)		
Burundi	1973-2007 (35)	0.860a	-0.650	0.098	-14125	0.742
1998		(0.138)	(0.539)	(0.109)	(10176)	
[0.0001]	1973-1997 (25)	0.766a	-1.871a	-0.018	-14215	0.839
		(0.084)	(0.374)	(0.070)	(8662)	
	1998-2007 (10)	0.822a	0.941	0.638a	-36843a	0.930
		(0.095)	(0.422)	(0.168)	(9659)	
	1973-2007 (35)	0.979a	-0.708	0.107		0.939
		(0.073)	(0.524)	(0.111)		
	1973-1997 (25)	0.903a	-1.834a	0.009		0.962
		(0.036)	(0.401)	(0.081)		
	1998-2007 (10)	1.067a	0.451	0.725a		0.973
		(0.080)	(0.664)	(0.236)		
Belgium	1962-1997 (36)	0.975a	0.071	0.064	-1.145	0.920
1980		(0.065)	(0.015)	(0.257)	(31.7)	
[0.0000]	1962-1979 (18)	1.012a	-0.944a	0.492a	-0.279	0.959
		(0.079)	(0.337)	(0.087)	(24.4)	
	1980-1997 (18)	0.846a	0.065	-0.039	66.9b	0.953
		(0.061)	(0.012)	(0.182)	(28.3)	
	1962-1997 (36)	0.976a	0.070	0.057		0.923
		(0.082)	(0.026)	(0.110)		
	1962-1979 (18)	1.012a	-0.947a	0.491a		0.970
		(0.076)	(0.159)	(0.087)		
	1980-1997 (18)	0.822a	0.096	0.330b		0.954
		(0.109)	(0.026)	(0.147)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
BurkinaFaso	1972-2006 (35)	0.677a	-2.058b	0.057	-49002b	0.763
		(0.172)	(0.904)	(0.109)	(24419)	
	1972-2006 (35)	0.904a	-1.667b	0.014		0.931
		(0.098)	(0.942)	(0.096)		
Bahrain	1982-2000 (19)	1.091a	0.111	0.887a	-54.6a	0.922
		(0.106)	(0.168)	(0.056)	(20.8)	
	1982-2000 (19)	0.859a	-0.173	0.841a		0.908
		(0.118)	(0.167)	(0.105)		
Belize	1986-2006 (21)	0.806a	-0.994a	0.606a	-29.4b	0.936
		(0.058)	(0.156)	(0.203)	(13.2)	
	1986-2006 (21)	0.869a	-1.058a	0.505b		0.977
		(0.053)	(0.189)	(0.221)		
Bolivia	1986-2007 (22)	0.906a	-0.199b	0.705a	-539a	0.967
		(0.036)	(0.102)	(0.048)	(189)	
	1986-2007 (22)	0.911a	-0.351a	0.670a		0.958
		(0.059)	(0.109)	(0.031)		
Barbados	1976-1997 (22)	0.672a	0.241	0.283	-29.6	0.510
1983		(0.126)	(0.744)	(0.259)	(65.3)	
[0.0056]	1976-1982 (7)	0.021b	1.265	0.156	-329	0.616
		(0.354)	(0.444)	(0.269)	(127)	
	1983-1997 (15)	0.169	-1.263b	0.273	141b	0.467
		(0.203)	(0.568)	(0.227)	(52.8)	
	1976-1997 (22)	0.687a	0.084	0.265		0.506
		(0.133)	(0.534)	(0.259)		
	1976-1982 (7)	0.938a	1.542	0.332		0.794
		(0.147)	(0.740)	(0.417)		
	1983-1997 (15)	0.500b	-0.414	0.306		0.369
		(0.205)	(0.364)	(0.255)		
Bhutan	1986-2006 (21)	0.477a	-2.592b	0.698a	-1695a	0.715
		(0.169)	(1.093)	(0.178)	(582)	
	1986-2006 (21)	0.872a	-1.808	0.726a		0.924
		(0.135)	(1.491)	(0.244)		
Central Africa	1987-2005 (19)	0.396	-0.710	-0.090	-18.5b	0.196
		(0.229)	(1.089)	(0.143)	(8.66)	
	1987-2005 (19)	0.868a	-1.344	-0.084		0.827
		(0.103)	(0.920)	(0.154)		
Switzerland	1981-2007 (27)	0.926a	-0.082a	0.926a	-0.268	0.980
		(0.026)	(0.020)	(0.084)	(0.722)	
	1981-2007 (27)	0.918a	-0.085a	0.916a		0.994
		(0.022)	(0.014)	(0.083)		
Chile	1976-2007 (32)	0.761a	-0.007	0.270a	-562a	0.678
1996		(0.160)	(0.120)	(0.097)	(224)	
[0.0000]	1976-1995 (20)	0.707a	-0.352b	0.091	-315	0.730
		(0.125)	(0.152)	(0.158)	(173)	
