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Chen, Wang

Kinkyo, Takuji

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Financial Development and Income Inequality: Long-Run Relationship and Short-Run Heterogeneity

(Author) Wang Chen

Graduate School of Economics, Kobe University

Address: 2-1, Rokkodai, Nada-Ku, Kobe 657-8501, Japan.

E-mail: tinou3776@yahoo.co.jp (W. Chen)

(Corresponding author) Takuji Kinkyo

Faculty of Economics, Kobe University

Address: 2-1, Rokkodai, Nada-Ku, Kobe 657-8501, Japan.

E-mail: kinkyo@econ.kobe-u.ac.jp (T. Kinkyo)

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Abstract:

This paper examines the dynamic relationship between financial development and income inequality using the PMG estimator developed by Pesaran et al. (1999). We find that financial development will reduce inequality in the long run, while it can increase inequality in the short run. Using the estimates of country-specific short-run coefficients, we also find that adverse short-run effects of financial development are associated with the vulnerabilities of countries in terms of their greater susceptibility to crises and poor quality of governance. Good governance seems to be important for achieving inclusive growth though financial development.

JEL classifications: G00; O11; O16

Keywords: financial development, income inequality, financial crises, governance

2. Introduction

Developing efficient and sound financial systems is a key ingredient in successful growth strategies, particularly in low and middle-income countries. Modern financial economics focuses on market failures arising from information asymmetries and transaction costs. It suggests that financial development will improve the allocation of capital and thus accelerates economic growth by mitigating these sources of market failures. Since the seminal work by King and Levine (1993), there has been a large accumulation of empirical evidence that financial development accelerates long-run economic growth (Levine, 2005; Demirgüç-Kunt and Levine, 2008; Akisik, 2013; Fang and Jiang, 2014).

However, what is less unambiguous about financial development is its effect on income distribution. Some argue that financial development will reduce income inequality because it expands economic opportunities for the poor by easing their external financing constraints due to the lack of collateral, credit histories, and connections (Banerjee and Newman, 1993; Galor and Zeria, 1993; Aghion and Boltion, 1997; Galor and Moav, 2004). By contrast, others argue that the rich and well-connected can disproportionally benefit from financial development at early stages of development, particularly under the poor quality of governance (Greenwood and Jovanovic, 1990; Rajan and Zingales, 2003).

By comparison, less analysis has been done to empirically examine the relationship between financial development and income inequality and the existing studies provide mixed evidence. Clark et al. (2006) examine the relationship between financial development and income inequality for 83 countries over the period 1960-1995 and find that, in the long run, inequality is less when financial development is greater. Beck et al.

(2007) use data for 72 countries over the period 1996-2005 and show that financial development disproportionately increases income of the poor and thus reduce income inequality. Hamori and Hashiguchi (2012) use the panel data of 126 countries for the period 1963-2002 and find that financial development reduces inequality but economic growth weakens this equalizing effect of financial development. Inoue and Hamori (2013a) use the state-level panel data of India and present evidence that financial development reduces poverty rates both in urban and rural areas. Inoue and Hamori (2013b) measure the degree of financial penetration by using the data of access to microfinance and show that greater financial penetration reduces poverty.

By contrast, Roine et al. (2009) use a panel data of 16 OECD countries over the entire twentieth century and find that financial development is pro-rich and the effect is strongest at relatively low levels of economic development. Gimet and Lagoarde-Segot (2011) use a panel Bayesian structural vector autoregressive model for 49 countries over the period 1994-2002 and show that financial development measured in terms of banking credit tends to increase income inequality. Using the same data set as Beck et al. (2007), Kim and Lin (2011) estimate a threshold regression model to examine whether there is a nonlinear relationship between financial development and inequality. They find that financial development reduces income inequality only when the country reaches a threshold level of financial development and below this critical level, financial development increases inequality. Law et al. (2014) also use a threshold regression model and find a similar nonlinear relationship that depends on institutional quality.

Although these studies tend to focus on the long-run relationship between financial development and income inequality, financial development could have different economic effects depending on the time horizon. For example, a stable and sustained

growth in banking credit will accelerate economic growth in the long run, while rapid and excessive credit expansion can induce financial crises in the short run[1]. In fact, Loayza and Rancière (2006) find evidence that financial development accelerates economic growth in the long run, while decelerating it in the short run. It is equally possible that financial development could have contradicting effects on income inequality depending on the time horizon.

