

Financialization, Financial Globalization, and Investment – Panel Cointegration Results Using OECD Data

Hochul Shin

This study analyzes the long-term effects of financialization and financial development on investment and growth by using data of OECD countries since the 1970s. The panel cointegration approach is adopted to investigate the long-run effects of these variables. Estimation results show evidence of cointegration among financial globalization, investment, and growth in the long run. Group means fully modified ordinary least squares results show that financial globalization is negatively correlated with private investment for fixed capital. Meanwhile, results of the panel vector error-correction model reveal a unilateral Granger causality from financial globalization to private investment. An inverted U-shape relationship between the new measure of financial development and investment or growth is also estimated similar to that found in recent literature.

Keywords: Financialization, Financial globalization, Financial development, Investment, Growth, Panel cointegration

JEL Classification: O16, F65, G15

I. Introduction

The financial system has been regarded for a long time as a critical factor in economic growth. Since Schumpeter (1912) emphasized the role of finance in innovation, several scholars have found a significant positive effect of financial development on economic growth (King and

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Levine 1993; La Porta, Lopez-de-Silanes, and Shleifer 2002). Financial development generally refers to the improvement of financial functions, which leads to investment information production, efficient allocation of capital, firm monitoring, risk management, savings mobilization, and ease of exchange of goods and services (Levine 2005). Given that these functions of the financial system are crucial for investment and resource allocation, improving these functions is beneficial to economic growth.

Several studies have reported a statistically significant positive effect of financial development on economic growth by using various data types (*e.g.*, cross-country, country panel, industry, and firm data) and econometric methods (*e.g.*, OLS, fixed effect, and generalized method of moments) (King and Levine 1993; Levine and Zervos 1998; Beck and Levine 2004; Rajan and Zingales 1998; Beck *et al.* 2005).

However, the last global financial crisis casted doubt on the role of the financial system in the economy given that this crisis was ignited by the well-developed financial system of the US. Since then, various critical views about the financial system have emerged, and financialization has become a critical concept for describing the growing dominance or importance of the financial system in an economy.

Financialization is a broadly defined observational concept that was introduced to depict the rapid development or expansion of the financial sector in the US since the 1980s. A concept similar to financialization can be traced back to Hilferding's "*Finance Capital*" (1981 [1910]), but the most widely used definition of financialization is that proposed by Epstein (2005), who argued that "financialization means the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies."

Other scholars have proposed slightly different definitions of financialization. Specifically, they used this term to describe the rising share of the financial sector or an increase in the financial activities of non-financial sectors (Stockhammer 2004; Tomaskovic-Devey *et al.* 2015; Kus 2012).

This paper adopts the definition proposed by Epstein (2005) but captures the "increasing role of financial system" in three aspects, namely, (1) the expansion of the financial sector in the economy, (2) increased share of the financial sector or shareholders among the profits or resources of non-financial sectors, and (3) increased overseas

financial activities (financial globalization). On the basis of these aspects, this paper analyzes the effects of financialization on domestic investment and growth by using panel cointegration methods. Shin and Lee (2019) argued that the second aspect of financialization, namely, dividend tendency in non-financial firms, is correlated with income inequality (*e.g.*, the top 10% income share in the long run in OECD countries). This paper thus complements Shin and Lee (2019) by analyzing the long-run effects of financialization and financial development on investment and growth since the 1970s.

The contributions of this study are twofold. First, this paper estimates the long-run effects of financialization on investment and growth by applying an improved panel cointegration approach that is robust to endogeneity problems and by using OECD country data since the 1970s. Second, this paper captures various aspects of financialization and financial development by using several measures and compares their long-run effects on investment and growth. Estimation results suggest a negative significant correlation between financial globalization and investment and an inverted U-shaped relationship between financial development measures and investment or growth in OECD countries in the long run.

The rest of this paper is structured as follows. Section II presents the literature review. Section III presents the data and estimation method. Sections IV and V present the estimation results and robustness checks, respectively. Section VI concludes the paper.

II. Financialization, financial globalization, and investment

The shares of the financial sector or shareholders in the profits or resources of non-financial sectors have increased in developed countries, such as the US, since the 1980s. For example, the shares of shareholders and owners¹ in the net value-added of non-financial corporations in the US increased from 5.58% in 1998 to 7.82% in 2015. A rapid increase in such share from 1.48% in 1988 to 21.8% in 2005 was also reported in Norway.

Given that the additional shares of resources and profits of firms

¹ This share is measured by the net payments of distributed income of corporations, including net payments of dividends plus withdrawals from the income of owners of quasi-corporations.

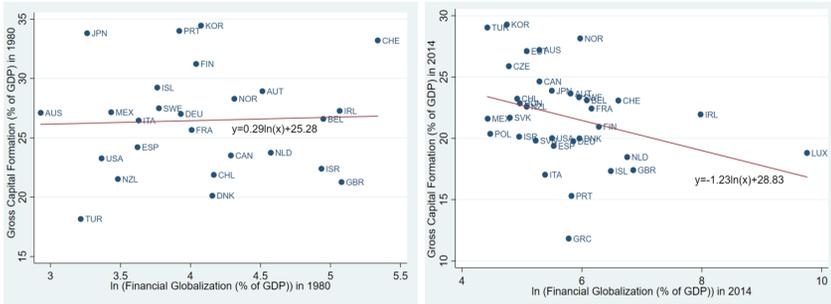
are distributed among shareholders and owners, the internal funds of a firm for investment will be reduced. Furthermore, if the CEOs of firms are pressured to increase their short-term profits to maximize shareholder value, they may increase their investments in financial assets and activities instead of fixed capital because the latter generally requires a longer time to make profit. Similarly, Lazonick (2014) showed that 54% and 37% of the earnings of S&P 500 firms in the US were spent on stock buybacks and dividends, respectively, from 2003 to 2012.²

Financial globalization, which is another aspect of financialization, can also affect investments. Given that restrictions on international capital transactions have been relaxed since the 1980s and that the degree of financial globalization has deepened, a large amount of capital is sent overseas to earn high expected returns or diversify risks than to accumulate domestic investment for fixed capital. The following figure shows the relationships between financial globalization and investment rate in 1980 and 2014.

This study measures financial globalization as external financial assets plus liabilities excluding FDI stock and liability-to-GDP ratio. Panel (a) of Figure 1 shows only a slight correlation between these variables in 1980 ($r=0.04$), whereas panel (b) shows a negative relationship between the log of financial globalization measure and gross-capital-formation-to-GDP ratio of OECD countries in 2014 ($r=-0.34$). As a result, panel (c) shows that those countries reporting an increase in their log of financial globalization measure tend to also report a decrease in their investment rate during this period ($r=-0.34$).

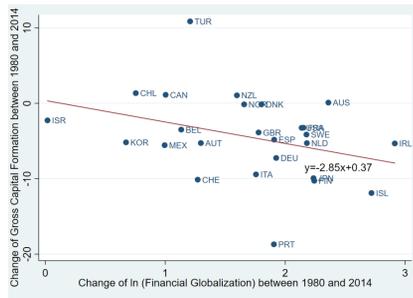
Some studies argue that the reduction in investment rate since the 1980s is related to financialization, particularly in the US. For example, by using US non-financial firm data from 1973 to 2003, Orhangazi (2008) argued that the increased payment to financial markets (measured by the sum of interest, dividends, and stock buyback) decreases the internal funds of firms and their ratio of fixed capital investment to fixed capital stock. Davis (2014) reported similar results by using industry-level averages of gross stock repurchases relative to total equity from Compustat data for years 1971 to 2011. By performing a country-level time series regression for the US and France from the

² This condition is called “profits without prosperity.”



Panel (a). Relationship in 1980

Panel (b). Relationship in 2014



Panel (c). Relationship between the changes in these two variables from 1980 to 2014

Source: Worldbank, Lane and Milesi-Ferretti (2007)

Note: Financial globalization is the ratio of external financial assets plus liabilities to GDP (%) (except FDI stock and liability).

FIGURE 1

RELATIONSHIP BETWEEN LOG OF FINANCIAL GLOBALIZATION MEASURE AND GROSS CAPITAL FORMATION (% OF GDP) IN 1980 AND 2014 AMONG OECD COUNTRIES

1960s to the 1990s, Stockhammer (2004) reported that the share of interest and dividend in value-added for non-financial firms decreases the growth rate of gross business capital stock, but financialization does not show any significant effect in the UK and Germany. In addition, Barradas and Lagoa (2017) reported that payments to financial markets reduce real investments in the non-financial sectors of Portugal since the late 1970s.

Several papers have investigated the relationship between financial globalization or financial integration and economic growth. In theory, financial globalization can positively affect growth by risk sharing,

lowering the cost of capital, ensuring an efficient capital allocation and production specialization, improving the function of the domestic financial system when faced with increasing market competition, and introducing foreign financial services (Obstfeld 1994; Acemoglu and Zilibotti 1997; Klein and Olivei 2008; Levine 2001; Wei 2018). However, several empirical studies suggest that the relationship between financial integration and economic growth is not robust (Milesi-Ferretti and Grilli 1995; Kraay 1998; Edison *et al.* 2002; Fratzscher and Bussière 2004). Schularick and Steger (2010) attributed this lack of robustness to the fact that the financial integration since the 1970s is not related to increasing domestic investment, whereas the financial integration between 1880 and 1914 increased domestic investment in those countries with scarce domestic savings. Meanwhile, Obstfeld and Taylor (2004) argued that the current financial globalization is mainly related to diversification finance instead of development finance in the previous era. Therefore, financial globalization since the 1970s may have decreased the domestic investment for fixed capital in developed countries because a large amount of financial resources can go overseas for higher returns, diversified risks, and shorter payback periods.

This study adopts a conventional measure of financial globalization, that is, external financial assets plus liability-to-GDP ratio. FDI stock and liability are excluded from this measure to estimate the effect of overseas financial investment instead of fixed capital investment.

If financialization affects the level or rate of fixed capital investment, then financialization may also affect growth. However, only few studies have analyzed this relationship, except for those that deal with financial globalization or integration. Tomaskovic-Devey *et al.* (2015) found that financialization measured by the ratio of financial assets to total assets has a negative effect on value-added by using US non-financial industry-level data from 1970 to 2008.

III. Data and estimation method

This section briefly discusses the data and estimation methods adopted for the econometric analysis. The following table presents the detailed definitions of the variables and the sources of data used in this paper.