	1996-2007 (12)	0.351b	0.204	0.276a	-1287b	0.760
		(0.140)	(0.184)	(0.084)	(408)	
	1976-2007 (32)	0.930a	-0.102	0.214b		0.802
		(0.118)	(0.104)	(0.117)		
	1976-1995 (20)	0.809a	-0.375b	0.016		0.901
		(0.135)	(0.170)	(0.163)		
	1996-2007 (12)	0.684a	-0.092	0.245b		0.708
		(0.177)	(0.151)	(0.116)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Côte d'Ivoire	1963-2007 (45)	0.814a	-0.368b	0.538a	21.2	0.820
1994		(0.074)	(0.169)	(0.108)	(32.2)	
[0.0003]	1963-1993 (31)	0.870a	-0.407a	0.631a	1.257	0.845
		(0.074)	(0.160)	(0.096)	(31.5)	
	1994-2007 (14)	-0.309	1.214	-0.023	867a	0.634
		(0.151)	(0.292)	(0.044)	(114)	
	1963-2007 (45)	0.846a	-0.343b	0.554a		0.905
		(0.049)	(0.153)	(0.102)		
	1963-1993 (31)	0.872a	-0.405a	0.631a		0.886
		(0.058)	(0.140)	(0.090)		
	1994-2007 (14)	0.881a	-0.362	0.363b		0.930
		(0.074)	(0.715)	(0.198)		
Cameroon	1971-2006 (36)	0.374a	-0.490b	0.098	8.27	0.421
		(0.150)	(0.255)	(0.085)	(22.5)	
	1971-2006 (36)	0.382a	-0.484b	0.107		0.429
		(0.148)	(0.248)	(0.080)		
Colombia	1966-1985 (20)	0.797a	-0.176	0.569a	-1233a	0.905
		(0.124)	(0.161)	(0.129)	(395)	
	1966-1985 (20)	0.820a	-0.449	0.353b		0.707
		(0.128)	(0.273)	(0.151)		
Costta Rica	1962-2001 (40)	0.890a	-0.204	0.085b	-26.8b	0.786
1987		(0.075)	(0.156)	(0.037)	(11.0)	
[0.0000]	1962-1986 (25)	0.963a	-0.695a	0.422a	-17.5b	0.919
		(0.050)	(0.167)	(0.097)	(8.318)	
	1987-2001 (15)	-0.082	-0.382b	0.038	-248a	0.414
		(0.212)	(0.182)	(0.034)	(39.5)	
	1962-2001 (40)	1.052a	-0.099	0.142a		0.955
		(0.058)	(0.167)	(0.054)		
	1962-1986 (25)	1.057a	-0.771a	0.378a		0.973
		(0.046)	(0.180)	(0.093)		
	1987-2001 (15)	1.100a	0.035	0.096b		0.950
		(0.086)	(0.222)	(0.053)		
Cyprus	1962-2007 (46)	0.724a	-0.184b	0.239	-37.3	0.500
		(0.190)	(0.087)	(0.206)	(30.0)	
	1962-2007 (46)	0.799a	-0.211a	0.182		0.721
		(0.146)	(0.082)	(0.199)		
Germany	1962-1989 (28)	0.664a	-0.093	0.747a	-4.02	0.849
		(0.080)	(0.076)	(0.109)	(6.50)	
	1962-1989 (28)	0.655a	-0.135a	0.718a		0.929
		(0.072)	(0.048)	(0.100)		
Dominica	1982-2005 (24)	0.816a	-0.027	1.043a	-38.6a	0.702
		(0.114)	(0.381)	(0.209)	(11.2)	
	1982-2005 (24)	1.067a	-0.251	1.069a		0.952
		(0.071)	(0.381)	(0.224)		
Denmark	1971-2007 (37)	0.874a	0.017	0.681a	-4.871	0.872
1987		(0.068)	(0.012)	(0.161)	(3.043)	
[0.0054]	1971-1986 (16)	0.136	-0.417a	0.437b	-16.3a	0.500
		(0.194)	(0.102)	(0.196)	(5.189)	
	1987-2007 (21)	0.714a	0.017	0.658a	4.932	0.789
		(0.079)	(0.012)	(0.248)	(3.885)	
	1971-2007 (37)	0.857a	0.010	0.501a		0.888
		(0.064)	(0.012)	(0.124)		
	1971-1986 (16)	0.788a	-0.542a	0.280b		0.696
		(0.129)	(0.130)	(0.125)		
	1987-2007 (21)	0.768a	0.020	0.780a		0.942
		(0.082)	(0.011)	(0.203)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Dominican Republic	1981-2007 (27)	1.108a	0.348	0.109	-1055	0.733
		(0.155)	(0.201)	(0.150)	(4506)	
	1981-2007 (27)	1.138a	0.355	0.107		0.973
		(0.070)	(0.198)	(0.145)		
