경제학박사학위논문

금융화와 노동 시장 제도가 불평등, 투자, 성장에 미치는 장기적 효과

: 패널 공적분 방식 접근

The Long-run Effect of Financialization and Labor Market Institutions on Inequality, Investment, and Growth

: Panel Cointegration Approach

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Abstract

This dissertation analyzes the long-term effect of financial and labor market institutions on inequality, investment, and growth. Prior to this analysis, I examine the dynamic evolution of capitalism in terms of growth, employment, and inequality using cluster analysis in the first section. My investigation shows that the type of capitalism in most European countries differs from Anglo-Saxon capitalism since the 1990s. This distinction is relatively stable over time despite globalization and rising inequality around the world. However, compared with European countries, East Asian and emerging economies have shown a more dynamic evolution of capitalism over time. Korea, Japan, Russia, and Brazil have converged to Anglo-Saxon capitalism, which is characterized by slow growth and high inequality while Taiwan converged to Northern European capitalism, which is characterized by moderate growth and low inequality over time. The reason for these different evolutions between European countries and emerging countries might be that path dependency or institutional complementarity are relatively weak in emerging economies than in European countries due to the relatively short history of capitalism in the former.

The second section investigates the long-term effect of financialization, financial development, and labor market institutions, such as minimum wage and union density, on inequality, investment, growth, and consumption using data of Organization for Economic Cooperation and Development (OECD) member countries since the 1970s. I used various measures of financialization and financial development. Labor market institution variables are used to test arguments on wage-led growth theory.

To investigate the long-run effect of these variables, I used panel cointegration approach. Results of estimation show evidence of cointegration between financial and labor market institutions and each economic outcome such as inequality, labor income share, investment, growth, and consumption. Group mean fully modified ordinary least squares (FMOLS) results, which is robust of endogeneity problem, show that high dividend tendency in the non-financial corporations is positively correlated to inequality in the long run. It also shows that financial globalization is negatively correlated to private investment and financial development is positively correlated to private investment in the long run. Results of panel vector error-correction model (VECM) show the existence of unilateral Granger causality from financial globalization to private investment. No direct effect of financialization and

financial development on growth is observed, but their indirect effect occurs via private investment.

However, estimation results for labor market institutions suggest that they are not robustly correlated to macroeconomic outcomes in the long run. This condition is not in accordance with the findings of proponents and critics of wage-led growth. No robust evidence exists to show that increasing minimum wage and union density, which are representative policies for wage-led growth, are correlated to inequality and labor income share in the long run. Similar to what wage-led growth theory posits, there is weak evidence that the increase of minimum wage is related to the increase of private consumption in the long run. However, these results are not robust to the change of specification. Similar to criticism of wage-led growth theory, there is weak evidence that an increase in minimum wage and union density is related to a decrease in private investment, but these results are not robust to the change of specification either. Estimation results of this study suggest that the empirical basis of both support and criticism for wage-led growth theory is weak.

Keywords : financialization, financial development, inequality, investment, growth, panel cointegration, minimum wage, union density, wage-led growth, consumption
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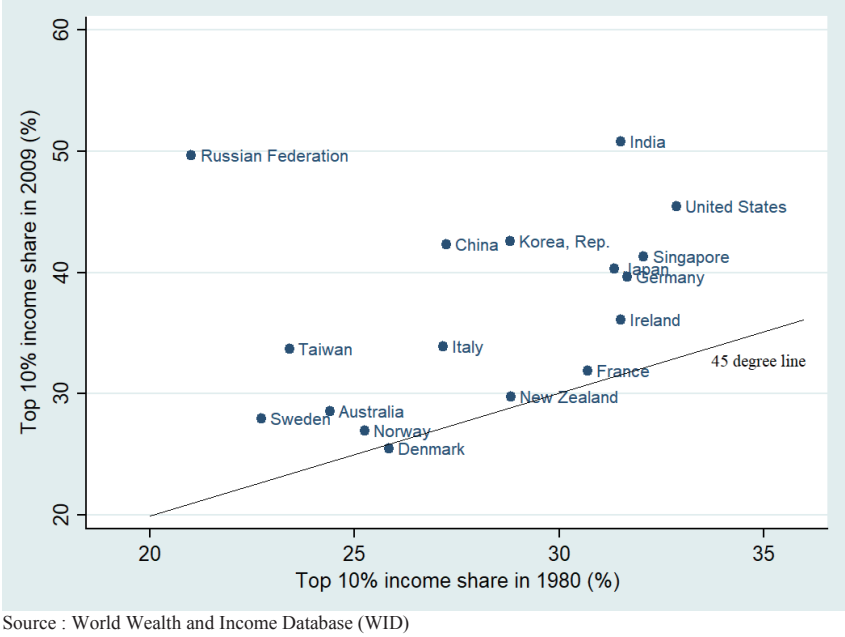
1. Introduction