TABLE 1
DEFINITIONS OF VARIABLES AND SOURCES OF DATA

Variable	Definition	Source
Log private GFCF per capita	Log of private gross fixed capital formation per capita (PPP, 2005 US\$)	IMF
Log GDP per capita	Log of expenditure-side real GDP at chained PPPs per capita (2011 US\$)	Penn World Table 9.0
Finance and insurance share	Share of value-added in the finance and insurance sectors among all sectors (%)	OECD Structural Analysis Databases (OECD STAN) (ISIC Rev. 3)
Financial globalization	Ratio of external financial assets plus liabilities to GDP (%) (except FDI stock and liability)	Lane and Milesi-Ferretti (2007)
Distributed income of corporations	Share of net payments of distributed income of corporations among net value-added for non-financial corporations (%)	OECD National Accounts
Private credit	Domestic credit provided by financial sectors to the private sector as percent of GDP (%)	Worldbank
Market capitalization	Market capitalization of listed domestic companies (% of GDP)	Worldbank
Turnover ratio	Domestic shares traded divided by market capitalization (%)	Worldbank
Trade openness	Exports+imports/GDP (%)	Worldbank
Tertiary enrolment ratio	Gross enrolment ratio, tertiary, both sexes (%)	Worldbank
Savings rate	Gross saving as percent of GDP (%)	Worldbank
Lending interest rate	Lending interest rate by banks to private sectors (%)	Worldbank
Central government debt	Central government debt as percent of GDP (%)	OECD Stat.
Log triadic patent stock per million population	Log triadic patent stock per million population	OECD Stat.

This paper uses log private gross fixed capital formation (log private

GFCF) per capita and log GDP per capita to measure investment and growth. Both of these logs in turn are measured by purchasing power parity. Private GFCF data are collected from the IMF, whereas GDP per capita data are collected from Penn World Table 9.0. Investment and growth are usually measured based on the share of investments in GDP and GDP growth rate. However, panel unit root tests (PURT) suggest that these measures are stationary³; therefore, they are not used in this paper. The adopted panel cointegration approach requires the dependent variable to be non-stationary because the linear combination of non-stationary dependent and independent variables is considered stationary. If all variables are stationary, then cointegration becomes trivial.

Following the discussion in the previous section, three variables are used to measure financialization, namely, the share of value-added in the finance and insurance sectors in the total value-added of all sectors (finance and insurance share), the share of net payments of the distributed income of corporations in the net value-added of non-financial corporations (distributed income of corporations), and the ratio of external financial assets plus liabilities to GDP (financial globalization).

Finance and insurance share is a basic indicator of the relative size of financial sectors in the economy and represents the first aspect of financialization (*i.e.*, expansion of the financial sector in the economy). Data are collected from the OECD Structural Analysis Database.

The distributed income of corporations measures how much of the value-added of firms is distributed to the shareholders and owners of non-financial corporations. This variable represents the second aspect of financialization (*i.e.*, increased share of the financial sector or shareholders in the total profit or resources of non-financial sectors).

Financial globalization measures the activeness of a country in the global financial market and represents the third aspect of financialization (*i.e.*, increased overseas financial activities). Data are collected from Lane and Milesi-Ferretti (2007).

In addition to financialization, three traditional measures of financial development are adopted, namely, the domestic credit provided by financial sectors to the private sector as a percent of GDP (private

³ The PURT results for these variables are presented in Appendix Table 1.

credit), the market capitalization of listed domestic companies (market capitalization), and the domestic shares traded divided by market capitalization (turnover ratio).

Private credit is a common measure of financial development (King and Levine 1993; Levine and Zervos 1998) that measures how much capital the financial system provides to the private sector. Market capitalization measures the general development of the stock market, whereas turnover ratio measures the activeness of stock trading and the relative trading frictions. Several studies show a significant correlation between growth and these variables, especially private credit and turnover ratio (King and Levine 1993; Levine and Zervos 1998; Beck and Levine 2004).

As previously mentioned, if the linear combination of non-stationary variables turns to be stationary, then these variables are “cointegrated.” In other words, these variables are closely related and do not diverge from their equilibrium relationship in the long run.

The basic estimation equation is as follows:

$$y_{it} = \alpha_i + \delta_i t + \beta' x_{it} + \gamma' z_{it} + \varepsilon_{it} \dots \quad (1)$$

where y_{it} denotes the dependent variable, which can be the log private GFCF per capita or log GDP per capita in country i and year t , and x_{it} denotes the financialization or financial development variables.

In the equation, z_{it} denotes a set of control variables that differ according to the dependent variables. For the investment equation, the control variables include savings rate, central government debt, lending interest rate by banks, and trade openness. Except for lending interest, all of these variables are expressed as percentages of GDP. These variables are traditional determinants of investment (Ndikumana, 2000) and are non-stationary as revealed in the PURT results in the following section. The other determinants of investment, including GDP growth and inflation, are not used here because of their stationarity⁴. The panel cointegration approach is robust to this omission as will be discussed later.

For the growth equation, the control variables include log private GFCF per capita, tertiary enrollment ratio, log triadic patent stock per

⁴ The PURT results for these variables are presented in Appendix Table 1.

million population, and trade openness, which represent the traditional production factors of physical capital, human capital, technology, and external factors, respectively. Tertiary enrollment ratio, instead of primary or secondary enrollment ratio, is used to measure human capital because most OECD countries have provided universal primary and secondary education since the 1980s.⁵ The triadic patent represents those patents that are filed at three major patent offices, namely, the European Patent Office, the Japan Patent Office, and the US Patent and Trademark Office.

α_i denotes the country fixed effect, $\delta_i t$ is a country-specific linear trend, β is the effect of financialization or financial development on investment or growth, and ε_{it} is an error term that is stationary if a cointegration relationship exists. If cointegration is present, then $(\beta', \gamma)'$ denotes the cointegrating vector.

The panel cointegration approach⁶ is used to study the long-run effects of financialization and financial development on investment and growth. By using this approach, endogeneity can be controlled given the existence of cointegration, whereas the long-run effect can be estimated. The direction of Granger causality of the long- or short-run effects can also be investigated by using a panel vector error-correction model (VECM).

The empirical estimation can be divided into four steps, namely, PURT, panel cointegration test, group-mean fully modified OLS (group-mean FMOLS), and panel VECM.

The first step tests whether the variables are stationary or non-stationary. Two widely used PURTs, namely, the Im, Pesaran, and Shin (2003) test (IPS) and the Pesaran (2007) test, are conducted. The IPS test uses the augmented Dickey–Fuller (ADF) test in the panel setting that allows a heterogeneous AR(1) coefficient. However, IPS tests assume the cross-sectional independence of the error term. Meanwhile, the existence of cross-sectional dependence in a variable is tested by performing the cross-section dependence (CD) test of Pesaran (2004). If a cross-sectional dependence exists, then the Pesaran (2007) test is conducted to allow the cross-sectional dependence of the error term.

⁵ The secondary enrolment ratio in 1980 was over 90% in 9 countries and over 80% in 21 countries among the 28 OECD countries with available data.

⁶ A similar approach was used in Shin (2019).

This test adds the cross-sectional averages of lagged levels and first differences to the ADF regression to control for the common effect in the error term. The null hypothesis of both the IPS and Pesaran (2007) tests is that the time series are non-stationary in all countries, whereas their alternative hypothesis is that the time series are stationary in at least one country.

In the second step, if the variables are non-stationary for all countries, then a panel cointegration test is performed to check for a cointegration relationship. This study performs the Pedroni (1995, 1997) cointegration test, which applies individual ADF regression for the residuals in each country. The null hypothesis is that cointegration does not exist, whereas the alternative hypothesis is that cointegration exists for all countries.

In the third step, if a cointegration relationship exists, then group-mean FMOLS is used to estimate the long-run coefficients. Developed by Pedroni (2001a, b), this approach has two advantages. First, its convergence rate is $T\sqrt{N}$, which is faster than the conventional \sqrt{N} convergence rate. Therefore, group-mean FMOLS has a better small sample property compared with traditional approaches. Second, group-mean FMOLS is robust to the omission of variables that are not included in the cointegrating relationship (Pedroni 2007). Therefore, omitting those stationary variables that can affect the dependent variable and be correlated to the finance variables will not present an issue if these variables are not part of the cointegrating relationship.

In the last step, panel VECM is applied to conduct Granger causality tests (Pesaran *et al.* 1999; Apergis and Payne 2009). The estimation equation is

$$\Delta w_{it} = \mu_i \hat{\varepsilon}_{it-1} + \sum_{j=1}^p \Theta_{ij} \Delta w_{it-j} + \tau_i + \xi_{it} \dots \tag{2}$$

If the number of independent variables is k , then equation (2) is a simple error-correction model, where w_{it} is the $((k + 1) \times 1)$ vector of all variables (including the dependent variable as the first element and the finance variable), $\hat{\varepsilon}_{it-1}$ is the estimated error correction term, and μ_i is the $((k + 1) \times 1)$ speed of adjustment vector of country i . The error correction term comes from the residual of the group-mean FMOLS regression and represents the error from a long-run relationship. Given that the long-run error term is estimated from the FMOLS regression,

the long-run relationship in Equation (2) does not need to be estimated as a conventional error-correction model.

In the equation, Θ_{ij} is the $((k + 1) \times (k + 1))$ matrix of short-run effect coefficients in country i and year $t-j$, τ_i is the $((k + 1) \times 1)$ vector of the country fixed effect, and ξ_{it} is the $((k + 1) \times 1)$ vector of the error term.

If the null hypothesis $H_0 : \mu_{1i} = 0, \forall i$ is rejected, then the dependent variable responds to the deviation from the long-run relationship of the previous year. In this case, the other variables are the Granger cause of the dependent variable in the long run. Similarly, the direction of the long-run Granger causality between variables can be identified by testing $H_0 : \mu_{2i} = 0, \forall i, \dots$.

A short-run Granger causality test can be conducted by estimating the $((k + 1) \times (k + 1))$ matrix $\Theta_{ij} = (\theta_{11}^j \dots \theta_{1(k+1)}^j \dots \theta_{(k+1)1}^j \dots \theta_{(k+1)(k+1)}^j)$. If the null hypothesis $H_0 : \theta_{12}^j = 0, \forall i, j$ is rejected, then the first independent variable is the Granger cause of the dependent variable in the short run because the first differences of the first independent variable in the previous years will affect the first difference of the dependent variable in the current year. The existence of other short-run effects can also be checked by testing the null hypothesis of each element of matrix Θ_{ij} . Therefore, the existence and direction of long- and short-run Granger causalities can be tested by using panel VECM. Given the limits in the length of time series, $p = 1$ is set in Equation (2), which uses two-year lags of variables.