Algeria	1982-2007 (26)	0.971a	-0.095a	0.962a	-47.6a	0.986
1989		(0.020)	(0.032)	(0.028)	(18.9)	
[0.0053]	1982-1988 (7)	-1.136	0.897	-0.127	-21.5	0.578
		(0.709)	(0.534)	(0.381)	(28.0)	
	1989-2007 (19)	0.980a	-0.143a	0.987a	-57.2a	0.995
		(0.021)	(0.049)	(0.033)	(19.0)	
	1982-2007 (26)	0.935a	-0.036	0.906a		0.987
		(0.017)	(0.041)	(0.031)		
	1982-1988 (7)	-1.272	0.831	-0.181		0.540
		(0.815)	(0.480)	(0.449)		
	1989-2007 (19)	0.935a	-0.023	0.918a		0.994
		(0.017)	(0.028)	(0.028)		
Ecuador	1962-1999 (38)	0.289	-0.501b	0.085	-34941	0.276
1979		(0.246)	(0.257)	(0.076)	(25535)	
[0.0011]	1962-1978 (17)	0.299	-1.364a	0.250a	-83473	0.611
		(0.257)	(0.329)	(0.055)	(52787)	
	1979-1999 (21)	-0.004	-0.210	0.009	13835	0.098
		(0.264)	(0.272)	(0.073)	(15296)	
	1962-1999 (38)	0.374	-0.443b	0.096		0.290
		(0.230)	(0.251)	(0.075)		
	1962-1978 (17)	0.486b	-1.613a	0.231a		0.648
		(0.226)	(0.540)	(0.057)		
	1979-1999 (21)	-0.026	-0.237	0.002		0.135
		(0.257)	(0.260)	(0.071)		
Egypt	1962-2007 (46)	0.842a	-0.080	0.194	-3465a	0.718
		(0.087)	(0.127)	(0.151)	(1022)	
	1962-2007 (46)	0.990a	-0.093	0.148		0.91
		(0.091)	(0.136)	(0.158)		
Spain	1975-1998 (24)	0.744a	-0.197b	0.785b	-1302	0.703
		(0.149)	(0.113)	(0.348)	(758)	
	1975-1998 (24)	0.957a	-0.196b	0.418		0.907
		(0.103)	(0.101)	(0.282)		
Ethiopia	1969-2001 (33)	1.077a	-0.027	0.042	-88.2	0.865
		(0.119)	(0.194)	(0.070)	(299)	
	1969-2001 (33)	1.105a	-0.008	0.046		0.938
		(0.058)	(0.165)	(0.073)		
Finland	1962-1999 (38)	0.729a	-0.131a	0.745a	-4.98a	0.952
		(0.044)	(0.036)	(0.085)	(1.023)	
	1962-1999 (38)	0.765a	-0.206a	0.461a		0.925
		(0.046)	(0.039)	(0.060)		
Fiji	1972-2005 (34)	0.916a	0.092	0.001	-31.3	0.538
		(0.204)	(0.431)	(0.160)	(24.2)	
	1972-2005 (34)	0.954a	-0.064	-0.037		0.659
		(0.196)	(0.411)	(0.154)		
France	1962-1997 (36)	0.912a	-0.055	0.326	-19.7	0.811
		(0.098)	(0.055)	(0.275)	(40.3)	
	1962-1997 (36)	0.905a	-0.077a	0.197b		0.829
		(0.089)	(0.023)	(0.081)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Gabon	1970-2005 (36)	1.001a	-0.532	0.901a	-29.3	0.969
1990		(0.041)	(0.613)	(0.036)	(25.6)	
[0.0095]	1970-1989 (20)	1.043a	0.903	0.922a	-53.8b	0.930
		(0.079)	(0.459)	(0.086)	(23.8)	
	1990-2005 (16)	1.022a	-1.806a	0.906a	-43.4	0.986
		(0.034)	(0.422)	(0.040)	(28.6)	
	1970-2005 (36)	0.958a	-0.744	0.873a		0.982
		(0.019)	(0.549)	(0.036)		
	1970-1989 (20)	0.923a	0.177	0.809a		0.938
		(0.044)	(0.624)	(0.099)		
	1990-2005 (16)	0.964a	-1.823a	0.878a		0.995
		(0.016)	(0.459)	(0.036)		
Ghana	1966-1997 (32)	0.900a	-0.264	0.220a	-19.53	0.697
		(0.115)	(0.460)	(0.062)	(17.0)	
	1966-1997 (32)	0.980a	-0.212	0.224a		0.801
		(0.095)	(0.464)	(0.072)		
Grenada	1988-2007 (20)	0.950a	0.100	0.469	-41.3	0.688
		(0.193)	(0.677)	(0.648)	(34.0)	
	1988-2007 (20)	1.047a	0.286	0.564		0.920
		(0.150)	(0.595)	(0.609)		
Guatemala	1981-2006 (26)	1.038a	0.398	0.269a	-985	0.929