A serious challenge to modern capitalism is the rising incidence of inequality. Income inequality has risen around the world since the 1980s. For example, the top 10% share to national income has risen from 32.87% in 1980 to 47.81% in 2015 in the United States. Among 17 countries where data since 1980 are available in the World Wealth and Income Database (WID), the top 10% income share increased in 16 countries from 1980 to 2009. Denmark is the only country in which inequality decreased. Speed of rising inequality is fastest in Russia, but other developed countries such as the US, Germany, Japan, and Korea and developing countries such as India and China also showed a significant increase in inequality since the 1980s. Figure 1 shows top 10% income share among 12 countries that are members of the OECD and 5 non-OECD countries in 1980 and 2009.

Figure 1. Top 10% income share among 12 OECD and 5 non-OECD countries in 1980 and 2009 (in %)



Source : World Wealth and Income Database (WID)

Many scholars have attempted to find the cause of this rising inequality. According to previous studies, the causes are skill-biased technological change (Bekman et al., 1998), globalization (Dreher and Gaston, 2008), financialization, decrease of union density (Card, 2001; Volscho and Kelly, 2012), increase of capital-income ratio (Piketty, 2014), shortage of higher education (Goldin and Katz, 2009), and superstar effect (Rosen, 1981; Gabaix and Landier, 2008). Among these factors, financialization in the focus of the analysis in Section 3.

This rising inequality has generated many economic, political, and social problems in modern capitalism. Not only does rising inequality increase social conflicts, it also generates xenophobia and support for protective trade. Furthermore, it can change the traditional classification of capitalism between liberal market economies and coordinated market economies because it can put pressure on different types of capitalism to converge, which I will analyze in Section 2.

In addition to recent rising inequality, the global financial crisis from 2007 to 2008 put the global economy into a deep depression. At the same time, the crisis changed many traditional economic perspectives. One of them is the wage-led growth strategy proposed by Lavoie and Stockhammer (2012). Wage is a cost item from the firm viewpoint in traditional economics. However, this perspective emphasizes wage as a source of workers' income and argues that increasing wages or wage share to GDP can increase GDP or GDP growth rate while it decreases income inequality.

This theory is attractive to politicians because it argues for the possibility to achieve important economic and social goals, which are growth and equality, at the same time. Consequently, several politicians and governments in developed countries, such as the Obama administration in the US and the Abe administration in Japan, conducted similar policies based on wage-led growth theory. In addition, the Korean government, which began in May 2017, considers wage-led growth[1] as one of its key policy objectives.

A representative policy for wage-led growth is an increase in minimum wage. This policy is widely applied because it affects the income of low-paid workers directly and is relatively easy to implement than other policies such as increase of union density or wage bargaining coverage. Since the global financial crisis, the US increased its federal hourly minimum wage from $5.15 in 2006 to $7.25 in 2009 and Japan increased its minimum wage from 713 yen in

[1] The term "Income-led growth" is frequently used in Korea to reflect a relatively high share of workers who are self-employed.

2010 to 823 yen in 2017. Korea also increased its hourly minimum wage from 3,100 won in 2006 to 6,470 won in 2017.

In this study, I estimate the long-run effect of financialization, financial development, and labor market institutions such as minimum wage and union density on macroeconomic outcomes such as inequality, investment, growth and consumption using panel cointegration approach. By doing so, I can estimate the long-run effect of financialization and financial development on several important economic outcomes and test the empirical basis of wage-led growth theory. In Section 2, I analyze the long-run evolution of capitalism types using cluster analysis. In Section 3, I estimate the long-run effect of financial and labor institutions on macroeconomic outcomes. The conclusion is presented in Section 4.

2. Evolution of capitalism

2.1. Introduction

One easy way to understand a specific economic system is by comparing it with other economic systems. The traditional comparison in the 20th century is between capitalism and communism, but after the collapse of communism in the 1990s, the focus of comparison has shifted to various types of capitalism. After World War II, many European and East Asian countries have constructed various types of capitalism, which are different with the Anglo-Saxon model. However, some observers argue that recent technological development and globalization put pressure on different capitalisms to converge (Friedman, 2000). They argue that worldwide competition caused by globalization and recent technological development has forced many countries to choose Anglo-Saxon capitalism to achieve economic success.