IV. Estimation results

The PURT results are presented in the Appendix. The data coverage for each variable is the widest used in the following analysis. For example, given that trade openness is used in the investment and growth equations, any country that is used in these equations is also included in the PURT of trade openness. If the IPS or Pesaran (2007) tests do not reject the null hypothesis and one variable is non-stationary, then the smaller data coverage of this variable is also non-stationary because the null hypotheses in both tests posit that each time series of this variable is non-stationary. This approach reduces the burden on PURT because various specifications are used in the following analysis.

As shown in Appendix Table 2, the CD test reveals a cross-sectional dependence in all variables. The CD statistics are significant at the 1%

level for all variables. Therefore, the Pesaran (2007) test is performed instead of the IPS test for these variables. Test results show that the Pesaran (2007) statistics are insignificant regardless of the existence of a linear trend for most variables except for turnover ratio and trade

TABLE 2
PEDRONI PANEL COINTEGRATION TEST FOR LOG PRIVATE GFCF PER CAPITA

Finance variable Statistics	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio
Panel v-Statistic	0.25 (0.403)	3.03** (0.001)	3.64** (0.000)	0.57 (0.286)	2.75** (0.003)	2.51** (0.006)
Panel rho-Statistic	4.22 (1.000)	4.13 (1.000)	4.16 (1.000)	4.35 (1.000)	4.86 (1.000)	5.21 (1.000)
Panel PP-Statistic	-3.46** (0.000)	-0.20 (0.423)	0.50 (0.690)	0.28 (0.610)	0.98 (0.837)	2.07 (0.981)
Panel ADF-Statistic	-1.12 (0.132)	-1.73* (0.041)	0.39 (0.652)	0.54 (0.706)	0.44 (0.668)	1.95 (0.975)
Group rho-Statistic	6.71 (1.000)	6.70 (1.000)	6.43 (1.000)	6.25 (1.000)	6.92 (1.000)	7.45 (1.000)
Group PP-Statistic	-9.50** (0.000)	-3.20** (0.001)	-6.15** (0.000)	-9.83** (0.000)	-7.20** (0.000)	-6.72** (0.000)
Group ADF-Statistic	-2.04* (0.021)	-2.43** (0.008)	-1.46 (0.072)	-1.66* (0.048)	-1.98* (0.024)	-1.89* (0.030)
Number of countries	20	27	24	27	25	25
Number of obs. per country	13.70	21.30	20.25	20.33	19.08	18.92
Period	1983-2010	1981-2010	1981-2009	1981-2010	1981-2010	1981-2010

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; p-value is enclosed in parentheses.
- 2) Null hypothesis: No cointegration.
- 3) Four variables (savings rate, lending interest rate, central government debt, and trade openness), linear country-specific trends, and fixed effects are controlled.
- 4) Use d.f. corrected Dickey-Fuller residual variances.
- 5) Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length.
- 6) Newey-West automatic bandwidth selection and Bartlett kernel.

openness. Pesaran (2007) statistics are also insignificant for turnover ratio and trade openness if linear trends are included. Given that the

TABLE 3
PEDRONI PANEL COINTEGRATION TEST FOR LOG GDP PER CAPITA

Finance variable	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio	None
Panel v-Statistic	4.69** (0.000)	3.86** (0.000)	2.89** (0.002)	4.07** (0.000)	0.02 (0.491)	0.09 (0.463)	5.75** (0.000)
Panel rho-Statistic	5.00 (1.000)	4.16 (1.000)	4.73 (1.000)	4.01 (1.000)	4.09 (1.000)	4.05 (1.000)	2.40 (0.992)
Panel PP-Statistic	0.01 (0.503)	-1.20 (0.114)	1.83 (0.967)	0.24 (0.593)	-0.26 (0.398)	-1.06 (0.145)	-2.03* (0.021)
Panel ADF-Statistic	-0.94 (0.172)	-1.00 (0.159)	0.47 (0.682)	0.23 (0.589)	-0.17 (0.434)	-0.97 (0.166)	-2.03* (0.021)
Group rho-Statistic	6.95 (1.000)	5.78 (1.000)	6.87 (1.000)	5.98 (1.000)	6.51 (1.000)	6.46 (1.000)	4.71 (1.000)
Group PP-Statistic	-5.15** (0.000)	-3.31** (0.001)	-3.28** (0.001)	-1.61 (0.053)	-6.75** (0.000)	-5.33** (0.000)	-2.14* (0.016)
Group ADF-Statistic	-1.94* (0.026)	-1.95* (0.025)	-1.40 (0.081)	-0.71 (0.238)	-1.77* (0.038)	-2.61** (0.005)	-1.02 (0.155)
Number of countries	24	30	28	30	28	28	30
Number of obs. per country	16.92	24.30	19.64	22.87	21.04	20.82	24.47
Period	1986-2013	1986-2013	1986-2009	1986-2013	1986-2013	1986-2013	1986-2013

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; p-value is enclosed in parentheses.
- 2) Null hypothesis: No cointegration.
- 3) Four variables (log private GFCF per capita, tertiary enrolment, log triadic patent stock per million population, and trade openness), linear country-specific trends, and fixed effects are controlled.
- 4) Use d.f. corrected Dickey-Fuller residual variances.
- 5) Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length.
- 6) Newey-West automatic bandwidth selection and Bartlett kernel.

country-specific linear time trend is used as a default control variable, this paper considers these variables as non-stationary with caution in the following analysis.

The table 2, 3 show the cointegration test results for the variables in the investment and growth equations.

One finance variable is included with the control variables, fixed effect, and country-specific linear trends for one specification, and this finance variable is changed across specifications due to the restrictions on the number of independent variables in the Pedroni cointegration test. Seven test statistics are available, and each statistic can produce different results regarding the existence of cointegration. Therefore, a criterion that identifies the existence of a cointegration relationship must be set. To this end, this paper adopts two criteria. First, if 4 test statistics (out of 7) or more are statistically significant, then cointegration is present. Second, if one of the “panel” statistics and one of the “group” statistics⁷ are statistically significant at the same time, then a cointegration is present⁸.

When log private GFCF per capita is the dependent variable in Table 2, a cointegration relationship exists in the specifications that include distributed income of corporations, financial globalization, finance and insurance share, market capitalization, or turnover ratio. When log GDP per capita is the dependent variable in Table 3, a cointegration relationship exists in the specifications that include distributed income of corporations, financial globalization, or finance and insurance share. However, no specification satisfies the first criterion. Moreover, 4 test statistics are statistically significant in the specification without the finance variable in the last column of Table 3.

The following table shows the group-mean FMOLS results for the variables in the investment equation.

⁷ “Panel” statistics are within-dimension-based statistics, and “group” statistics are between-dimension-based statistics. See Pedroni (1999).

⁸ The author thanks an anonymous reviewer for his suggestion about the second criterion.

TABLE 4
PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE INVESTMENT EQUATION

Regression number	(1)	(2)	(3)	(4)	(5)
Variable	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.
Distributed income of corporations ($\hat{\beta}_1$)	-0.001 (0.002)				
Financial globalization ($\hat{\beta}_2$)		-0.0015** (0.0003)			
Finance and insurance share ($\hat{\beta}_3$)			0.003 (0.008)		
Market capitalization ($\hat{\beta}_4$)				-0.001 (0.001)	
Turnover ratio ($\hat{\beta}_5$)					0.000 (0.001)
Savings rate ($\hat{\gamma}_1$)	0.011** (0.003)	0.021** (0.002)	0.025** (0.002)	0.030** (0.002)	0.034** (0.003)
Lending interest rate ($\hat{\gamma}_2$)	-0.004 (0.004)	-0.001 (0.003)	-0.006 (0.003)	0.001 (0.004)	0.001 (0.004)
Central government debt ($\hat{\gamma}_3$)	-0.028** (0.001)	-0.021** (0.001)	-0.015** (0.001)	-0.006** (0.001)	-0.006** (0.001)
Trade openness ($\hat{\gamma}_4$)	0.003** (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)
Number of observations per country	13.7	21.3	20.3	19.1	18.9
Number of observations	274	575	486	477	473
Number of countries	20	27	24	25	25
Period	1983-2010	1981-2010	1981-2009	1981-2010	1981-2010

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

Table 4 presents the estimation results for those specifications where a cointegration relationship exists. Linear country-specific trends and fixed effects are also controlled in the regression. Financial globalization is negatively correlated to log private GFCF per capita in the long run in regression number (2) of Table 4. Financial globalization is significant and negative at the 1% significance level, thereby indicating that a 1

TABLE 5
 PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE GROWTH EQUATION

Regression number	(1)	(2)	(3)	(4)
Variable	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.
Distributed income of corporations ($\hat{\beta}_1$)		0.002* (0.001)		
Financial globalization ($\hat{\beta}_2$)			0.000 (0.000)	
Finance and insurance share ($\hat{\beta}_3$)				-0.005 (0.003)
Log private GFCF per capita ($\hat{\gamma}_1$)	0.243** (0.014)	0.205** (0.020)	0.258** (0.013)	0.242** (0.015)
Tertiary enrolment ratio ($\hat{\gamma}_2$)	0.000 (0.001)	-0.005** (0.001)	0.000 (0.001)	0.001 (0.001)
Log triadic patent stock per million populations ($\hat{\gamma}_3$)	0.022 (0.017)	0.189** (0.030)	0.039 (0.023)	0.021 (0.017)
Trade openness ($\hat{\gamma}_4$)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.002** (0.000)
Number of observations per country	24.5	16.9	24.3	19.6
Number of observations	734	406	728	550
Number of countries	30	24	30	28
Period	1986-2013	1986-2013	1986-2013	1986-2013

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

percentage point increase in financial globalization corresponds to a 0.15% decrease in private GFCF per capita in the long run. The share of central government debt in GDP is negative and significant, that of savings rate is positive and significant, and those of trade openness and lending interest rate are not statistically significant. Meanwhile, the other finance variables are not statistically significant in the other specifications, thereby suggesting that financial globalization, instead of other financialization or financial development, has a significant long-run relationship with private investment.

The table 5 shows the group-mean FMOLS results for the variables in the growth equation.

The estimation results for the specifications in Table 5 suggest the presence of a cointegration relationship. Regression number (1) has no finance variable. In this model, log private investment per capita is positively and significantly correlated with log GDP per capita in the long run. A 1% increase in private investment per capita corresponds to a 0.24% increase in GDP per capita in the long run. The other variables show the expected positive coefficient even though only trade openness is statistically significant.