However, to our best knowledge, none of the existing studies explicitly distinguish between long-run and short-run effects of financial development on income inequality. To fill this gap in the literature, this paper examines the dynamic relationship between financial development and inequality using a panel error-correction model, in which both long-run and short-run effects are estimated jointly using an autoregressive distributed lag (ARDL) model. To estimate the model, we use the pooled mean group (PMG) estimator developed by Pesaran et al. (1999). The major advantage of the PMG estimator is that it addresses the possible cross-country heterogeneity in parameters by allowing the short-run coefficients to be different while restricting the long-run coefficient to be the same across countries. Moreover, the estimates of country-specific short-run coefficients allow us to examine the cross-country pattern of variations in short-term coefficients. We speculate that cross-country heterogeneity in short-term effects is associated with the vulnerabilities of countries in terms of their susceptibility to financial crises and quality of governance. To verify this claim, we statistically examine the relationship between the measures of these vulnerabilities and the country-specific short-run coefficients.

[1] The empirical evidence indicates that a rapid and excessive growth in domestic credit is one of the most common factors associated with financial crises (see Demirgüç-Kunt and Detragiache, 1998; Kaminsky and Reinhart, 1999; IMF, 2004).

The rest of the paper is organized as follows. Section 2 describes the econometric methodology and data. Section 3 presents the estimation results. Section 4 examines the vulnerabilities of countries associated with heterogeneous short-run effects. Section 5 summarizes and concludes.

3. Econometric Methodology and Data

When estimating a panel model with a large group of countries, heterogeneity in parameters across countries can be a problem. There are broadly three approaches to estimating a dynamic panel model with possible cross-country heterogeneity. One approach assumes fully heterogeneous parameters across countries and thus imposes no cross-country restriction. The mean group (MG) estimator developed by Pesaran and Smith (1995) can be used for this case of full heterogeneity. The MG estimator provides consistent parameter estimates of cross-country mean by taking the average of individually estimated parameters. Another approach assumes that the slope coefficients are identical across countries but the intercepts can differ between countries. One of the most popular methods used in this approach is the generalized method of momentum (GMM) for dynamic panel models, which is developed by Arellano and Bond (1991) and Arellano and Bover (1995). For example, Beck et al. (2007), Hamori and Hashiguchi (2012), and Inoue and Hamori (2013) use the GMM estimator to examine the effect of financial development on income inequality and poverty rates.

The third approach distinguishes between long-run and short-run effects and assumes that the latter is country-specific, while the former is common across countries. This paper employs this approach and estimates a panel error-correction model using the PMG estimator developed by Pesaran et al. (1999). The PMG estimator allows the

short-run slope coefficient and intercepts to be heterogeneous while restricting the long-run coefficient to be the homogeneous across countries. It also provides consistent estimates of the cross-country mean of short-run coefficients by taking the average of estimated individual coefficients. By comparing the estimated country-specific short-run coefficients, the PMG estimator allows us to examine the cross-country pattern of variations in estimated short-run coefficients. Our estimation strategy is closely correlated with that of Loayza and Rancière (2006), which uses the PMG estimator to examine the long-run and short-run relationship between financial development and economic growth.

The estimation procedure for PMG estimator can be described briefly as follows. Suppose that the dynamic relationship between income inequality and its determinant is given by the following autoregressive distributed lag (ARDL) (*p*,*q*) model:

$$y_{it} = \sum_{j=1}^{p} \beta_{ij} y_{i,t-j} + \sum_{j=0}^{q} \gamma_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \tag{1}$$

where y_{it} is the measure of income inequality; x_{it} represents a set of explanatory variables, including the measure of financial development and control variables; μ_i is the fixed effect; β_{ij} and γ_{ij} are the coefficients; ε_{it} is the time-varying disturbance; and the subscript *i* and *t* represents country and time, respectively. Eq. (1) can be re-parameterized as an error-correction form:

$$\Delta y_{it} = \phi_i (y_{i,t-1} - \theta_i x_{i,t}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \tag{2}$$