In this section, I attempt to classify capitalism according to economic performance and test whether any convergence exists across the different types of capitalism. In addition, previous studies tend to classify capitalism types using only data from developed countries (Geffen and Kenyon, 2006; Schneider and Paunescu, 2012), but I analyze the evolution of capitalism using data from both developed and emerging economies.

2.2. Conventional classification of capitalism based on Varieties of Capitalism literature and the convergence hypothesis

2.2.1. Varieties of Capitalism theory

Capitalism can be classified in many ways, but varieties of capitalism (VoC) proposed by Soskice and Hall (2001) is a representative classification. VoC argues that two efficient types of capitalism exist, namely, liberal market economies (LMEs) and coordinated market economies (CMEs). The main focus of VoC is how firms enter into a relation with other actors such as workers, suppliers, business associations, governments, and other stakeholders.

If firms use market institutions, such as competitions and formal contracts, to coordinate the relationship, then the economy is classified as an LME. If firms use non-market relationship, such as strategic interaction among actors to coordinate, then the economy is classified as CME (Soskice and Hall, 2001).

VoC analyzes five areas of institutions, which are industrial relations, vocational training and education, corporate governance, inter-firm relations, and relationship with employees. Soskice and Hall (2001) argued that LMEs and CMEs have different institutions for each area and these institutions are characterized by complementarity. Thus, both LMEs and CMEs can be efficient and have comparative institutional advantages. For example, LMEs such as the US have a stock-market-based financial system, which is volatile and sensitive to short-term profit. To meet the demand from stock market investors, LMEs have a flexible labor market and job security is generally weak. Due to weak job security, workers have less incentive to accumulate firm-specific skills. Instead, workers tend to choose to accumulate general skills that can be used in any firm by obtaining higher formal education such as a university degree. As a result, firms in LMEs have a comparative advantage in the high-technology or general skill-based sectors. Meanwhile, CMEs such as Germany have bank-based financial systems based on a long-term relationship between banks and firms. Thus, pressure from the financial sector for short-term profit is weaker, and firms can provide more secure jobs to workers. Due to relatively higher job security, workers have more incentive to accumulate firm-specific skills and a vocational training system established by firms and governments enables students to easily accumulate firm-specific skills. As a result, CMEs have a comparative advantage in the medium-tech or specific skill-based sectors. However, in terms of general economic development, both LMEs and CMEs can achieve a similar level of economic performance.

Soskice and Hall (2001) classified the US, the United Kingdom, Australia, Canada, New Zealand, and Ireland as LMEs and Germany, Japan, Switzerland, the Netherlands, Belgium, Sweden, Norway, Denmark, Finland, and Austria as CMEs. They classified France, Italy, Spain, Portugal, Greece, and Turkey as having an ambiguous position as mixed market economies (MMEs).

Soskice and Hall (2001) provided a new theory of comparative economics, but the result of their classification is very similar to the old conventional classification. All LMEs are UK or UK offspring countries and CMEs consist of Continental European, Northern European, and

East Asian countries.

Several studies have tested VoC predictions, but the results are mixed. Taylor (2004) tested the VoC arguments on different innovation types between LMEs and CMEs using data from patents and scientific papers, but their findings did not support the arguments of VoC. Allen et al. (2006) tested VoC arguments on different sectoral comparative advantage using export data and their results generally support the arguments. With regard to institutional complementarity, Hall and Gingerich (2009) and Amable (2003) used country-level data to find econometric evidence for the existence of institutional complementarity between institutions, but Kenworthy (2006) did not find such evidence. However, all of these researchers used simple econometric methods and did not control the endogeneity of institutions.

Other problem in VoC classification seems to be the instability of classification of LMEs and CMEs. Several studies have found that LMEs and CMEs are not fixed and some countries move from being LMEs to CMEs or from being CMEs to LMEs. Geffen and Kenyon (2006) attempted to classify 18 OECD countries from 1975 to 2000 using cluster analysis, but they found that trichotomous partition is most stable than dichotomous partition such as VoC. In this trichotomous partition, Australia, France, New Zealand, Sweden, and the UK moved from the CME cluster or middle cluster to the LME cluster over time. On the other hand, Finland, Germany, and Ireland moved from the CME cluster to the middle cluster over time. Schneider and Paunescu (2012) also found similar results using data from 26 OECD countries from 1990 to 2005. They found that Denmark, Finland, the Netherlands, Sweden, and Spain moved from other types to LMEs over time, whereas Italy and Belgium moved to CME over time. These results suggest the possible dynamic evolution of capitalism types over time.