In regression number (2), the distributed income of corporations is significant and positive with log GDP per capita at the 5% level, which can be ascribed to the positive effect of dividend payments on growth or to the increased dividend payments resulting from a higher GDP per capita. This hypothesis will be tested via panel VECM in the following section. Financial globalization or finance and insurance share are not statistically significant in regression numbers (3) and (4) of Table 5.

The estimation results in Tables 4 and 5 imply that financial globalization has an indirect effect on GDP per capita because the former is negatively correlated with private investment per capita, which in turn is positively correlated with GDP per capita. If the two coefficients in regression number (2) of Table 4 and regression number (1) of Table 5 are multiplied, then a 1 percentage point increase in financial globalization corresponds to a 0.036% decrease in GDP per capita in the long run.

The panel VECM results for log private GFCF per capita in regression number (2) of Table 4 are presented as follows.

TABLE 6
 PANEL VECM RESULTS FOR LOG PRIVATE GFCF PER CAPITA

Dependent variable	Source of causation (independent variables)						
	Long-run	Short-run					
	L.ECT ($H_0 : \mu_{mi} = 0, \forall i$)	L. Δ Log private GFCF per capita ($H_0 : \mu_{m1}^i = 0, \forall i$)	L. Δ Financial globalization ($H_0 : \mu_{m2}^i = 0, \forall i$)	L. Δ Saving rate ($H_0 : \mu_{m3}^i = 0, \forall i$)	L. Δ Lending interest ($H_0 : \mu_{m4}^i = 0, \forall i$)	L. Δ Central government debt ($H_0 : \mu_{m5}^i = 0, \forall i$)	L. Δ Trade openness ($H_0 : \mu_{m6}^i = 0, \forall i$)
Δ Log private GFCF per capita ($m=1$)	2.58** (0.000)	2.85** (0.000)	4.29** (0.000)	2.09** (0.001)	3.04** (0.000)	1.43 (0.078)	2.02** (0.002)
Δ Financial globalization ($m=2$)	0.41 (0.996)	0.63 (0.928)	1.42 (0.084)	2.34** (0.000)	0.38 (0.998)	0.64 (0.922)	0.30 (1.000)
Δ Savings rate ($m=3$)	0.90 (0.613)	1.12 (0.314)	2.62** (0.000)	1.32 (0.137)	1.98** (0.003)	1.47 (0.063)	1.81** (0.009)
Δ Lending interest ($m=4$)	2.71** (0.000)	5.36** (0.000)	1.01 (0.457)	0.67 (0.893)	3.19** (0.000)	11.32** (0.000)	3.04** (0.000)
Δ Central government debt ($m=5$)	5.54** (0.000)	1.62* (0.028)	3.66** (0.000)	0.85 (0.677)	2.97** (0.000)	3.91** (0.000)	1.50 (0.055)
Δ Trade openness ($m=6$)	1.51 (0.053)	1.68* (0.019)	3.55** (0.000)	1.69* (0.019)	1.88** (0.006)	1.83** (0.008)	0.81 (0.744)

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively.
- 2) Wald statistics are presented, p-value is enclosed in parentheses.
- 3) Error correction term (ECT) comes from the residual of group-mean FMOLS with a country-specific linear trend in regression number (2) of Table 4.
- 4) 27 countries from 1982 to 2011.
- 5) Owing to the limited time series length, $p = 1$ is set in Equation (2), which uses two-year lags of variables. Therefore, the j subscript is not necessary in Equation (2), and the null hypothesis of short-run Granger causality does not include the j subscript.
- 6) m denotes the row number of vector μ_i and matrix θ_i in Equation (2).

Table 6 shows the Wald statistics and their p-value in parentheses. Estimation results suggest that the null hypothesis $H_0 : \mu_{1i} = 0, \forall i$ is rejected at the 1% significance level (F stat.=2.58), which indicates that log private GFCF per capita responds to a deviation from the long-run

relationship of the previous year, thereby supporting the results of the panel cointegration test and group-mean FMOLS in Tables 2 and 4. However, the null hypothesis $H_0 : \mu_{2i} = 0, \forall i$ cannot be rejected even at the 10% significance level (F stat.=0.41), thereby suggesting that financial globalization does not respond to the deviation from the long-run relationship of the previous year. These results altogether suggest a unilateral Granger causality from financial globalization to private investment in the long run.⁹

For the short-run effect, the null hypothesis $H_0 : \theta_{12}^i = 0, \forall i$ is rejected at the 1% level (F stat. = 4.29), whereas the null hypothesis $H_0 : \theta_{21}^i = 0, \forall i$ cannot be rejected even at the 10% significance level (F stat.=0.63). These findings also suggest a unilateral short-run Granger causality from financial globalization to log private GFCF per capita.

The panel VECM results for log GDP per capita in regression number (2) of Table 5 are presented as follows.

Estimation results suggest that neither null hypothesis $H_0 : \mu_{1i} = 0, \forall i$ nor $H_0 : \mu_{2i} = 0, \forall i$ is rejected even at the 10% significance level (F stat.=0.73 and 0.52), which suggests that the previous FMOLS results, which reveal a long-run significant relationship between dividend payments and growth, are not supported by panel VECM results¹⁰. Similarly, neither the null hypothesis $H_0 : \theta_{12}^i = 0, \forall i$ nor $H_0 : \theta_{21}^i = 0, \forall i$ is rejected (F stat. = 0.76 and 1.33), thereby rejecting a short-run Granger causality. This result may be ascribed to the relatively short time series in Table 7¹¹. However, given that these results are not robust, this paper focuses on the significant long-run relationship between financial globalization and private investment in the following robustness checks.

V. Robustness checks

Various robustness checks are conducted in this section. First, the nonlinear relationship between financial development or financialization

⁹ Country-specific estimation results for the lagged ECT term in the panel VECM for investment equation are presented in Appendix Table 7.

¹⁰ Country-specific estimation results for the lagged ECT term in the panel VECM for growth equation are presented in Appendix Table 8.

¹¹ The average number of observations per country is 16.9 in Table 7 and 21.3 in Table 6.

TABLE 7
 PANEL VECM RESULTS FOR LOG GDP PER CAPITA

Dependent variable	Source of causation (independent variables)						
	Long-run			Short-run			
	L.ECT ($H_0 : \mu_{mi} = 0, \forall i$)	L. Δ Log GDP per capita ($H_0 : \theta_{m1}^i = 0, \forall i$)	L. Δ Distributed income of corporations ($H_0 : \theta_{m2}^i = 0, \forall i$)	L. Δ Log private GFCF per capita ($H_0 : \theta_{m3}^i = 0, \forall i$)	L. Δ Tertiary enrolment ratio ($H_0 : \theta_{m4}^i = 0, \forall i$)	L. Δ Log triadic patent stock per million populations ($H_0 : \theta_{m5}^i = 0, \forall i$)	L. Δ Trade openness ($H_0 : \theta_{m6}^i = 0, \forall i$)
Δ Log GDP per capita ($m=1$)	0.73 (0.820)	0.40 (0.995)	0.76 (0.779)	0.88 (0.636)	0.89 (0.622)	0.85 (0.666)	0.90 (0.606)
Δ Distributed income of corporations ($m=2$)	0.52 (0.969)	1.33 (0.148)	2.96** (0.000)	0.82 (0.714)	1.20 (0.248)	0.70 (0.849)	0.51 (0.972)
Δ Log private GFCF per capita ($m=3$)	0.79 (0.742)	0.71 (0.838)	1.75* (0.021)	1.44 (0.093)	1.35 (0.138)	0.86 (0.651)	1.16 (0.286)
Δ Tertiary enrolment ratio ($m=4$)	1.93** (0.008)	1.48 (0.078)	0.46 (0.987)	0.38 (0.997)	2.15** (0.002)	1.00 (0.470)	1.08 (0.365)
Δ Log triadic patent stock per million populations ($m=5$)	6.41** (0.000)	0.85 (0.672)	0.80 (0.737)	1.67* (0.030)	1.53 (0.059)	5.65** (0.000)	0.61 (0.927)
Δ Trade openness ($m=6$)	0.68 (0.864)	1.70* (0.026)	1.20 (0.241)	1.04 (0.421)	0.67 (0.879)	0.86 (0.655)	1.60* (0.043)

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively.
- 2) Wald statistics are presented, p-value is enclosed in parentheses.
- 3) Error correction term (ECT) comes from the residual of group-mean FMOLS with a country-specific linear trend in regression number (2) of Table 5.
- 4) 24 countries from 1987 to 2014.
- 5) Owing to the limited time series length, $p = 1$ is set in Equation (2), which uses two-year lags of variables. Therefore, the j subscript is not necessary in Equation (2), and the null hypothesis of short-run Granger causality does not include the j subscript.
- 6) m denotes the row number of vector μ_i and matrix θ_i in Equation (2).

and investment or growth is considered. The square term of financial development or financialization variables is added in the specifications

of Tables 2 and 3, and the presence of a cointegration relationship among the finance variable, its square term, and the dependent variables is tested given the same control variables, fixed effects, and linear trend. However, the results of cointegration tests suggest that such relationship does not exist.¹²

Second, IMF financial development indices are considered new measures for financial development (Sviryzdenka 2016; Sahay *et al.* 2015). These indices measure the three dimensions of the financial system, namely, access, depth, and efficiency of financial institutions and markets. Nine indices are used, including four financial institution indices (access, depth, efficiency of financial institutions, and overall index of financial institutions), four financial market indices (access, depth, efficiency of financial markets, and overall index of financial markets), and one overall index of financial development. PURT results suggest that the nine IMF financial development indices are non-stationary.¹³ The cointegration of these indicators or their linear and square terms to investment or growth is then tested given the same control variables, fixed effects, and linear trend shown in Tables 2 and 3. Results highlight a cointegration relationship in some specifications.¹⁴ Table 8 shows the FMOLS regression results in these cointegrated specifications when the dependent variable is log private GFCF per capita.

In regression number (1), the financial market access index¹⁵ is cointegrated to investment and is statistically significant and positive at the 5% level. Therefore, accessibility in the financial market, such as the stock or bond market, is an important factor for private investment for fixed capital. In regression number (2), the linear term of the financial market depth index¹⁶ is cointegrated to investment but is statistically

¹² Results of the cointegration test are available upon request.

¹³ Results of PURT are available upon request.

¹⁴ Results of the cointegration test are available upon request.