		(0.049)	(2.127)	(0.105)	(954)	
	1981-2006 (26)	1.105a	0.655	0.249a		0.978
		(0.037)	(2.32)	(0.089)		
Honduras	1962-2007 (46)	1.121a	-0.325b	0.219	295	0.954
		(0.045)	(0.135)	(0.164)	(419)	
	1962-2007 (46)	1.105a	-0.310a	0.229		0.979
		(0.042)	(0.127)	(0.159)		
Hungary	1985-2007 (23)	0.575b	0.169	0.061	-107	0.471
		(0.242)	(0.075)	(0.285)	(71.6)	
	1985-2007 (23)	0.663a	0.121	0.074		0.456
		(0.261)	(0.058)	(0.326)		
Indonesia	1983-2007 (25)	0.401b	-0.170a	0.289	-21404b	0.420
		(0.203)	(0.063)	(0.216)	(9048)	
	1983-2007 (25)	0.436b	-0.173b	0.068		0.389
		(0.201)	(0.072)	(0.172)		
Ireland	1962-1998 (37)	0.840a	-0.262a	0.576a	-506a	0.876
1976		(0.059)	(0.073)	(0.108)	(116)	
[0.0064]	1962-1975 (14)	0.671a	-0.132	0.767a	-516a	0.832
		(0.067)	(0.101)	(0.089)	(124)	
	1976-1998 (23)	0.634a	-0.221a	0.788a	-1436a	0.910
		(0.084)	(0.064)	(0.144)	(324)	
	1962-1998 (37)	0.983a	-0.299a	0.469a		0.937
		(0.057)	(0.083)	(0.116)		
	1962-1975 (14)	0.991a	-0.306	0.688a		0.876
		(0.168)	(0.184)	(0.107)		
	1976-1998 (23)	0.985a	-0.267a	0.414a		0.945
		(0.064)	(0.105)	(0.151)		
Iceland	1971-2006 (34)	0.654a	-0.912a	0.739a	-8589a	0.869
	1983, 1984	(0.212)	(0.064)	(0.198)	(0.008)	
	1971-2006 (34)	0.731a	-0.209a	0.558a		0.883
	1983, 1984	(0.231)	(0.069)	(0.199)		
Israel	1977-2008 (32)	0.726a	0.075	0.053	-10712	0.544
		(0.121)	(0.105)	(0.217)	(5563)	
	1977-2008 (32)	0.930a	-0.041	-0.061		0.929
		(0.068)	(0.098)	(0.198)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Italy	1966-1998 (33)	0.827a	-0.103	0.607a	-11.9	0.739
		(0.069)	(0.120)	(0.243)	(8.55)	
	1966-1998 (33)	0.793a	-0.153	0.350a		0.740
		(0.069)	(0.115)	(0.099)		
Jamaica	1971-2007 (37)	1.086a	-0.184	0.305b	-382	0.886
1993		(0.067)	(0.227)	(0.143)	(2918)	
[0.0066]	1971-1992 (22)	0.564a	-0.800a	0.372b	-11877b	0.624
		(0.208)	(0.173)	(0.182)	(5211)	
	1993-2007 (25)	1.042a	0.037	0.184	-5343	0.876
		(0.122)	(0.375)	(0.222)	(8965)	
	1971-2007 (37)	1.093a	-0.183	0.306b		0.965
		(0.039)	(0.224)	(0.139)		
	1993-2007 (25)	1.002a	-0.734a	0.587a		0.940
		(0.062)	(0.204)	(0.153)		
	1971-2007 (37)	1.114a	0.032	0.167		0.98
		(0.047)	(0.381)	(0.177)		
Jordan	1979-2004 (26)	0.613a	-0.038	0.355	-613b	0.229
		(0.203)	(0.297)	(0.316)	(270)	
	1979-2004 (26)	1.059a	0.047	0.567		0.967
		(0.068)	(0.340)	(0.298)		
Kenya	1966-2006 (41)	0.655a	-0.879	-0.235	-22100	0.578
1994		(0.185)	(0.561)	(0.338)	(12102)	
[0.0000]	1966-1993 (28)	0.561a	-1.640a	0.305a	-12083	0.686
		(0.110)	(0.525)	(0.104)	(5985)	
	1994-2006 (13)	0.355	-1.465b	-0.513	-87059	0.680
		(0.354)	(0.723)	(0.204)	(39084)	
	1966-2006 (41)	0.806a	-0.895	-0.271		0.792
		(0.128)	(0.705)	(0.349)		
	1966-1993 (28)	0.700a	-1.929a	0.303a		0.899
		(0.088)	(0.542)	(0.114)		
	1994-2006 (13)	0.837a	0.178	-0.904		0.863
		(0.175)	(0.511)	(0.246)		
St. Kitts and Nevis	1982-2007 (26)	0.727a	-0.843	0.498b	-32.0	0.516
		(0.162)	(0.512)	(0.205)	(19.5)	