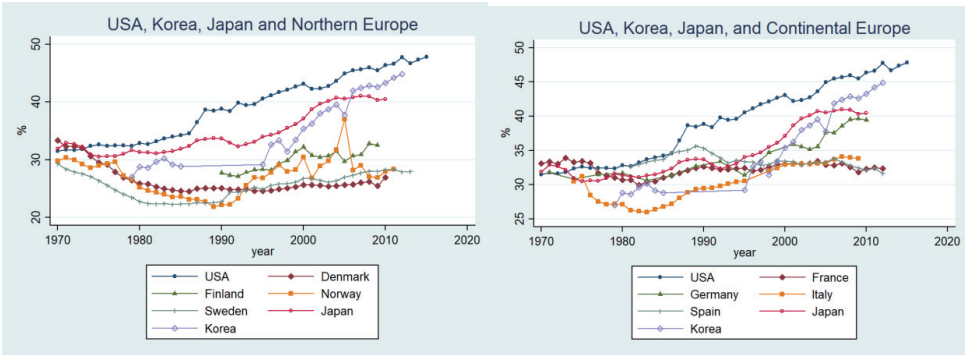
2.2.2. Convergence hypothesis

VoC argues that no convergence occurs between LMEs and CMEs over time despite recent technological development and globalization. Soskice and Hall (2001) argued that long-term economic performance is satisfactory both in LMEs and CMEs according to growth rate of

GDP per capita, level of GDP per capita, and unemployment data from the 1960s to the 1990s.

However, rising inequality in many developed countries may change this evaluation. As I have stated in the Introduction, the top 10% income share to the national income has increased around the world, especially in the US and East Asia since the 1980s. Figure 2 illustrates this point.

Figure 2. Top 10% income share to national income in the US, Japan, Korea, and European countries from 1970 to 2015



Source : World Wealth and Income Database

The left panel in Figure 2 indicates the comparison of top 10% income share between the US, Korea, Japan, and four Northern European countries (Denmark, Finland, Norway, and Sweden). The right panel in Figure 2 shows the comparison between the US, Korea, Japan, and the four largest Continental European countries (France, Germany, Italy, and Spain). Figure 2 shows that the top 10% income share was similar among these countries in the 1970s, but it has increased faster in the US, Korea, and Japan than in these European countries since the 1980s. As a result, the US, Korea, and Japan has become more inequitable countries than these European countries since the 2000s.

The VoC classifies Korea, Japan, Germany, and Northern European countries as CMEs and France, Italy, and Spain as MMEs. However, in terms of inequality, Korea and Japan have become much closer to the US than these European countries. Thus, the classification of capitalism may change if inequality is considered as a measure of economic performance.

One possible reason for this different movement between East Asia and Europe might be the path dependency and strength of institutional complementarity. East Asian countries have a relatively short history of capitalism than European countries, so their institutional

complementarity might be relatively weak and institutions might change relatively easily if external shocks occur.

For example, the top 10% income share in Korea started to increase rapidly since the Asian financial crisis in 1997–1998. During the crisis, Korea implemented policy prescriptions of the International Monetary Fund in exchange for a bailout loan, and many Korean institutions became similar to those in the US. The financial market was liberalized and most of the restrictions on foreigners' domestic investments were removed. As a result, foreigners' stock shares in Korean firms have increased rapidly and shareholder capitalism has strengthened. The share of shareholders and owners in net value-added for non-financial corporations[2] increased from 5.97% in 2000 to 10.74% in 2015 in Korea.

The labor market has also been liberalized and the previous Japanese lifetime employment system has weakened significantly. To increase labor flexibility, layoffs due to statutory requisites and employment leasing were introduced in 1998. Thus, the share of part-time or irregular workers to the total employment has rapidly increased and most Korean workers in the private sector have realized that their jobs are no longer stable.

These changes make Korean capitalism transmute previous government-driven financial system and relatively secure labor market into a more liberalized financial and labor market similar to that of the US. This condition could weaken the previous institutional complementarity and affect the recent increase in Korean inequality. Since the crisis, the Korean government has reinforced the social welfare system, including the minimum wage, but this solution is inadequate. Japan has also experienced a similar change since the collapse of its economic bubble in 1991.[3]

Considering the aforementioned situation, I present the following hypotheses:

H1: Classifications of capitalism change over time.

H2: Capitalism in East Asia has converged to Anglo-Saxon capitalism over time in terms of economic performance including inequality.