where ϕ_i is the coefficient on the error correction term; θ_i is the long-run coefficient; and λ_{ij} and δ_{ij} are the short-run coefficients. The PMG estimator is obtained by restricting the long-run coefficients, θ_i, to be common across countries. The maximum likelihood method is used for the estimation. Pesaran et al. (1999) show that under certain regularity conditions, the PMG estimators are consistent and asymptotically normal regardless of whether regressors are *I*(0) or *I*(1). Once the estimates of short-run coefficients for individual countries are obtained, consistent estimates of cross-country mean of these parameters are given by

$$\lambda_{Mj} = \sum_{i=1}^{N} \lambda_{ij} / N \qquad j = 1,2,\mathrm{K}\ , p-1 \tag{3}$$

$$\delta_{Mj} = \sum_{i=1}^{N} \delta_{ij} / N \qquad j = 0,1,\mathrm{K}\ , q-1 \tag{4}$$

where *N* represents the number of countries.

Our panel data set consists of 88 countries with annual data for the period 1961-2012[2]. The level of income inequality is measured by the Gini coefficient taken from

[2] 88 countries include: Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Barbados, Belarus, Bolivia, Botswana, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Czech Rep., Denmark, Dominican Rep., Ecuador, Egypt Arab Rep., El Salvador, Estonia, Ethiopia, Finland, France, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong SAR China, Hungary, Iceland, India, Iran Islamic Rep., Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Korea Rep., Latvia, Lesotho, Madagascar, Malawi, Malaysia, Mexico, Moldova, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Russian, Rwanda, Senegal, Sierra Leone, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Ukraine, United Kingdom, United States, Uruguay, Venezuela RB, Vietnam, Zambia.

Standardized World Income Inequality Database (SWIID) Version 4.0[3]. Following the existing studies, notably Beck et al. (2007), we measure financial development by private domestic credit as a percentage of GDP. Private credit is the claims on private sectors by financial intermediaries. The control variables include income levels, trade openness, and inflation rates. We control for income levels because financial development can influence income inequality by affecting economic growth and thus income levels (Beck et al., 2007). Assuming that income levels are negatively correlated with subsequent economic growth due to convergence effects, we anticipate that income inequality is positively correlated with income levels through its negative correlation with economic growth[4]. Higher inflation rates can increase income inequality because the rich has more access to financial instruments that can hedge the exposure to inflation while the poor has limited access to such instruments and instead holds more cash (Easterly and Fischer, 2001; Erosa and Gustavo, 2002). The impact of trade openness on income inequality is ambiguous, though there is some evidence that greater openness increases inequality (Ravallion, 2001; Wagle, 2007; Hamori and Hashiguchi, 2012). The income level is measured by the log of GDP per capita. Trade openness is measured by the sum of export and import as a percentage of GDP. The inflation rate is measured by the annual changes of GDP deflator. The data source for these variables is the World Bank's World Development Indicators.

4. Estimation Results

[3] The data can be downloaded at: http://myweb.uiowa.edu/fsolt/swiid/swiid.html.
[4] Hamori and Hashiguchi (2012) find that inequality is positively correlated with income levels, while Inoue and Hamori (2013) find that inequality is negatively correlated with economic growth.

Table 1 shows the results obtained with PMG estimator in comparison with those with the MG estimator. Since one of our purposes is to examine cross-country variations in short-run coefficients, we impose common lag structures across countries. The maximum lag of one is chosen for all variables to preserve the degrees of freedom[5]. A lag of one is consistent with the existing studies that use the dynamic panel GMM model with the specification of one lag for the dependent variable (see, among others, Beck et al. 2007; Hamori and Hashiguchi, 2012; Inoue and Hamori, 2013). The Hausman test indicates that the null hypothesis of homogeneous long-run coefficients cannot be rejected jointly for all parameters, as well as for individual ones. We therefore focus on the results of the PMG estimator below.

[Table 1]

The estimates of long-run coefficients on all control variables are positive and statistically significant, which indicate that higher income levels, greater trade openness, and higher inflation rates are all associated with increased income inequality in the long run. By contrast, the long-run coefficient on financial development is negative and statistically significant, indicating that financial development is associated with less income inequality in the long run[6]. The result is consistent with the previous findings by Clarke et al. (2006), Beck et al. (2007), Hamori and Hashiguchi (2012), and Inoue and Hamori (2013).