	1982-2007 (26)	0.866a	-1.192b	0.446b		0.902
		(0.125)	(0.493)	(0.229)		
Kuwait	1976-2007 (30)	1.014a	-0.254	1.001a	-3.360	0.927
	1991, 1992	(0.073)	(0.299)	(0.091)	(239)	
	1966-2006 (41)	0.806a	-0.895	-0.271		0.792
	1991, 1992	(0.128)	(0.705)	(0.349)		
St. Lucia	1986-2007 (22)	0.692a	-0.764b	0.795b	-46.0b	0.602
		(0.193)	(0.433)	(0.391)	(22.2)	
	1986-2007 (22)	0.839a	-0.847b	0.763b		0.831
		(0.200)	(0.429)	(0.376)		
Sri Lanka	1962-2007 (46)	1.017a	-0.067	0.454a	-10979b	0.839
		(0.061)	(0.136)	(0.171)	(4720)	
	1962-2007 (46)	1.115a	-0.043	0.421a		0.948
		(0.048)	(0.128)	(0.174)		
Lesotho	1981-2006 (22)	0.9589a	-0.567	0.149	-142	0.8261
	1997-2000	(0.091)	(0.867)	(0.267)	(150)	
	1981-2006 (22)	1.031a	-0.630	0.130		0.970
	1997-2000	(0.049)	(0.854)	(0.263)		
Luxembourg	1971-1998 (25)	0.632a	0.082	0.243	18.7	0.459
	1994-1996	(0.229)	(0.149)	(0.314)	(10.9)	
	1971-1998 (25)	0.859a	0.193	0.304		0.912
	1994-1996	(0.124)	(0.203)	(0.314)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Morocco	1962-2007	0.863a	-0.054	0.393a	-2.44b	0.764
		(0.058)	(0.129)	(0.104)	(1.096)	
	1962-2007 (46)	0.922a	-0.158	0.339a		0.806
		(0.066)	(0.109)	(0.101)		
Madagascar	1967-2007 (39)	1.018a	0.392	0.102	-19.0	0.825
	1979, 1980	(0.071)	(0.499)	(0.094)	(27.3)	
	1967-2007 (39)	1.052a	0.432	0.085		0.929
	1979, 1980	(0.054)	(0.409)	(0.089)		
Mexico	1980-2007 (28)	0.708a	0.055	-0.141	7.668	0.561
		(0.165)	(0.107)	(0.189)	(32.4)	
	1980-2007 (28)	0.728a	0.065	-0.109		0.565
		(0.136)	(0.124)	(0.105)		
Mali	1990-2007 (18)	0.125	0.600	-0.210	-160a	0.191
		(0.234)	(0.430)	(0.140)	(51.6)	
	1990-2007 (18)	0.963a	0.305	-0.146		0.943
		(0.087)	(0.491)	(0.181)		
Malta	1963-2007 (45)	0.844a	-0.096	0.708	-22.9a	0.524
		(0.210)	(0.173)	(0.465)	(6.481)	
	1963-2007 (45)	0.982a	-0.208	0.720		0.731
		(0.225)	(0.189)	(0.465)		
Mauritius	1965-2007 (43)	0.868a	-0.457a	0.800a	-958a	0.858
		(0.070)	(0.072)	(0.114)	(321)	
	1965-2007 (43)	0.930a	-0.554a	0.747a		0.879
		(0.066)	(0.066)	(0.124)		
Malawi	1983-2005 (23)	1.387a	0.333	0.225b	2734	0.703
		(0.303)	(1.073)	(0.128)	(3847)	
	1983-2005 (23)	1.220a	-0.132	0.206b		0.894
		(0.130)	(1.041)	(0.105)		
Malaysia	1962-2007 (46)	0.862a	0.069	0.885a	-4145a	0.953
1998		(0.062)	(0.115)	(0.218)	(1255)	
[0.0000]	1962-1997 (26)	0.895a	-0.121a	0.717a	-2037a	0.795
		(0.124)	(0.029)	(0.163)	(830)	
	1998-2007 (20)	0.789a	0.466	0.464b	3631	0.953
		(0.070)	(0.151)	(0.193)	(3963)	
	1962-2007 (46)	0.847a	0.006	0.789a		0.949
		(0.072)	(0.113)	(0.235)		
	1962-1997 (26)	0.867a	-0.162a	0.589a		0.787
		(0.148)	(0.030)	(0.136)		
	1998-2007 (20)	0.823a	0.476	0.523b		0.993
		(0.047)	(0.130)	(0.209)		
Niger	1971-2004 (34)	0.874a	0.090	0.055	-16.4	0.419
		(0.289)	(0.337)	(0.080)	(21.9)	
	1971-2004 (34)	1.056a	0.219	0.069		0.883
		(0.075)	(0.349)	(0.079)		
Nigeria	1963-2004 (42)	0.402a	1.090	0.452a	-10.3	0.449