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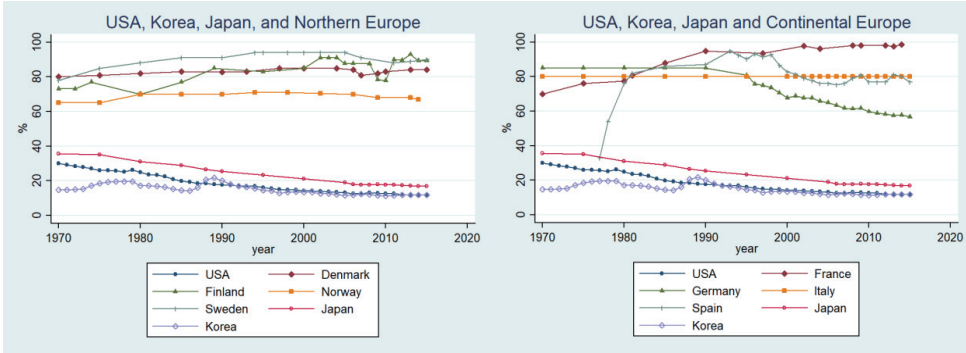
[2] This is a measure of financialization in this paper. It will be explained in detail in the next section.

[3] In particular, the Koizumi administration has conducted liberalization policies such as privatization and deregulation since 2001.

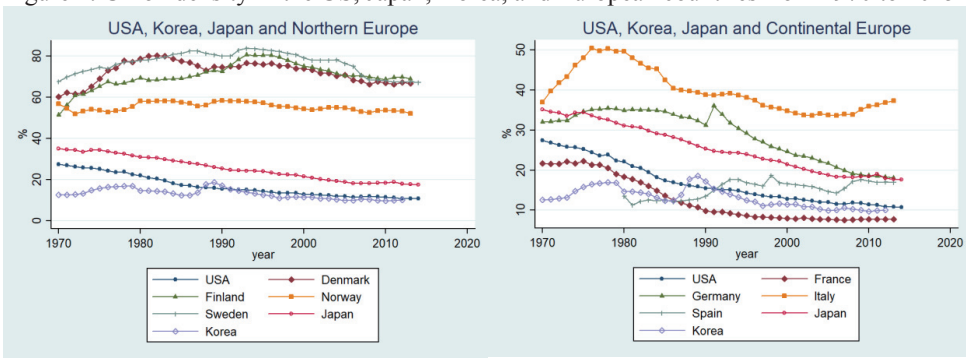
However, the evolution of capitalism might be different in European countries. Most of these countries seem to maintain their specific institutions, especially the labor market institutions. A centralized wage bargaining system is still a dominant way for wage negotiation in European countries and union density is still higher in most European countries than in the US, Korea, and Japan. This point is presented in Figures 3 and 4.

Figure 3. Collective bargaining coverage in the US, Japan, Korea, and European countries from 1970 to 2015



Source : OECD Stat.

Figure 4. Union density in the US, Japan, Korea, and European countries from 1970 to 2015



Source : OECD Stat.

Figure 3 shows that European countries maintain a much higher collective bargaining coverage than the US, Korea, and Japan. Figure 4 also shows that most European countries except France and Spain maintain higher union density than the US, Korea, and Japan.

As mentioned, European countries have a relatively longer history of capitalism than East Asian countries. Thus, institutional complementarity and path dependency are likely stronger

in Europe than in East Asia. This condition may help these countries maintain their different capitalism type to Anglo-Saxon capitalism.

For example, similar to East Asian countries, Northern European countries also experienced financial crisis from 1991 to 1993. Due to the crisis, they also conducted liberalization policies such as abolishment of fixed exchange rate system, privatization, and decrease in social public expenditure and unemployment benefits (BOK, 2000).

However, Northern European countries seem to maintain their core specific institutions despite external shocks and liberalization policies. In addition to high collective bargaining coverage and union density, other specific elements of Northern European capitalism such as active labor market policies and generous social protection still exist in Northern European countries. Denmark and Sweden spent 2.05% and 1.27% of their GDP on active labor market policies in 2015, respectively, but Korea, Japan, and the US respectively spent 0.36%, 0.14%, and 0.1% of GDP on them in 2015. The share of social public expenditure to GDP also remains the world's highest level at approximately 30% in Northern Europe.

Considering the preceding insights, I present the following hypothesis:

H3: Capitalism in Europe does not converge to Anglo-Saxon capitalism over time in terms of economic performance, including inequality. These countries maintain their specific types of capitalism.

2.3. Cluster analysis

To analyze the evolution of capitalism by statistical method, I used cluster analysis. Cluster analysis is basically a "grouping" method for many observations. I used hierarchical agglomerative cluster analysis, which generates hierarchically related sets of clusters. The advantage of this method is that it does not require a pre-specified number of clusters. In the beginning, each observation is treated as a separate group (the number of observations for each group is 1). Then, the closest pairs of groups are combined into one group. Thereafter, the same process iterates until all observations belong to one group. This process generates a hierarchy of clusters. Measure of distance between groups is simple Euclidean distance.