[5] Note that adding one lag increases the number of short-run coefficients by 88 for each explanatory variable.

[6] For robustness check, we use M2 as a ratio to GDP as an alternative measure of financial intermediation and find that its long-run coefficient is negative. We also find that the mean of its short-run coefficients is positive, but the short-run coefficient is only marginally significant at the 10%-significance level.

However, the estimates of short-run coefficients indicate that financial development is associated with more income inequality in the short run. While the estimates of country-specific short-run coefficients on financial development are heterogeneous as shown in Figure 1, the mean of these coefficients is positive and statistically significant. Note that none of the means of short-run coefficients on control variables is statistically significant. The contrast between the long-run and short-run effects and the cross-country heterogeneity in the latter provide rationale for using the PMG estimator.

[Figure 1]

The estimated coefficient on error-correction terms is statistically highly significant and correctly signed. However, the relatively small size of coefficient implies that it takes a long time for the equation to return to its long-run equilibrium once it is shocked. The slow speed of adjustments underlies the importance of distinguishing between long-run and short-run effects and thus provides another rationale for using the PMG estimator.

In sum, the above estimation results indicate that the effect of financial development on income inequality can be different and even contradicting depending on the time horizon. More specifically, we find that financial development reduces income inequality in the long run, while it tends to increase inequality in the short run[7].

[7] Strictly speaking, the causality could run in the reverse direction and thus income inequality might affect financial development. However, there is no plausible explanation for the contradicting effect that income inequality promotes financial development in the long run, while reversing it in the short run. Hence, we interpret our estimation results to indicate the causality running from financial development to income inequality.

5. Vulnerabilities Associated with Heterogeneous Short-Run Effects

So what could be the reasons for the adverse effect of financial development on income inequality in the short run? To address this question, we utilize the estimates of country-specific short-run coefficients on financial development. Following Loayza and Rancière (2006), we examine the vulnerabilities of countries that might be associated with the adverse short-run effects of financial development. By doing so, we seek to provide possible explanations for why financial development can increase income inequality in certain countries. In this paper, we examine two types of vulnerabilities that are widely observed in low and middle-income countries. The first one is the susceptibility to financial crises. Empirical evidence indicates that credit booms in the aftermath of financial liberalization are common factors associated with financial crises, particularly under weak regulatory environments[8]. Loayza and Rancière (2006) focus on this vulnerability and find evidence that the susceptibility to crises measured by crisis frequency is associated with the adverse effects of financial development on short-run economic growth. It is equally possible that susceptibility to crises is associated with adverse effects of financial development on income inequality in the short run. We measure the susceptibility to crises by the number of crises that countries experienced for the period 1970-2012. The data source is Laeven and Valencia (2012).

Another vulnerability that might be associated with adverse effects of financial development on inequality is the quality of governance. There is growing evidence that good governance will not only accelerate economic growth but also reduce income inequality through better education, social safety nets, and infrastructure (Acemoglu et al., 2001, 2002; Rodrik and Subramanian, 2004; Rodrik, 2008). Furthermore, a robust

[8] See the literature in footnote 1.

framework of financial regulations and supervision underpinned by good governance will help to prevent severe financial crises, which are likely to hurt the poor most. We therefore predict that good governance is inversely associated with the adverse short-run effects of financial development on inequality because financial development will more likely bring the benefits of faster growth and more jobs to the poor under good governance. The quality of governance is measured using the World Bank's Governance Indicators. There are six types of governance indicators: government effectiveness, control of corruption, political stability and absence of violence/terrorism, rule of law, regulatory quality, and voice and accountability[9]. We estimate the first principal component of these six indicators for the period 1996-2012 and use each country's time average as the measure of the quality of governance[10].