¹⁵ This normalized measure uses the percent of market capitalization outside of top 10 largest companies and the total number of issuers of debt for domestic and external, non-financial, and financial corporations (Sviryzdenka 2016).

¹⁶ This normalized measure uses stock market capitalization to GDP, stocks traded to GDP, international debt securities of government to GDP, total debt securities of financial corporations to GDP, and total debt securities of non-financial corporations to GDP (Sviryzdenka 2016).

TABLE 8

PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE INVESTMENT EQUATION USING IMF FINANCIAL DEVELOPMENT INDICES

Regression number	(1)	(2)	(3)	(4)	(5)
Variable	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.
Financial globalization ($\hat{\beta}_1$)					-0.0015** (0.0004)
Financial market access index ($\hat{\beta}_2$)	0.167* (0.073)				0.230** (0.079)
Financial market depth index ($\hat{\beta}_3$)		-0.050 (0.063)	3.177* (1.439)		3.387 (2.020)
Square of financial market depth index ($\hat{\beta}_4$)			-4.114** (1.461)		-4.911** (1.821)
Financial market index ($\hat{\beta}_5$)				-0.411 (0.651)	
Square of financial market index ($\hat{\beta}_6$)				0.359 (1.024)	
Savings rate ($\hat{\gamma}_1$)	0.022** (0.002)	0.022** (0.002)	0.022** (0.002)	0.022** (0.002)	0.023** (0.003)
Lending interest rate ($\hat{\gamma}_2$)	-0.003 (0.003)	-0.001 (0.003)	-0.001 (0.003)	0.000 (0.004)	
Central government debt ($\hat{\gamma}_3$)	-0.020** (0.001)	-0.021** (0.001)	-0.023** (0.001)	-0.020** (0.002)	-0.023** (0.002)
Trade openness ($\hat{\gamma}_4$)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	
Number of observations per country	21.3	21.3	21.3	21.3	22.4
Number of observations	575	575	575	575	606
Number of countries	27	27	27	27	27
Period	1981-2010	1981-2010	1981-2010	1981-2010	1981-2010

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

insignificant. However, when the square term of the financial market depth index is added in regression number (3), the linear term becomes significant and positive, but the square term is significant and negative to investment. Therefore, an inverted U-shaped relationship is revealed

between financial market depth and investment, which is in line with the findings of recent studies that highlight a non-linear relationship between financial development and growth (Cecchetti and Kharroubi 2012; Manganelli and Popov 2013; Ductor and Grechyna 2015; Arcand *et al.* 2015). Given that financial market depth has improved to some degree, some funds can be provided to the private sector. However, if the financial market depth is too high, such as during a stock market bubble, then the private investment for fixed capital may decrease in the long run because much of the internal funds for firms may be sucked into the financial market. Furthermore, an excessive financial market depth may increase financial instability¹⁷, thereby affecting investment in the long run. The axis of symmetry is at 0.39, which is similar to the median of the financial market depth index (0.38) in the sample. In regression number (4), the linear and square terms of the overall financial market index are cointegrated to investment but are not statistically significant.

In regression number (5), all variables, including financial globalization, that show significant effects on investment in Tables 4 and 8 are considered. Results are similar to what was previously reported. The coefficient of financial globalization is the same as that shown in Table 4 and is statistically significant and negative at the 1% level. Financial market access and depth index are also statistically significant and positive at the 1% level, but the linear term of financial market depth index is statistically significant and positive at the 10% level. Therefore, the estimated effect of financial globalization is robust even when considering the IMF financial development indices. Table 9 shows the FMOLS regression results when the dependent variable is log GDP per capita.

Similar to Table 8, cointegration test results¹⁸ suggest that finance variables are cointegrated to log GDP per capita in all specifications in Table 9. In regression number (1), the linear term of the overall financial development index is statistically significant and positive, but the square term is statistically significant and negative. These results also suggest an inverted U-shaped relationship between financial development and

¹⁷ Ductor and Grechyna (2015) argued that one source of financial instability is the unbalanced growth between rapid financial development (*e.g.*, expansion of private credit) and slow real output growth.

¹⁸ Results of the cointegration test are available upon request.

TABLE 9
 PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE GROWTH EQUATION USING IMF
 FINANCIAL DEVELOPMENT INDICES

Regression number	(1)	(2)	(3)
Variable	Coef./S.E.	Coef./S.E.	Coef./S.E.
Overall financial development index ($\hat{\beta}_1$)	3.468** (1.240)		
Square of overall financial development index ($\hat{\beta}_2$)	-2.340* (0.910)		
Financial institution index ($\hat{\beta}_3$)		1.829 (1.524)	
Square of financial institution index ($\hat{\beta}_4$)		-0.795 (0.924)	
Financial market access index ($\hat{\beta}_5$)			1.299** (0.357)
Square of financial market access index ($\hat{\beta}_6$)			-2.113** (0.628)
Log private GFCF per capita ($\hat{\gamma}_1$)	0.235** (0.012)	0.236** (0.011)	0.214** (0.014)
Tertiary enrolment ratio ($\hat{\gamma}_2$)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Log triadic patent stock per million populations ($\hat{\gamma}_3$)	0.013 (0.014)	0.023 (0.018)	0.019 (0.026)
Trade openness ($\hat{\gamma}_4$)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Number of observations per country	24.5	24.5	24.4
Number of observations	734	734	707
Number of countries	30	30	29
Period	1986-2013	1986-2013	1986-2013

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

log GDP per capita in the long run. As Ductor and Grechyna (2015) summarized, financial innovations and financial liberalization may increase systemic risk¹⁹, which in turn affects economic growth in the

¹⁹ For example, financial innovations in the 1990s, such as the credit default

long run. In regression number (2), the linear and square terms of financial institution indices²⁰ are cointegrated to log GDP per capita but are not statistically significant. In regression number (3), the linear term of the financial market access index is statistically significant and positive, but its square term is statistically significant and negative to log GDP per capita at the 1% level. These results are interesting because this index has a statistically significant and positive relationship with investment as shown in Table 8. Improving accessibility to the financial market can increase private investments for fixed capital, whereas an excessively high level of accessibility may increase financial instability or systemic risk because the affected number of economic agents may increase along with accessibility when a financial crisis occurs.

Estimation results in Tables 3 and 9 suggest that the linear terms of financial development measures, such as private credit or IMF financial development indices without square terms, are not cointegrated to log GDP per capita in the long run. These findings contradict those reported in the literature, such as King and Levine (1993) and Beck and Levine (2004), and may be ascribed to the differences in their estimation periods. Specifically, in this paper, the estimation period for the cointegration test ranges from the 1980s to the 2010s, whereas King and Levine (1993) and Beck and Levine (2004) used 1960 to 1989 and 1975 to 1998 as their estimation periods, respectively. Recent studies show that the positive correlation between financial development and growth has been weakened since the 1970s (De Gregorio and Guidotti, 1995). Arcand *et al.* (2015) found an insignificant correlation between private credit and growth in the 1960–2005 and 1960–2010 samples but also reported significant correlations in the 1960–1995 and 1960–2000 samples. The sample for the cointegration test in this paper includes OECD countries from the 1980s to 2010s, during which many countries have already achieved a sufficiently high level of financial development. Therefore, an inverted U-shape relationship between financial development and growth may be stronger than the linear relationship for the previous period.

Third, log gross national income (GNI) per capita is used as another

swap and collateralized debt obligation, eventually contributed to the occurrence of the global financial crisis (Coval *et al.* 2009).

²⁰ This indicator reflects the overall development of financial institutions, such as banks, pension funds, mutual funds, and insurance companies.

measure of development to consider the capital income inflow from overseas resulting from financial globalization. If financial globalization can increase overseas capital income, then a positive correlation may be observed between financial globalization and log GNI per capita given the domestic investment for fixed capital. The GNI data are collected from the World Bank and are measured in constant 2010 US dollars. Results of the panel unit root test and cointegration test suggest that log GNI per capita is non-stationary and is cointegrated to financial globalization and other control variables in the same specifications used in regression number (2) of Table 4.²¹ Table 10 shows the FMOLS regression results when the dependent variable is log GNI per capita.

Estimation results suggest that financial globalization is not

TABLE 10
 PEDRONI GROUP-MEAN FMOLS RESULTS WHEN THE DEPENDENT VARIABLE IS THE LOG
 GNI PER CAPITA

Variable	Coef./S.E.
Financial globalization ($\hat{\beta}$)	0.000 (0.000)
Log private GFCF per capita ($\hat{\gamma}_1$)	0.232** (0.008)
Tertiary enrolment ratio ($\hat{\gamma}_2$)	0.002** (0.000)
Log triadic patent stock per million populations ($\hat{\gamma}_3$)	0.076** (0.017)
Trade openness ($\hat{\gamma}_4$)	0.000 (0.000)
Number of observations per country	23.2
Number of observations	673
Number of countries	29
Period	1986-2013

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

²¹ Results of PURT and the cointegration test are available upon request.

significantly correlated with log GNI per capita in the long run. This result is similar to that in regression number (3) of Table 5 and presents little evidence to support that financial globalization is correlated to growth by overseas capital income inflow. Therefore, financial globalization affects growth but only through investment, which is similar to the results shown in Tables 4 and 5.

As a final robustness check, other control variables, such as exchange rate volatility and financial crisis, are considered to check whether the relationship between financial globalization and investment is robust even if these variables are controlled²². Financial crisis data are taken from Laeven and Valencia (2018), and three variables for financial crisis are used, namely, a dummy for banking crisis, the peak share of non-performing loans (NPLs) among total loans during the banking crisis, and a financial crisis variable that takes a value of 0, 1, 2, or 3, which corresponds to the number of financial crises in a specific year, including banking, currency, and sovereign crises²³. For exchange rate volatility, the monthly real effective exchange rate (REER) data from IMF IFS database are used. The measure for volatility is the annual standard deviation of monthly REER for each year.

However, results of the panel PURTs suggest that all these variables are stationary. Most of the IPS and Pesaran (2007) statistics strongly reject the null hypothesis of the non-stationarity of these variables²⁴. Furthermore, adding these variables to regression number (2) of Table 4 weakens the results of the cointegration test, and no cointegration relationship is observed between the dependent and independent variables given the financial crisis or the exchange rate volatility variable²⁵. Similar to what was described in Section III, omitting the stationary variables does not pose a problem for the panel cointegration approach if these variables are not part of a cointegrating relationship because the omitted variable bias goes to zero asymptotically. Therefore, omitting these variables may not pose a problem. Nevertheless, whether or not the results of the group-mean FMOLS change after including these variables is also checked. However, results in Table

²² The author thanks an anonymous reviewer for the comments.