Average linkage method[4] is used and number of clusters is chosen as the number that maximizes Calinski–Harabasz pseudo-F statistics.[5]

I used three variables to measure economic performance: growth rate of GDP per capita, employment rate, and top 10% income share. These are representative measures for growth, employment, and inequality. GDP per capita data is from Penn World Table (PWT) 9.0 database. Employment rate is the share of employment among the population over 15 years old is from the International Labour Organization (ILO). Top 10% income share is the share of top 10% income to national income and is from the WID.

In terms of employment, unemployment rate is another representative measure, but it depends on how much non-working people seek jobs and does not reflect discouraged workers. Thus, the ratio of employment to population aged over 15 is a better measure of the ability of an economic system to create jobs.

In terms of inequality, top 10% income share measures how much share of income is concentrated in the top decile. It can avoid a downward bias for the income of the rich from survey data because it is derived from administrative tax data. Other representative measures are functional income distribution, such as labor income share among GDP, or personal income distribution such as Gini coefficient. However, data availability of the Gini coefficient is limited because large parts of Gini data have varying quality, income concept, and coverage of survey. Thus, the comparable data of Gini is limited and is not included in the analysis. Including unemployment rate and adjusted wage share to GDP in the analysis provides qualitatively similar results and is shown in Appendix 2.

Before conducting cluster analysis, I averaged the employment rate and top 10% income share over five- year periods[6], such as 1955–1959, 1960–1964, ⋯ , and 2010–2014, to reduce annual fluctuation. Averaging is applied if at least three observations on a country are within a certain period. Growth rate refers to the five-year average annual growth rate of GDP per capita.

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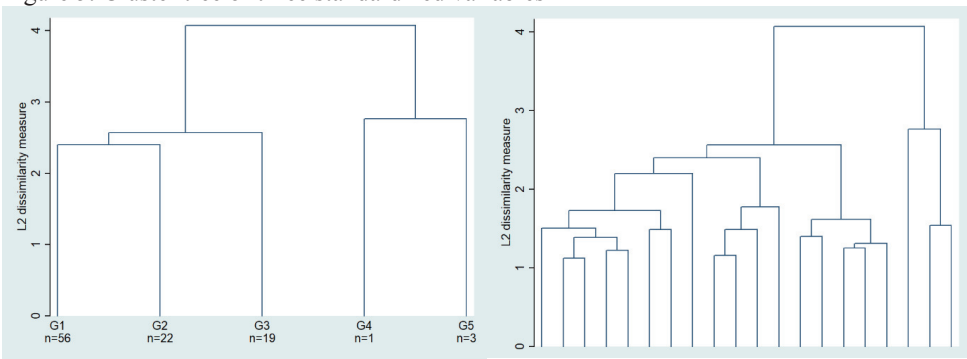
[4] Average linkage method uses the average distance of observations between groups as a measure of distance between two groups.

[5] Calinski–Harabasz pseudo-F statistics measure the variation between clusters relative to variation within clusters. Milligan and Cooper (1985) evaluated 30 methods for decision on the number of clusters and reported that Calinski–Harabasz pseudo-F statistics are among the most effective methods.

[6] I also used 10-year averaged data for 1960–1969 and 2000–2009. The results of cluster analysis are in Appendix 3. It provided qualitatively similar results.

Then, I standardized the variables so that they have zero mean and unit standard deviation. This approach is intended to avoid a situation in which some volatile variables dominate the results. The data included 19 OECD countries (Australia, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK, and the US) from 1955 to 2014 and the number of observations are 101. Figure 5 shows the results of cluster analysis.

Figure 5. Cluster tree of three standardized variables



Source : PWT 9.0, ILO, World Wealth and Income Database

Figure 5 presents cluster trees of three standardized variables of economic performance. Right figure shows 20 clusters in detail and left figure shows an agglomeration of 5 clusters. The height of each branch indicates dissimilarity between clusters. For example, group 1 on the left is more similar to group 2 than groups 3, 4, or 5. Group 3 is more similar to an agglomerative group consisting of groups 1 and 2 than groups 4 or 5. Calinski–Harabasz pseudo-F statistics are maximized at 5 between 2 and 10 clusters[7], so I chose the number of clusters as 5.

Among the 5 clusters, the main clusters are groups 1, 2, and 3. Groups 1, 2, 3 have 56, 22, and 19 observations, respectively. Groups 4 and 5 have 1 or 3 observations each and they seem to be outliers or idiosyncratic clusters. Table 1 shows the members of each clusters over time.