Table 2 shows the correlation coefficients with the estimated short-run coefficients on financial development both for the frequency of crises and the quality of governance. As expected, both the simple and rank correlations are positive for the crisis frequency while they are negative for the governance quality. Although the correlation with the crisis frequency is not statistically significant at the 5% significance level based on the simple correlation, it is significant when measured by the rank correlation. For the governance quality, both the simple and rank correlations are statistically highly significant. In addition, their values are -0.35 and -0.33, respectively, which are meaningfully large enough. These results indicate that both greater susceptibility to crises and poor quality of governance are associated with adverse short-run effects of financial development on income inequality.

[9] The details of the indicators are available at: www.govindicators.org.
[10] The eigenvalue indicates that the first principal component accounts for nearly 90% of the total variance, providing reasonable summary of individual indicators.

[Table 2]

We next examine whether there is a difference in the mean of short-run coefficients between countries with high crisis frequency and those with low frequency, as well as between countries with good governance and those with poor governance. We split the sample into these two subsamples using the median of the number of crises and the value of the governance indicators, respectively. Table 3 shows the means of short-run coefficients for each subsample and the results of *t*-tests for the significance of their differences. When we divide the sample according to crisis frequency, the mean of short-run coefficients for countries with high crisis frequency is positive, while that for low frequency countries is negative. The *t*-tests indicate that the difference in the mean of short-run coefficients between the two subsamples is statistically highly significant. As for the subsamples divided by governance quality, we find that the mean of short-run coefficients is negative for countries with good governance, while it is positive for those with poor governance. The *t*-tests indicate that the difference in the mean of short-run coefficients between the two subsamples is statistically highly significant. These results are consistent with those of the correlation analyses above.

[Table 3]

Finally, we examine whether there is visible differences in the frequency distribution of short-run coefficients between the two subsamples. Figures 2(a) and 2(b) show the frequency distributions for each subsample divided by crisis frequency and governance

quality, respectively. We can see that the mean of short-run coefficients represented by the vertical line for each distribution is negative for countries with low crisis frequency and good governance while it is positive for countries with high crisis frequency and poor governance. Note also that countries with poor governance have more dispersed distribution and fat tails, particularly towards the positive part of the spectrum.

[Figure 2]

In sum, the statistical evidence indicates that greater susceptibility to crises and poor quality of governance are associated with adverse short-run effects of financial development on income inequality. These two vulnerabilities, which are widely observed in low- and middle-income countries, could prevent financial development from delivering economic benefits to the poor in the short run[11].

6. Conclusions

Since the seminal work by King and Levine (1993), there has been a large accumulation of evidence that financial development accelerates long-run economic growth. By comparison, less analysis has been done to empirically examine the relationship between financial development and income inequality and the existing studies provide mixed results. This study contributes to the literature by distinguishing between long-run and short-run effects of financial development on income inequality and presenting the evidence that financial development can have different and even

[11] We assume that the quality of governance is constant in the short run because both institutional reforms and capacity building take a long time for the governance to improve. However, the quality of governance is likely to improve in the long run as financial development accelerates economic growth, and thus promotes necessary institutional reforms and capacity building.

contradicting effects on inequality depending on the time horizon. The study also finds that the observed adverse short-run effects of financial development are associated with the vulnerabilities of countries in terms of their susceptibility to crises and quality of governance.

To derive the long-run and short-run relationship between financial development and income inequality, we use the PMG estimator developed by Pesaran et al. (1999). The PMG estimator addresses the problem of cross-country heterogeneity in parameters by allowing the short-run coefficients to be different while restricting the long-run coefficients to be the same across countries. By comparing the estimated country-specific short-run coefficients, the PMG estimator allows us to examine the cross-country pattern of variations in short-run coefficients.

We find that the estimate of long-run coefficient on financial development is negative and statistically significant, indicating that financial development will reduce income inequality in the long run. By contrast, the mean of the estimated short-run coefficients is positive and statistically significant, indicating that financial development can increase inequality in the short run. To explore the reason for why financial development can increase inequality in the short run, we examine the vulnerabilities of countries that might be associated with the adverse effects of financial development. Focusing on countries' susceptibility to crises and quality of governance, we examine how these vulnerabilities are associated with the estimates of country-specific short-run coefficients on financial development. The statistical evidence indicates that these vulnerabilities are associated with the adverse short-run effects of financial development on inequality.