²³ See Laeven and Valencia (2018) for a detailed definition of each crisis.

²⁴ Results of PURTs are presented in Appendix Table 3.

²⁵ Results of the cointegration test are available upon request.

TABLE 11
 PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE INVESTMENT EQUATION USING
 FINANCIAL CRISIS AND EXCHANGE RATE VOLATILITY MEASURES

Variable	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.	Coef./S.E.
Financial globalization ($\hat{\beta}$)	-0.0015** (0.0003)	-0.0015** (0.0003)	-0.0015** (0.0003)	-0.0015** (0.0003)	-0.0010** (0.0003)
Savings rate ($\hat{\gamma}_1$)	0.021** (0.002)	0.023** (0.002)	0.023** (0.002)	0.023** (0.002)	0.016** (0.003)
Lending interest rate ($\hat{\gamma}_2$)	-0.001 (0.003)	0.005* (0.002)	0.005* (0.002)	0.005* (0.002)	0.002 (0.004)
Central government debt ($\hat{\gamma}_3$)	-0.021** (0.001)	-0.007** (0.001)	-0.007** (0.001)	-0.007** (0.001)	-0.008** (0.001)
Trade openness ($\hat{\gamma}_4$)	0.001 (0.001)	0.004** (0.001)	0.004** (0.001)	0.004** (0.001)	0.006** (0.001)
Banking crisis dummy ($\hat{\gamma}_5$)		-0.052** (0.014)			
Peak NPLs share among total loans at banking crisis ($\hat{\gamma}_6$)			0.000 (0.003)		
Financial crisis ($\hat{\gamma}_7$)				-0.034** (0.011)	
Annual SD of monthly REER ($\hat{\gamma}_8$)					0.002 (0.004)
Number of observations per country	21.3	22.9	22.9	22.9	16.9
Number of observations	575	457	457	457	423
Number of countries	27	20	20	20	25
Period	1981- 2010	1981- 2010	1981- 2010	1981- 2010	1991- 2010

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Linear country-specific trends and fixed effects are controlled.
- 3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

11 indicate that the estimation results are almost the same and that financial globalization is negative and significant. Estimation results are presented as follows.

Even though this paper has focused on estimating the common cointegrating vector $(\beta', \gamma)'$ in the equation (1) or the average of the heterogeneous cointegrating vector by group-mean FMOLS, country-

specific FMOLS results are also available. Appendix Table 6 shows the country-specific FMOLS results for the investment equation. The average of country-specific FMOLS estimates is the same as the group-mean FMOLS estimates in regression number (2) of Table 4. A total of 19 countries have negative FMOLS estimates, whereas 8 countries have positive estimates. Even though country-specific FMOLS regression has low power due to the small number of observations for each country, Spain, Israel, Germany, Japan, and the Netherlands show significant negative relationships between financial globalization and private investment in the long run, whereas Switzerland and Greece show a significant positive relationship.

Two interesting points can be derived from these results. First, a significant negative relationship between financial globalization and private investment is observed among European and East Asian countries, such as Spain, Germany, Japan, and the Netherlands, rather than among Anglo-Saxon countries, such as the USA and the UK. Lee and Shin (2021) argued that several European and East Asian countries, such as Germany, Japan, and Korea, shifted to a capitalism type similar to that of Liberal Market Economies (LME) since the 2000s. This change may affect the negative relationship between financial globalization and private investment in these countries because the negative effect of financial globalization may be stronger during the transitional period. Moreover, the rapid increase of financial globalization in non-LME countries may have a stronger negative effect compared with that in LME countries because the latter countries, such as the UK, have a longer history of financial globalization compared with the former ones.

Second, the positive relationship between financial globalization and private investment observed for Switzerland may reflect a large inflow of financial capital due to the secrecy of Swiss banks. Meanwhile, the positive relationship observed in Greece may reflect a large capital inflow from other European countries and an investment boom since the entry of this country into the Eurozone in 2001. However, these arguments are purely conjectures that warrant further research.

VI. Conclusion

In this paper, the long-run relationship among financialization, financial development, investment, and growth is investigated by using

the panel cointegration approach.

Estimation results reveal a negative significant correlation between financial globalization and investment in OECD countries in the long run. A unilateral Granger causality from financial globalization to investment is also observed, which suggests that increasing international financial investment may crowd out the domestic investment in developed countries in the long run. An inverted U-shaped relationship between financial development measures and investment or growth is also observed in recent studies.

According to Shin and Lee (2019), since the 1970s, the dividend tendency in non-financial corporations is positively correlated to the top 10% income share among OECD countries. This paper also suggests that financial globalization, which is another aspect of financialization, may explain the decreasing investment rate for fixed capital in OECD countries since the 1980s. Therefore, the financialization of societies in developed countries may be important given that such financialization is related to the two fundamental problems of modern capitalism, that is, increasing inequality and decreasing investments. The internal aspect of financialization affects income distribution, whereas its external aspect affects investment for fixed capital.

A possible policy implication is that a proper regulation for capital movement or a differentiated taxation between domestic investment for fixed capital and overseas financial investment may be necessary to increase the domestic investment for fixed capital instead of overseas financial investment.

While this paper uses OECD country data starting from the 1970s, additional countries or time series data must be considered in future studies that aim to conduct a more powerful panel cointegration analysis. If sufficient time series data are available, then the country-specific effects on various outcomes can be investigated or the power of panel VECM may be increased in future research. Firm-level analyses, such as those of Alvarez (2015) and Orhangazi (2008), can be conducted in future research to understand the effect of the financial system at the micro level.

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Appendix

APPENDIX TABLE 1

PANEL UNIT ROOT TEST (PURT) FOR GROWTH RATE OF GDP PER CAPITA, GROSS CAPITAL FORMATION (GCF, % OF GDP), AND INFLATION

Variables	Test	Pesaran (2007)				Pesaran (2007)				Pesaran (2004) CD test
		IPS	lags=0 lags=1 lags=2			IPS	lags=0 lags=1 lags=2			
			With intercept				With intercept and trend			
GDP growth	-19 (0.000)	-15.4 (0.000)	-9.6 (0.000)	-4.5 (0.000)	-16.2 (0.000)	-13.6 (0.000)	-8.2 (0.000)	-2.8 (0.000)	32.28 (0.000)	
GCF	-4.9 (0.000)	-2.81 (0.002)	-3.98 (0.000)	-1.34 (0.091)	-4.8 (0.000)	-1.79 (0.037)	-2.9 (0.002)	-0.3 (0.381)	29.5 (0.000)	
Inflation	-7.6 (0.000)	-6.19 (0.000)	-4.67 (0.000)	-3.03 (0.001)	-7.6 (0.000)	-4.78 (0.000)	-2.89 (0.002)	-1.27 (0.102)	57.93 (0.000)	

Note:

- 1) Data: GDP growth, GCF: 34 countries, 1970-2007, inflation: 27 countries, 1975-2010
- 2) p-value is enclosed in parentheses.
- 3) Null hypothesis: Variable is non-stationary.
- 4) IPS: Lag length selection based on SIC, maximum lag length is observation based, Newey-West automatic bandwidth selection and Bartlett kernel.
- 5) Source: Growth rate of GDP per capita: Penn World Table 9.0, GCF, Inflation: World Bank.

APPENDIX TABLE 2

PURT RESULTS

Variable	Test	IPS	Pesaran (2007)	IPS	Pesaran (2007)	Pesaran (2004)	Number of countries	Period
		With intercept		With intercept and trend		CD test		
Finance and insurance share		-0.94 (0.174)	0.36 (0.642)	-2.23 (0.013)	1.57 (0.942)	18.47 (0.000)	28	1972-2009
Financial globalization		8.89 (1.000)	-1.06 (0.144)	-0.12 (0.452)	1.56 (0.94)	98.42 (0.000)	30	1971-2013
Distributed income of corporations		-3.29 (0.001)	-0.16 (0.436)	-3.48 (0.000)	0.82 (0.795)	4.01 (0.000)	25	1979-2013
Private credit		2.87 (0.998)	1.43 (0.924)	1.94 (0.974)	4.57 (1.000)	72.32 (0.000)	34	1971-2014
Market capitalization		-4.32 (0.000)	-0.2 (0.421)	-6.12 (0.000)	1.74 (0.959)	51.36 (0.000)	32	1976-2014
Turnover ratio		-7.23 (0.000)	-2.28 (0.011)	-7.12 (0.000)	0.42 (0.663)	29.1 (0.000)	32	1976-2014
Trade openness		3.7 (0.999)	-1.81 (0.035)	-3.67 (0.000)	-1.58 (0.057)	89.62 (0.000)	34	1971-2014
Tertiary enrolment ratio		11.05 (1.000)	2.52 (0.994)	3.12 (0.999)	4.8 (1.000)	110.61 (0.000)	30	1971-2013
Log private GFCF per capita		-0.41 (0.34)	0.37 (0.643)	-1.62 (0.053)	3.24 (0.999)	87.52 (0.000)	30	1981-2013
Log GDP per capita		-1.7 (0.045)	-0.9 (0.183)	-1.28 (0.1)	2.1 (0.982)	99.92 (0.000)	30	1986-2013
Savings rate		-2.94 (0.002)	-0.24 (0.406)	-2.32 (0.01)	1.19 (0.884)	12.09 (0.000)	29	1981-2010
Lending interest rate		-0.98 (0.164)	0.65 (0.743)	-3.6 (0.000)	1.04 (0.85)	57.83 (0.000)	27	1981-2010
Central government debt		-0.35 (0.362)	2.45 (0.993)	-0.05 (0.481)	4.36 (1.000)	13.37 (0.000)	29	1981-2010
Log triadic patent stock per million populations		-23.18 (0.000)	2.81 (0.998)	-12.66 (0.000)	2.77 (0.997)	106.97 (0.000)	30	1986-2013

Note:

- 1) p-value is enclosed in parentheses.
- 2) The PURT test in Pesaran (2007) used AR (2) for the serial correlation of the residual.
- 3) Given the limited observations, the PURT test in Pesaran (2007) for savings rate used AR (1) for the serial correlation of the residual.
- 4) Null hypothesis: Variable is non-stationary.
- 5) IPS: Lag length selection based on SIC, maximum lag length is observation based, Newey-West automatic bandwidth selection and Bartlett kernel.