		(0.187)	(1.045)	(0.153)	(41.5)	
	1963-2004 (42)	0.397b	1.025	0.447a		0.466
		(0.176)	(0.977)	(0.150)		
Norway	1962-2006 (45)	0.409	0.428	0.890a	-8.397	0.351
		(0.275)	(0.341)	(0.172)	(20.1)	
	1962-2006 (45)	0.410	0.357	0.841a		0.401
		(0.266)	(0.323)	(0.189)		
Nepal	1977-2007 (31)	0.865a	-0.398	0.086	-3537	0.894
		(0.069)	(0.262)	(0.112)	(1622)	
	1977-2007 (31)	0.968a	-0.370	0.061		0.973
		(0.033)	(0.276)	(0.108)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
New Zealand	1962-2007 (46)	0.932a	-0.071	0.675a	-1096a	0.797
1993		(0.132)	(0.097)	(0.194)	(365)	
[0.0022]	1962-1992 (31)	0.787a	0.063	0.741a	-1423a	0.743
		(0.123)	(0.041)	(0.186)	(388)	
	1993-2007 (15)	0.455	-0.446b	1.191a	-3118a	0.880
		(0.318)	(0.243)	(0.214)	(675)	
	1962-2007 (46)	1.072a	-0.084	0.629b		0.902
		(0.141)	(0.094)	(0.266)		
	1962-1992 (31)	1.012a	0.008	0.688b		0.813
		(0.132)	(0.069)	(0.029)		
	1993-2007 (15)	0.740b	-0.373	0.457		0.964
		(0.398)	(0.321)	(0.325)		
Netherlands	1962-1998 (37)	0.973a	-0.024	0.579a	-0.025	0.885
1981		(0.066)	(0.020)	(0.156)	(0.015)	
[0.0000]	1962-1980 (19)	0.813a	0.019	0.590a	-0.057b	0.745
		(0.100)	(0.057)	(0.214)	(0.023)	
	1981-1998 (18)	0.579a	-0.070a	1.102a	0.060b	0.888
		(0.080)	(0.020)	(0.250)	(0.021)	
	1962-1998 (37)	0.911a	-0.026	0.411a		0.929
		(0.056)	(0.019)	(0.142)		
	1962-1980 (19)	0.770a	-0.101a	0.290b		0.691
		(0.126)	(0.039)	(0.129)		
	1981-1998 (18)	0.718a	-0.076a	1.295a		0.977
		(0.098)	(0.028)	(0.342)		
Pakistan	1971-2007 (37)	0.826a	-0.927a	0.140	3.17	0.604
1998		(0.130)	(0.254)	(0.118)	(14.3)	
[0.0000]	1971-1997 (27)	0.552b	0.219	0.126	-31.6b	0.208
		(0.246)	(0.369)	(0.214)	(14.0)	
	1998-2007 (10)	1.140a	-2.207a	-0.198	208a	0.933
		(0.107)	(0.340)	(0.080)	(54.2)	
	1971-2007 (37)	0.817a	-0.908a	0.149		0.692
		(0.123)	(0.237)	(0.112)		
	1971-1997 (27)	0.690a	-0.014	-0.125		0.496
		(0.237)	(0.420)	(0.181)		
	1998-2007 (10)	0.880a	-1.077a	0.196		0.799
		(0.139)	(0.213)	(0.147)		
Panama	1962-2007 (46)	0.576a	0.012	-0.224	-59.7	0.402
		(0.187)	(0.128)	(0.197)	(61.6)	
	1962-2007 (46)	0.587a	-0.032	-0.316		0.564
		(0.181)	(0.123)	(0.163)		
Philippines	1971-2007 (37)	0.916a	-0.101	0.724a	-28.0b	0.973
1986		(0.030)	(0.070)	(0.113)	(12.9)	
[0.0056]	1971-1985 (15)	0.452	-0.496a	0.394	-25.0a	0.487
		(0.366)	(0.111)	(0.361)	(13.2)	
	1986-2007 (22)	0.884a	-0.065	0.960a	-54.0a	0.994
		(0.024)	(0.040)	(0.073)	(8.33)	
	1971-2007 (37)	0.956a	-0.107	0.514a		0.967
		(0.040)	(0.081)	(0.062)		
	1971-1985 (15)	0.697a	-0.496b	0.391		0.688
		(0.319)	(0.204)	(0.344)		
	1986-2007 (22)	0.951a	-0.068	0.548a		0.983
		(0.045)	(0.084)	(0.068)		
Papua New Guinea	1976-2004 (29)	0.616a	-0.469	0.260	27.3	0.424
		(0.211)	(1.517)	(0.285)	(134)	
	1976-2004 (29)	0.621a	-0.431	0.276		0.428
		(0.209)	(1.482)	(0.263)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Poland	1983-2007 (25)	0.819a	-0.061	0.120	0.120	0.672