[7] Calinski–Harabasz pseudo-F statistics are presented in Appendix 1.

Table 1. Results of cluster analysis for 19 OECD countries from 1955 to 2014

Period	Group 1 (moderate growth, low inequality)	Group 2 (slow growth, high inequality)	Group 3 (low growth and employment)	Group 4 (rapid growth, low employment)	Group 5 (rapid growth, low inequality)
1955-1959	**USA**				**Japan**
1960-1964	**USA**				**Japan**
1965-1969	**USA**				**Japan**
1970-1974	**USA, Japan**				
1975-1979	**Canada Japan USA**				
1980-1984	Australia **Japan Korea USA**	**Canada**			
1985-1989	Australia **Canada** Denmark **Japan** New Zealand **USA**		France **Ireland** Italy Spain		
1990-1994	Australia Denmark **Japan** Netherlands New Zealand **Portugal**	**Canada** UK **USA**	France **Ireland** Italy Spain		
1995-1999	Australia Denmark Finland **Korea** Netherlands New Zealand Norway **Portugal** Sweden Switzerland	**Canada Japan** UK **USA**	France Italy Spain	**Ireland**	
2000-2004	Australia Denmark Finland **Ireland Korea** Netherlands New Zealand Norway Sweden Switzerland	Germany **Japan Portugal** UK **USA**	France Italy Spain		
2005-2009	Australia Denmark Finland Netherlands New Zealand Norway Sweden Switzerland	Germany **Ireland Japan Korea** UK **USA**	France Italy Spain		
2010-2014	Australia Netherlands New Zealand Sweden	**Korea** UK **USA**	France Spain		
Average of variables for each groups					
GDP growth (%)	2.18	1.30	1.64	8.95	8.38
Employment (%)	60.27	58.86	46.17	50.48	66.87
Top 10% income share (%)	30.28	39.81	32.41	35.44	30.16

* Cluster analysis used hierarchical agglomerative average linkage method.

* Measure of dissimilarity is Euclidean distance.

* Number of clusters is determined by Calinski-Harabasz pseudo-F statistics from 2 to 10 clusters

* 19 countries from 1955 to 2014, 101 observations

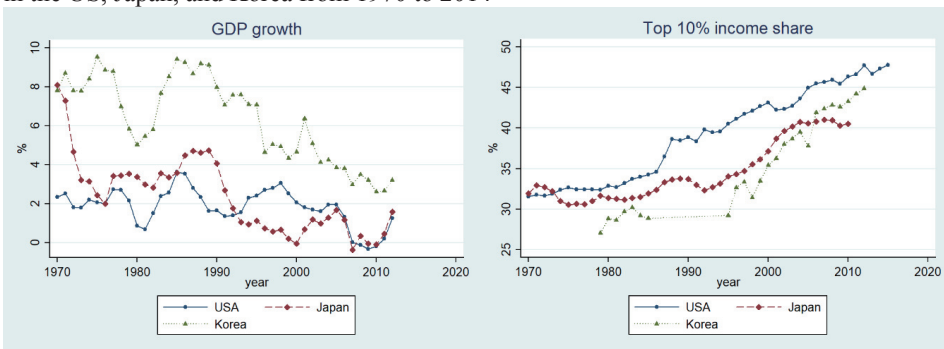
* bold font : countries which moves from other groups to group 2 over time

Table 1 shows the major evolution of clusters, which is the expansion of group 2 since the 1990s. Group 1 is the largest cluster and consists of Northern European countries, Australia, and New Zealand. Group 2 is second largest cluster and consists of the US, the UK, Canada, Ireland, and East Asian countries. The lower panel of Table 1 shows an average of each variable according to cluster. Compared with group 1, group 2 shows lower growth rate and high inequality.

In Table 1, the countries with names written in boldface have moved from other groups to group 2 over time. Until the 1970s, no country was in group 2, but Canada moved from group 1 to group 2 in the early 1980s. Since then, the US and Japan also moved from group 1 to group 2 in the 1990s. Portugal, Korea, and Ireland moved to group 2 in the 2000s.

These results suggest three points. First, some LMEs such as the US, Canada, and Ireland have moved to a cluster with slower growth and higher inequality, but other LMEs such as Australia and New Zealand have stayed in group 1. Second, most European countries do not converge to Anglo-Saxon capitalism over time. Northern European countries have stayed in group 1 and Southern European countries have stayed in group 3, which partially supports hypothesis 3. Third, East Asian countries, such as Japan and Korea, have followed a path similar to that of the US, mainly due to decreasing growth rate and increasing inequality in these countries. Figure 6 illustrates this point.