APPENDIX TABLE 3

PURT RESULTS FOR EXCHANGE RATE VOLATILITY AND FINANCIAL CRISIS VARIABLES

Test	Variable	Banking crisis dummy	Peak NPLs share	Financial crisis	SD of REER
IPS	With intercept	-4.44 (0.000)	-2.15 (0.016)	-6.97 (0.000)	-17.34 (0.000)
Pesaran (2007)		-5.91 (0.000)	-2.56 (0.005)	-6.49 (0.000)	-3.49 (0.000)
IPS	With intercept and trend	-4.05 (0.000)	-3.34 (0.000)	-8.1 (0.000)	-15.87 (0.000)
Pesaran (2007)		-3.04 (0.001)	0.123 (0.549)	-4.26 (0.000)	-1.08 (0.14)
Pesaran (2004) CD test		n.a.	n.a.	n.a.	18.61 (0.000)
Number of countries		34	33	34	30
Period		1970-2015	1970-2015	1970-2015	1990-2015

Note: 1) p-value is enclosed in parentheses.

2) The PURT test in Pesaran (2007) used AR (2) for the serial correlation of the residual.

3) Null hypothesis: Variable is non-stationary.

4) IPS: Lag length selection based on SIC, maximum lag length is observation based, and Newey-West automatic bandwidth selection and Bartlett kernel.

5) n.a.: Not available.

APPENDIX TABLE 5

PEDRONI GROUP-MEAN FMOLS RESULTS FOR THE INVESTMENT EQUATION USING FINANCIAL GLOBALIZATION, SAVINGS RATE, AND CENTRAL GOVERNMENT DEBT

Variable	Coef.	S.E.
Financial globalization	-0.0012**	0.0003
Savings rate	0.023**	0.003
Central government debt	-0.021**	0.002
Number of observations per country		21.6
Number of observations		625
Number of countries		29
Period		1981-2010

Note:

1) ** and * denote statistical significance at 1% and 5%, respectively.

2) Linear country-specific trends and fixed effects are controlled.

3) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.

APPENDIX TABLE 6
COUNTRY-SPECIFIC FMOLS RESULTS FOR THE INVESTMENT EQUATION

Country	Financial globalization	Savings rate	Lending interest rate	Central government debt	Trade openness	Constant	Linear trend	Num. of obs.	R2
Mexico	-0.0103 (0.006)	0.069** (0.021)	-0.005 (0.005)	-0.002 (0.012)	0.004 (0.011)	6.829** (0.311)	-0.017 (0.016)	17	0.89
Chile	-0.0062 (0.003)	0.023 (0.022)	0.016* (0.006)	0.002 (0.011)	-0.003 (0.006)	4.774** (0.803)	0.088** (0.016)	13	0.97
Spain	-0.0049** (0.001)	0.047** (0.009)	-0.018* (0.007)	-0.020** (0.002)	0.007 (0.004)	6.299** (0.302)	0.084** (0.006)	30	0.97
Korea, Rep.	-0.0046 (-0.005)	0.005 (0.005)	0.003 (0.003)	-0.019* (-0.019)	-0.002 (-0.002)	6.859** (6.859)	0.077** (0.077)	30	0.98
Czech Republic	-0.0030 (0.002)	0.035** (0.010)	0.009 (0.006)	0.001 (0.004)	0.001 (0.002)	5.761** (0.401)	0.046** (0.009)	17	0.91
Israel	-0.0023* (0.001)	0.019 (0.009)	0.030** (0.005)	-0.011** (0.001)	-0.004* (0.001)	8.755** (0.282)	0.015* (0.006)	13	0.92
Sweden	-0.0019 (0.001)	0.045** (0.007)	0.016 (0.009)	-0.003 (0.002)	0.002 (0.005)	6.218** (0.405)	0.037** (0.013)	25	0.92
New Zealand	-0.0016 (0.001)	-0.003 (0.013)	0.014 (0.038)	-0.023 (0.009)	-0.010 (0.007)	9.740** (0.589)	-0.006 (0.009)	10	0.92
Australia	-0.0014 (0.001)	0.039** (0.013)	-0.003 (0.009)	-0.004 (0.003)	-0.010 (0.006)	6.905** (0.286)	0.053** (0.007)	21	0.97
Italy	-0.0014 (0.001)	0.040 (0.015)	-0.006 (0.007)	-0.004** (0.001)	-0.008 (0.004)	7.370** (0.388)	0.042** (0.009)	30	0.91
Germany	-0.0014** (0.000)	0.023** (0.005)	0.022** (0.003)	0.008* (0.003)	-0.002 (0.002)	6.992** (0.112)	0.028** (0.003)	30	0.96
Japan	-0.0013* (0.000)	0.039** (0.007)	-0.021 (0.036)	0.000 (0.001)	0.007* (0.003)	6.896** (0.371)	0.016 (0.008)	13	0.96
Canada	-0.0010 (0.001)	0.032** (0.008)	0.018** (0.006)	0.003 (0.002)	-0.004 (0.002)	7.062** (0.207)	0.033** (0.003)	29	0.95
United States	-0.0008 (0.001)	0.056** (0.012)	-0.031** (0.011)	-0.009** (0.002)	0.014 (0.013)	7.197** (0.226)	0.031** (0.007)	30	0.97
Netherlands	-0.0007** (0.000)	0.040** (0.011)	0.000 (0.007)	-0.007** (0.002)	-0.001 (0.002)	6.942** (0.338)	0.037** (0.006)	30	0.89
Poland	-0.0007 (0.004)	-0.001 (0.022)	0.015 (0.008)	-0.018* (0.007)	0.020 (0.010)	6.186** (0.626)	0.015 (0.024)	18	0.91

APPENDIX TABLE 6
COUNTRY-SPECIFIC FMOLS RESULTS FOR THE INVESTMENT EQUATION (CONTINUED)

Country	Financial globalization	Savings rate	Lending interest rate	Central government debt	Trade openness	Constant	Linear trend	Num. of obs.	R ²
Estonia	-0.0006 (0.001)	-0.106* (0.019)	-0.131** (0.015)	-0.402** (0.023)	-0.018* (0.003)	12.267** (0.538)	0.069* (0.020)	10	0.98
Portugal	-0.0006 (0.000)	0.016** (0.005)	-0.006 (0.003)	-0.019** (0.002)	0.007* (0.003)	7.094** (0.214)	0.056** (0.005)	26	0.96
Finland	-0.0001 (0.000)	0.024** (0.007)	-0.014 (0.027)	-0.009* (0.003)	0.000 (0.005)	7.875** (0.682)	0.014 (0.018)	20	0.95
United Kingdom	0.0000 (0.000)	0.025 (0.016)	0.058* (0.020)	-0.002 (0.003)	-0.002 (0.006)	6.474** (0.656)	0.042 (0.025)	12	0.93
Slovak Republic	0.0000 (0.001)	-0.001 (0.016)	0.023* (0.009)	-0.003 (0.005)	0.007* (0.002)	5.898** (0.610)	0.025 (0.013)	15	0.86
France	0.0001 (0.000)	0.015 (0.008)	0.000 (0.006)	-0.009** (0.002)	0.009* (0.003)	7.015** (0.202)	0.028** (0.008)	18	0.98
Iceland	0.0001 (0.000)	-0.008 (0.007)	0.004 (0.004)	-0.022** (0.002)	0.005 (0.004)	8.308** (0.340)	0.029** (0.005)	30	0.93
Switzerland	0.0003** (0.000)	0.002 (0.003)	0.026* (0.009)	-0.001 (0.003)	0.005* (0.002)	8.155** (0.226)	-0.004 (0.003)	24	0.8
Denmark	0.0009 (0.001)	0.057* (0.023)	-0.046* (0.018)	-0.004 (0.003)	-0.002 (0.005)	8.006** (0.747)	-0.012 (0.012)	22	0.92
Norway	0.0012 (0.001)	0.027 (0.015)	0.001 (0.014)	0.007 (0.007)	0.006 (0.014)	7.123** (1.055)	-0.002 (0.011)	27	0.78
Greece	0.0015* (0.001)	0.017* (0.006)	-0.012** (0.003)	-0.010** (0.001)	0.005** (0.002)	7.352** (0.351)	0.039** (0.009)	15	0.99
Average	-0.0015	0.021	-0.001	-0.021	0.001	7.272	0.032	575 (sum)	

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively; standard error is enclosed in parentheses.
- 2) Long-run covariance estimates: Bartlett kernel, Newey-West fixed bandwidth, and d.f. adjustment.
- 3) The averages of FMOLS estimates, except for the constant and linear trend, are the same as the group-mean FMOLS results for regression number (2) in Table 4.

APPENDIX TABLE 7

COUNTRY-SPECIFIC ESTIMATION RESULTS FOR THE LAGGED ECT TERM IN THE PANEL
VECM FOR LOG PRIVATE GFCF PER CAPITA

Country \ Dependent variable	Δ Log private GFCF per capita	Δ Financial globalization	Δ Savings rate	Δ Lending interest	Δ Central government debt	Δ Trade openness
Australia	-0.139 (0.195)	-24.275 (92.333)	-3.968 (4.139)	-3.212 (5.536)	-7.004 (7.894)	5.359 (10.898)
Canada	-0.015 (0.077)	-4.384 (36.568)	0.598 (1.639)	-0.244 (2.192)	-2.115 (3.236)	4.279 (4.316)
Chile	-0.251 (0.133)	4.762 (63.195)	0.691 (2.833)	-8.300* (3.789)	-1.008 (5.382)	9.734 (7.459)
Czech Republic	-0.004 (0.216)	-6.431 (102.124)	3.258 (4.578)	4.424 (6.122)	-0.335 (11.284)	11.860 (12.054)
Denmark	-0.042 (0.064)	-13.852 (30.534)	-0.710 (1.369)	-0.968 (1.857)	-5.316* (2.600)	2.187 (3.604)
Estonia	-1.131** (0.266)	70.070 (126.029)	2.796 (5.650)	4.484 (7.556)	-0.089 (11.008)	-17.962 (14.875)
Finland	-0.084 (0.157)	117.785 (74.501)	-4.200 (3.340)	-1.704 (4.466)	-13.336 (8.101)	-15.423 (8.794)
France	-0.009 (0.063)	-0.738 (29.826)	0.144 (1.337)	0.472 (1.788)	0.384 (3.925)	0.873 (3.520)
Germany	-0.080 (0.072)	21.156 (34.100)	-0.957 (1.529)	0.750 (2.044)	0.509 (2.912)	0.669 (4.025)
Greece	-0.055 (0.084)	22.875 (39.988)	-1.013 (1.795)	5.014* (2.397)	10.324** (3.882)	-2.761 (4.720)
Iceland	-0.155** (0.033)	-24.837 (15.406)	-0.377 (0.691)	4.925** (0.924)	16.983** (1.898)	3.278 (1.818)
Israel	-0.007 (0.163)	10.269 (76.980)	-3.788 (3.451)	0.191 (4.615)	-13.414* (6.669)	19.152* (9.086)
Italy	-0.038 (0.060)	19.354 (28.326)	0.218 (1.270)	-1.058 (1.698)	-1.903 (2.415)	4.489 (3.343)
Japan	0.018 (0.039)	12.976 (18.300)	0.743 (0.820)	0.042 (1.097)	-7.824** (2.897)	0.729 (2.160)
Korea, Rep.	-0.222 (0.145)	37.816 (68.760)	3.963 (3.082)	0.210 (4.122)	-3.552 (6.109)	-8.596 (8.116)
Mexico	0.334 (0.186)	-18.360 (88.139)	-6.149 (3.951)	-26.396** (5.284)	2.635 (10.633)	-19.491 (10.403)