1991		(0.163)	(0.043)	(0.127)	(0.127)	
[0.0000]	1983-1990 (8)	1.587a	-0.020	0.076a	-5141	0.958
		(0.134)	(0.010)	(0.013)	(3171)	
	1991-2007 (17)	0.565a	-0.408a	0.794	-17491a	0.840
		(0.111)	(0.110)	(0.130)	(2371)	
	1983-2007 (25)	0.838a	-0.048	0.094		0.668
		(0.157)	(0.033)	(0.085)		
	1983-1990 (8)	1.301a	-0.024	0.054b		0.978
		(0.077)	(0.019)	(0.023)		
	1991-2007 (17)	0.912a	0.043	0.284b		0.630
		(0.279)	(0.491)	(0.138)		
Portugal	1962-1997 (36)	0.985a	-0.006	0.746b	-227b	0.844
1986		(0.059)	(0.128)	(0.317)	(87.1)	
[0.0001]	1962-1985 (24)	0.938a	-0.237b	0.936a	-156b	0.946
		(0.042)	(0.120)	(0.193)	(66.7)	
	1986-1997 (12)	0.280	0.319	0.722	-2008b	0.375
		(0.358)	(0.229)	(0.460)	(709)	
	1962-1997 (36)	1.075a	-0.094	0.640b		0.952
		(0.049)	(0.113)	(0.369)		
	1962-1985 (24)	1.006a	-0.363a	0.757a		0.977
		(0.045)	(0.103)	(0.155)		
	1986-1997 (12)	1.169a	0.139	0.762		0.947
		(0.070)	(0.149)	(0.786)		
Paraguay	1964-2007 (44)	0.854a	0.109	0.380a	-331a	0.756
		(0.086)	(0.163)	(0.084)	(74.8)	
	1964-2007 (44)	1.012a	-0.131	0.275a		0.857
		(0.075)	(0.188)	(0.098)		
Rwanda	1970-2005 (32)	0.979a	0.246	0.181b	-8.84	0.817
	1994-1997	(0.098)	(0.320)	(0.091)	(9.30)	
	1970-2005 (32)	1.073a	0.184	0.181b		0.954
	1994-1997	(0.027)	(0.346)	(0.094)		
Saudi Arabia	1974-2007 (34)	0.838a	0.633	0.627a	-1.558	0.949
		(0.075)	(0.448)	(0.133)	(5.022)	
	1974-2007 (34)	0.834a	0.609	0.626a		0.972
		(0.081)	(0.399)	(0.131)		
Senegal	1971-2001 (31)	0.522a	-0.265	0.091	-53.6a	0.255
		(0.186)	(0.688)	(0.099)	(17.4)	
	1971-2001 (31)	0.992a	-0.016	0.100		0.809
		(0.105)	(0.743)	(0.129)		
Singapore	1981-2007 (27)	0.903a	-0.011	0.987a	-1325	0.954
		(0.059)	(0.115)	(0.163)	(957)	
	1981-2007 (27)	0.889a	-0.061	0.890a		0.978
		(0.063)	(0.089)	(0.140)		
Sierra Leone	1966-2003 (38)	0.848a	-1.421b	0.018	-29539	0.636
		(0.126)	(0.735)	(0.067)	(18133)	
	1966-2003 (38)	0.920a	-1.319	0.013		0.712
		(0.127)	(0.783)	(0.071)		
Suriname	1970-1997 (28)	0.423	-1.657b	0.608b	-53.6	0.511
		(0.473)	(0.736)	(0.321)	(42.2)	
	1970-1997 (28)	0.613b	-1.314b	0.683		0.554
		(0.357)	(0.641)	(0.409)		
Sweden	1962-2001 (40)	0.778a	-0.065a	0.759a	-6.74b	0.958
		(0.031)	(0.009)	(0.060)	(2.51)	
	1962-2001 (40)	0.736a	-0.081a	0.648a		0.957
		(0.037)	(0.012)	(0.039)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
Swaziland	1973-2006 (34)	0.871a	-1.348b	0.168	-77.7	0.744
		(0.076)	(0.603)	(0.241)	(105)	
	1973-2006 (34)	0.917a	-1.475a	0.138		0.872
		(0.060)	(0.535)	(0.236)		
Seychelles	1978-1998 (21)	0.897a	-0.980	0.283	-53.3	0.412
		(0.315)	(0.853)	(0.189)	(92.3)	
	1978-1998 (21)	1.058a	-1.152	0.317		0.899
		(0.095)	(0.677)	(0.200)		
Syrian Arab Republic	1965-2006 (42)	0.906a	-0.066	0.135	-3622	0.810
1997		(0.086)	(0.416)	(0.129)	(4368)	
[0.0027]	1965-1996 (32)	0.773a	-1.393a	-0.120	-9424b	0.776
		(0.097)	(0.552)	(0.094)	(4597)	
	1997-2006 (10)	0.900a	-0.923	0.573b	-5123	0.657