The key policy implications derived from the analysis can be summarized as follows: First, despite the long-run benefits of reduced income inequality, the adverse short-run effects of financial development could be a major political obstacle to its promotion. To mitigate the possible short-run adverse effects, social safety nets need to be improved simultaneously. Second, the evidence indicates that good governance is a prerequisite for successful financial development. Hence, countries aiming to achieve inclusive economic growth through financial development are required to make serious efforts towards better governance.

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Table 1
The long- and short-run effect of financial development on income equality

	PMG		MG		Hausman tests	
Variable	Coef.	Std.Error	Coef.	Std.Error	*h*-test	*p*-value
Long-run coefficients						
Financial development	-0.0953	0.0093	0.7026	0.6323	0.6587	0.4170
Income levels	3.9614	0.6959	-34.871	21.137	1.3965	0.2373
Trade openness	0.0424	0.0079	-0.0327	0.1535	0.0990	0.7530
Inflation rate	0.0042	0.0009	-0.0503	0.3360	0.0109	0.9168
			Joint Hausman test:		1.6600	0.7984
Error-correction coefficients	-0.0895	0.0167	-0.2633	0.0254		
Short-run coefficients						
Δ Financial development	0.0311	0.0112	0.0080	0.0189		
Δ Income levels	0.6546	1.2015	0.3540	1.4960		
Δ Trade openness	-0.0100	0.0068	-0.0093	0.0087		
Δ Inflation rate	-0.0057	0.0046	0.0132	0.0099		
Intercept	0.5840	0.2165	7.1256	6.3351		

Table 2
Correlations with short-run coefficients on financial development for the frequency of crises and the quality of governance

	Crisis frequency	Quality of governance
Standard correlation	0.1662 (0.1218)	-0.3476 (0.0009)
Rank correlation	0.2671 (0.0119)	-0.3280 (0.0018)

Note: *p*-values reported in parenthesis.

Table 3
Test of difference in means of short-run coefficients between the subsamples

(a) *Low crisis frequency vs. high crisis frequency*

		Mean short-run coefficients	Std. Error	No. Obs.
Low crisis frequency		-0.0078	0.0897	31
High crisis frequency		0.0523	0.1081	57
Test of difference in mean	Ho: Diff=0 vs Ha: Diff≠0			
Method		Diff	*t*-value	*p*-value
t-test		0.0601	2.6372	0.0099
Satterthwaite-Welch *t*-test*		0.0601	2.7870	0.0068

(b) *Good governance vs. poor governance*

		Mean short-run coefficients	Std. Error	No. Obs.
Good governance		-0.0070	0.0595	44
Poor governance		0.0693	0.1264	44
Test of difference in mean	Ho: Diff=0 vs Ha: Diff≠0			
Method		Diff	*t*-value	*p*-value
t-test		0.0763	-3.6197	0.0005
Satterthwaite-Welch *t*-test*		0.0763	-3.6197	0.0006

*Welch (1947)