APPENDIX TABLE 7

COUNTRY-SPECIFIC ESTIMATION RESULTS FOR THE LAGGED ECT TERM IN THE PANEL
VECM FOR LOG PRIVATE GFCF PER CAPITA (CONTINUED)

Country \ Dependent variable	Δ Log private GFCF per capita	Δ Financial globalization	Δ Savings rate	Δ Lending interest	Δ Central government debt	Δ Trade openness
Netherlands	-0.077 (0.073)	-3.660 (34.410)	0.692 (1.543)	1.910 (2.063)	-5.301 (3.126)	7.799 (4.061)
New Zealand	-1.157 (0.639)	-137.044 (302.406)	-14.754 (13.556)	1.940 (18.130)	-5.259 (41.874)	27.862 (35.694)
Norway	-0.141 (0.088)	27.275 (41.567)	1.499 (1.863)	0.199 (2.994)	-1.023 (3.539)	2.018 (4.906)
Poland	0.020 (0.126)	-19.264 (59.769)	6.427* (2.679)	5.665 (3.583)	-24.881** (5.811)	-7.506 (7.055)
Portugal	-0.101 (0.075)	0.214 (35.640)	-1.165 (1.598)	1.603 (2.165)	4.845 (3.211)	2.540 (4.207)
Slovak Republic	-0.042 (0.117)	-13.846 (55.491)	1.569 (2.488)	1.254 (3.327)	-11.739* (4.885)	20.434** (6.550)
Spain	-0.015 (0.084)	20.049 (39.590)	1.473 (1.775)	-1.587 (2.373)	-6.080 (4.306)	-1.432 (4.673)

APPENDIX TABLE 4

PEDRONI PANEL COINTEGRATION TEST FOR LOG GFCF PER CAPITA USING FINANCIAL
GLOBALIZATION, SAVINGS RATE, AND CENTRAL GOVERNMENT DEBT

Statistics	Finance variable	Financial globalization	
		stat.	p-value
Panel v-Statistic		3.57	0.000
Panel rho-Statistic		2.88	0.998
Panel PP-Statistic		-0.07	0.473
Panel ADF-Statistic		-3.10	0.001
Group rho-Statistic		4.95	1.000
Group PP-Statistic		-2.96	0.002
Group ADF-Statistic		-3.82	0.000
number of countries		29	
Number of observations per country		21.55	
Period		1981-2010	

Note: 1) Null hypothesis: No cointegration

2) Two variables (savings rate and central government debt), linear country-specific trends, and fixed effects are controlled.

3) Use d.f. corrected Dickey-Fuller residual variances.

4) Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length.

5) Newey-West automatic bandwidth selection and Bartlett kernel.

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Sweden	-0.069	-29.089	-1.715	-2.091	-2.326	-4.597
	(0.097)	(46.166)	(2.070)	(3.225)	(3.931)	(5.449)
Switzerland	-0.030	-26.227	0.813	-0.335	-1.801	0.332
	(0.041)	(19.556)	(0.877)	(1.172)	(1.669)	(2.308)
United Kingdom	-0.260*	19.811	-2.010	-1.145	12.727**	2.874
	(0.106)	(50.109)	(2.246)	(3.004)	(4.511)	(5.914)
United States	0.030	6.755	2.338	4.339	-3.708	3.180
	(0.085)	(40.319)	(1.807)	(2.417)	(3.507)	(4.759)

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively.
- 2) Country-specific estimation results for the L.ECT term are presented in the panel VECM for log private GFCF per capita in Table 6.
- 3) Standard error is enclosed in parentheses.
- 4) The ECT comes from the residual of the group-mean FMOLS with a country-specific linear trend in regression number (2) of Table 4.
- 5) 27 countries from 1982 to 2011.
- 6) Owing to the limited time series length, $p=1$ is set in Equation (2), which uses two-year lags of variables.

APPENDIX TABLE 8

COUNTRY-SPECIFIC ESTIMATION RESULTS FOR THE LAGGED ECT TERM IN THE PANEL
VECM FOR LOG GDP PER CAPITA

Country	Dependent variable $\Delta \text{Log GDP per capita}$	$\Delta \text{Distributed income of corporations}$	$\Delta \text{Log private GFCF per capita}$	$\Delta \text{Tertiary enrolment ratio}$	$\Delta \text{Log triadic patent stock per million population}$	$\Delta \text{Trade openness}$
Austria	-0.064 (0.166)	6.656 (11.464)	0.063 (0.546)	-18.855 (10.608)	0.036 (0.140)	-9.216 (30.889)
Belgium	-0.211 (0.273)	2.962 (18.914)	-0.231 (0.975)	-7.474 (17.661)	0.021 (0.231)	-5.870 (50.963)
Czech Republic	-0.118 (0.171)	-7.244 (11.862)	-0.848 (0.536)	-11.971 (10.977)	-0.210 (0.145)	0.121 (31.961)
Denmark	-0.183 (0.270)	-35.348 (18.728)	-0.148 (0.819)	24.507 (21.236)	0.180 (0.228)	28.581 (50.461)
Estonia	0.020 (0.079)	-3.972 (5.479)	0.025 (0.261)	6.586 (5.592)	0.293** (0.067)	-18.561 (14.762)
Finland	-0.364 (0.234)	-14.230 (16.221)	-0.738 (0.826)	1.250 (15.010)	-0.094 (0.198)	-21.792 (43.707)
France	-0.241 (0.295)	1.132 (20.444)	0.035 (0.900)	0.187 (18.917)	0.088 (0.249)	-14.499 (55.083)
Greece	0.067 (0.282)	-14.736 (19.514)	-0.381 (0.861)	-56.623** (18.764)	-0.515* (0.238)	3.009 (52.579)
Iceland	-0.027 (0.231)	0.844 (15.979)	1.324 (0.691)	28.765 (15.334)	0.849** (0.195)	-6.870 (43.055)
Ireland	-0.019 (0.063)	-0.763 (4.340)	-0.143 (0.262)	0.129 (5.604)	-0.034 (0.053)	26.746* (11.694)
Italy	-0.398 (0.231)	-0.324 (15.981)	-0.704 (0.777)	-12.681 (16.626)	-0.008 (0.195)	-29.559 (43.060)
Korea, Rep.	-0.155 (1.254)	19.254 (86.823)	1.641 (8.011)	94.248 (171.471)	-1.009 (1.059)	411.770 (233.936)
Mexico	-0.567 (0.537)	42.803 (37.185)	-1.827 (1.643)	1.088 (34.409)	-0.742 (0.454)	-23.337 (100.190)
Netherlands	0.153 (0.230)	12.796 (15.926)	-0.233 (0.688)	28.077 (14.826)	0.235 (0.194)	-0.644 (42.911)
New Zealand	-0.177 (0.326)	21.928 (30.678)	1.474 (1.326)	-8.684 (20.862)	0.222 (0.275)	22.545 (60.746)
Norway	-0.194 (0.150)	-0.153 (10.386)	-0.380 (0.488)	5.218 (9.610)	0.398** (0.127)	-10.553 (27.983)

APPENDIX TABLE 8

COUNTRY-SPECIFIC ESTIMATION RESULTS FOR THE LAGGED ECT TERM IN THE PANEL VECM FOR LOG GDP PER CAPITA (CONTINUED)

Country	Dependent variable Δ Log GDP per capita	Δ Distributed income of corporations	Δ Log private GFCF per capita	Δ Tertiary enrolment ratio	Δ Log triadic patent stock per million population	Δ Trade openness
Poland	0.154	4.644	-0.677	-19.971	0.203	-2.095
	(0.186)	(12.854)	(0.562)	(12.022)	(0.157)	(34.634)
Portugal	-0.355	33.456	1.232	6.193	0.401	53.324
	(0.523)	(36.238)	(1.581)	(34.281)	(0.442)	(97.639)
Slovak Republic	-0.046	-0.553	0.427	-0.724	0.638**	-10.308
	(0.080)	(5.554)	(0.241)	(5.140)	(0.068)	(14.966)
Spain	-0.082	-2.000	-0.603	3.115	0.082	-19.977
	(0.152)	(10.525)	(0.625)	(9.740)	(0.128)	(28.359)
Sweden	-0.694	2.552	0.124	-98.385**	-0.000	70.695
	(0.411)	(28.493)	(1.234)	(26.366)	(0.347)	(76.771)
Switzerland	0.103	14.939	0.276	0.994	0.055	49.083
	(0.157)	(10.886)	(0.489)	(10.076)	(0.133)	(29.331)
United Kingdom	-0.043	-11.881	0.144	-22.129	-0.002	2.128
	(0.204)	(14.104)	(0.610)	(13.051)	(0.172)	(38.002)
United States	0.811	-26.354	2.449	-71.199	-0.042	22.584
	(0.855)	(59.185)	(2.568)	(54.766)	(0.722)	(159.466)

Note:

- 1) ** and * denote statistical significance at 1% and 5%, respectively.
- 2) Country-specific estimation results for the L.ECT term are presented in the panel VECM for log GDP per capita in Table 7.
- 3) Standard error is enclosed in parentheses.
- 4) The ECT comes from the residual of the group-mean FMOLS with a country-specific linear trend in regression number (2) of Table 5.
- 5) 24 countries from 1987 to 2014.
- 6) Owing to the limited time series length, $p=1$ is set in Equation (2), which uses two-year lags of variables.

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