		(0.208)	(0.883)	(0.277)	(10314)	
	1965-2006 (42)	0.939a	-0.147	0.109		0.857
		(0.073)	(0.429)	(0.121)		
	1965-1996 (32)	0.905a	-1.143b	-0.151		0.911
		(0.074)	(0.596)	(0.099)		
	1997-2006 (10)	0.833a	-0.855	0.499b		0.856
		(0.124)	(0.821)	(0.190)		
Togo	1973-2007 (35)	0.831a	0.101	0.482a	-29.1	0.609
		(0.147)	(0.478)	(0.190)	(17.4)	
	1973-2007 (35)	1.019a	0.042	0.518b		0.853
		(0.075)	(0.529)	(0.190)		
Thailand	1968-2007 (40)	0.828a	-0.082	1.042a	-86.5a	0.842
1997		(0.142)	(0.071)	(0.185)	(15.3)	
[0.0029]	1968-1996 (29)	0.577a	-0.237a	0.576a	-52.1a	0.927
		(0.152)	(0.060)	(0.142)	(16.7)	
	1997-2007 (11)	0.891a	0.035	1.101a	-86.7	0.633
		(0.258)	(0.117)	(0.304)	(72.5)	
	1968-2007 (40)	0.751a	-0.116	0.672a		0.756
		(0.151)	(0.088)	(0.168)		
	1968-1996 (29)	0.841a	-0.187a	0.372a		0.935
		(0.132)	(0.068)	(0.129)		
	1997-2007 (11)	0.687a	0.001	0.852a		0.842)
		(0.189)	(0.110)	(0.188)		
Trinidad and Tobago	1962-2001 (40)	0.441a	-0.411b	0.611a	-435	0.601
		(0.169)	(0.221)	(0.106)	(340)	
	1962-2001 (40)	0.470a	-0.494b	0.596a		0.601
		(0.153)	(0.260)	(0.106)		
Turkey	1989-2007 (19)	0.173	-0.579	0.133	-2611b	0.268
		(0.467)	(0.424)	(0.129)	(1140)	
	1989-2007 (19)	0.519	-0.492	0.136		0.412
		(0.420)	(0.434)	(0.115)		
Uganda	1984-2006 (23)	1.247a	4.317	-0.192	27.3	0.891
		(0.184)	(2.844)	(0.134)	(93.6)	
	1984-2006 (23)	1.224a	4.237	-0.180		0.967
		(0.126)	(2.624)	(0.115)		
Uruguay	1978-2007 (30)	0.558a	-0.058	-0.090	-1662	0.396
		(0.153)	(0.035)	(0.056)	(964)	
	1978-2007 (30)	0.752a	-0.053	-0.115		0.679
		(0.104)	(0.042)	(0.053)		

Table A2 (Continued)

country Breaking year [P-value of the Chow test]	period (Obs.)	CA(-1)	DPC(-1)	DZ	CONS	R-squared
St. Vincent	1980-2006 (27)	0.719a	0.066	1.467a	-63.7a	0.569
and the Grenadines		(0.143)	(0.598)	(0.318)	(19.1)	
1999	1980-1998 (19)	0.385a	-1.552b	1.448a	-65.4a	0.715
[0.0023]		(0.116)	(0.631)	(0.289)	(17.4)	
	1999-2006 (8)	0.522b	2.356	1.379a	-161b	0.904
		(0.182)	(0.624)	(0.353)	(36.9)	
	1980-2006 (27)	1.021a	-0.650	1.238a		0.878
		(0.105)	(0.572)	(0.371)		
	1980-1998 (19)	0.752a	-2.182a	1.014a		0.902
		(0.099)	(0.668)	(0.316)		
	1999-2006 (8)	1.284a	0.576	2.008b		0.932
		(0.185)	(0.453)	(0.738)		
Venezuela	1974-2007 (34)	0.636a	-0.346a	0.742a	0.573	0.701
		(0.060)	(0.099)	(0.138)	(0.700)	
	1974-2007 (34)	0.675a	-0.349a	0.763a		0.859
		(0.068)	(0.098)	(0.127)		
South Africa	1964-2007 (44)	0.839a	-0.107a	0.542a	-7121a	0.612
1986		(0.151)	(0.040)	(0.187)	(2871)	
[0.0011]	1964-1985 (22)	0.613a	0.096	0.883a	-14308a	0.720
		(0.152)	(0.082)	(0.156)	(2807)	
	1986-2007 (22)	1.149a	-0.066b	0.312	-5453	0.777
		(0.183)	(0.027)	(0.191)	-5302	
	1964-2007 (44)	0.851a	-0.123a	0.354a		0.629
		(0.145)	(0.036)	(0.155)		
	1964-1985 (22)	0.744a	-0.212	0.645b		0.497
		(0.207)	(0.123)	(0.258)		
	1986-2007 (22)	1.092a	-0.078a	0.156		0.794
		(0.207)	(0.023)	(0.126)		