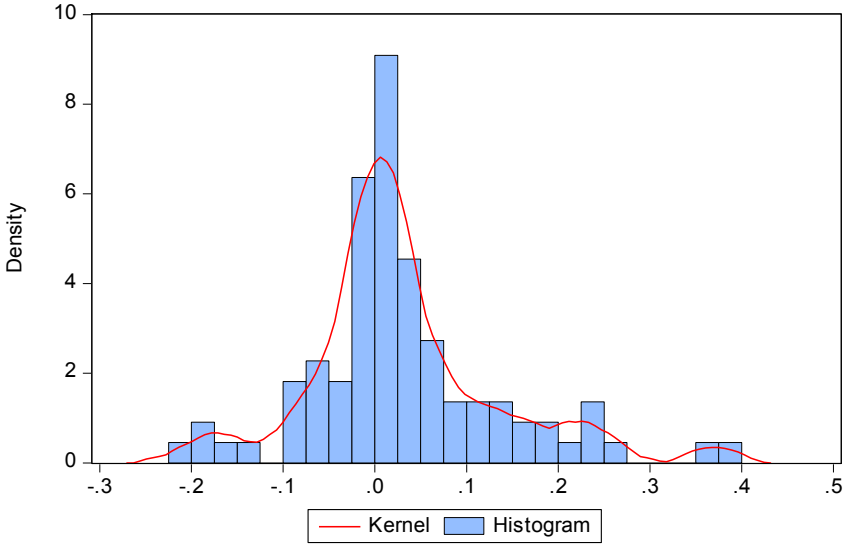

Fig. 1.Frequency distribution of short-run coefficients

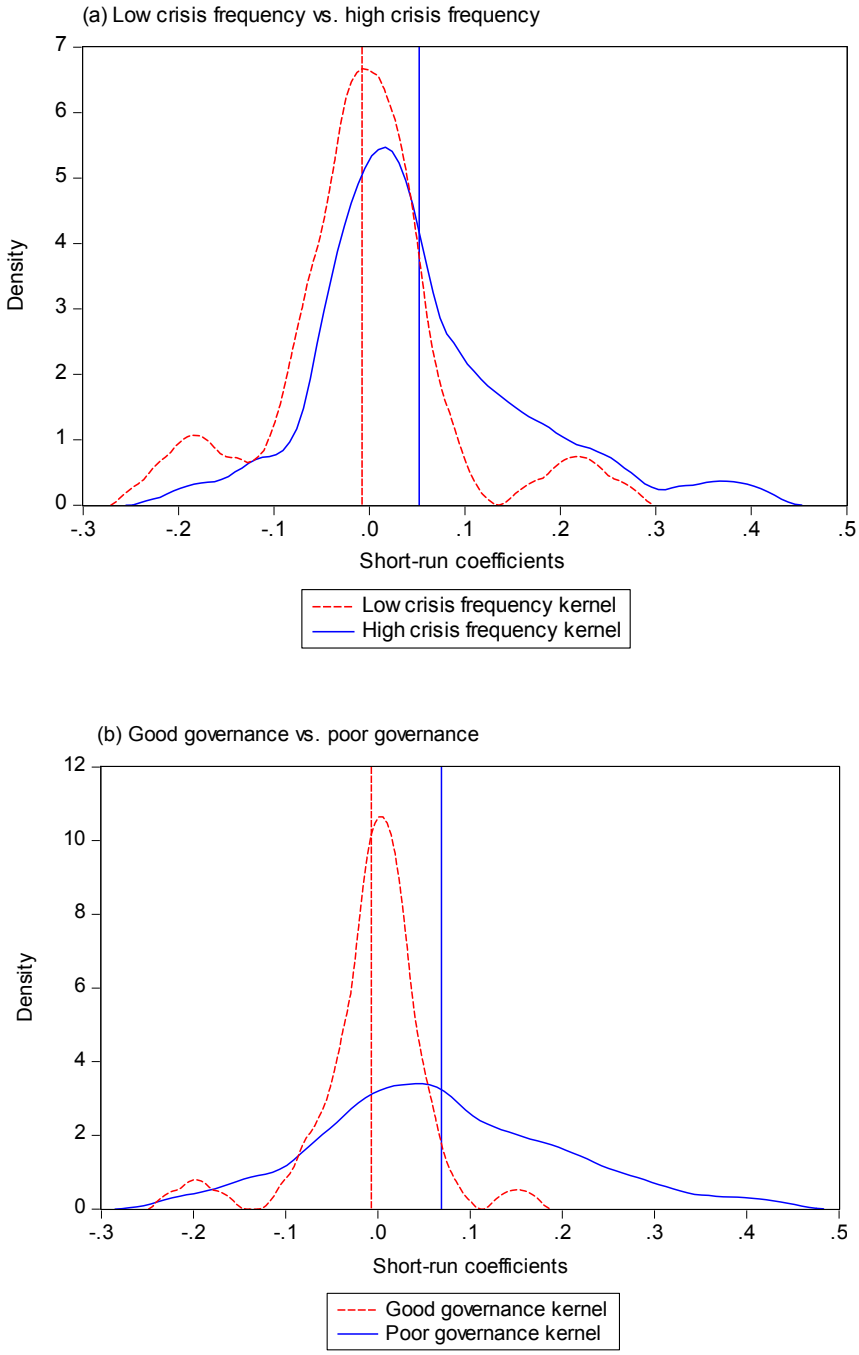

Fig.2. Frequency distributions of short-run coefficients for each subsample