Figure 6. Growth rate of GDP per capita (5-year moving average) and top 10% income share in the US, Japan, and Korea from 1970 to 2014



Source : PWT 9.0, World Wealth and Income Database

As Figure shows, Korea and Japan have become similar to the US in terms of growth and inequality over time. Therefore, results in Table 1 support Hypotheses 1 and 2.

Group 3 in Table 1 consists of continental European countries such as France, Spain, and Italy. Except Ireland, countries in group 3 are stable over time. Growth rate and top 10% income share in this group are between groups 1 and 3, but employment rate in group 3 is very low. This result seems to reflect relatively restrictive labor regulations such as strong job security, moderate centralization of wage bargaining, and moderate level of active labor market policies in these countries (Amable, 2003). Groups 4 and 5 are minor clusters. Group 4 reflects the transitory rapid growth rate of Ireland in the late 1990s when the country was called a "Celtic Tiger". During this period, the economy was characterized by a combination of rapid growth rate (driven by an enormous inflow of FDI) and relatively low employment rate. However, parts of the foreign capital fled from Ireland and the growth rate decreased after this period. Group 5 reflects the rapid growth period of Japan until the early 1960s. During this period, Japan achieved rapid growth and low inequality at the same time. Thus, results in Table 1 suggest that Japan has moved to slower growth and higher inequality over time, which reflects its movement from group 4 (high growth and low inequality) to group 1 (moderate growth and low inequality) to group 2 (low growth and high inequality) over time.

Cluster analysis in Table 1 used 19 OECD countries. To perform a robustness check, I add some large developing countries with available data and Taiwan and conduct cluster analysis. These additional countries are Brazil, Russia, China, and South Africa (the BRICS countries), Turkey, Malaysia, and Taiwan. Among the BRICS countries, India is excluded because of limited data on employment rate. Calinski–Harabasz pseudo-F statistics are maximized at 7 between 2 and 10 clusters, so the number of clusters is 7.[8] The number of observations is 124. The results of cluster analysis are reported in Table 2.

[8] Calinski–Harabasz pseudo-F statistics are shown in Appendix 1.

Table 2. Results of cluster analysis for 26 countries from 1955 to 2014

Period	Group 1 (moderate growth, low inequality)	Group 2 (low growth and employment)	Group 3 (slow growth and high inequality)	Group 4 (high growth and employment, low inequality)	Group 5	Group 6	Group 7
1955-1959	**USA**			**Japan**			
1960-1964	**USA**			**Japan**			
1965-1969	**USA**			**Japan**			
1970-1974	**USA Japan**						
1975-1979	**USA Japan Canada**						
1980-1984	Australia **Canada Japan Korea** Taiwan **USA**						
1985-1989	Australia **Canada** Denmark **Japan** Malaysia New Zealand **USA**	France Ireland Italy Spain		Taiwan			
1990-1994	Australia **Canada** Denmark Japan Netherlands New Zealand Portugal Taiwan UK	France Ireland Italy Spain	**USA**				
1995-1999	Australia Denmark Finland **Japan Korea** Netherlands New Zealand Norway Portugal Sweden Switzerland Taiwan	France Italy Spain	**Canada** Russia UK **USA**		Ireland		
2000-2004	Australia Denmark Finland Ireland **Japan Korea** Malaysia Netherlands New Zealand Norway Portugal Sweden Switzerland Taiwan	France Germany Italy Spain	Brazil UK **USA**	China		Russia	Turkey
2005-2009	Australia Denmark Finland Ireland Netherlands New Zealand Norway Sweden Switzerland Taiwan	France Germany Italy Spain	Brazil **Japan Korea** Russia UK **USA**	China			Turkey
2010-2014	Australia Malaysia Netherlands New Zealand Sweden Taiwan UK	France Spain	Brazil **Korea** Russia **USA**	China			South Africa
Average of variables for each groups							
GDP growth (%)	2.26	1.58	1.82	8.14	8.95	7.28	1.93
Employment (%)	59.87	46.82	59.97	67.77	50.48	59.28	42.03
Top 10% income share (%)	30.89	32.85	45.11	34.42	35.44	48.42	55.75

* Cluster analysis used hierarchical agglomerative average linkage method.

* Measure of dissimilarity is Euclidean distance.

* Number of clusters is determined by Calinski-Harabasz pseudo-F statistics from 2 to 10 clusters

* 26 countries from 1955 to 2014, 124 observations, bold font : countries which moves from other groups to group 3 over time

The results in Table 2 are similar to those in Table 1. Cluster 1 is the largest cluster and consists of 73 observations. Group 2 and 3 consist of 21 and 18 observations, respectively.

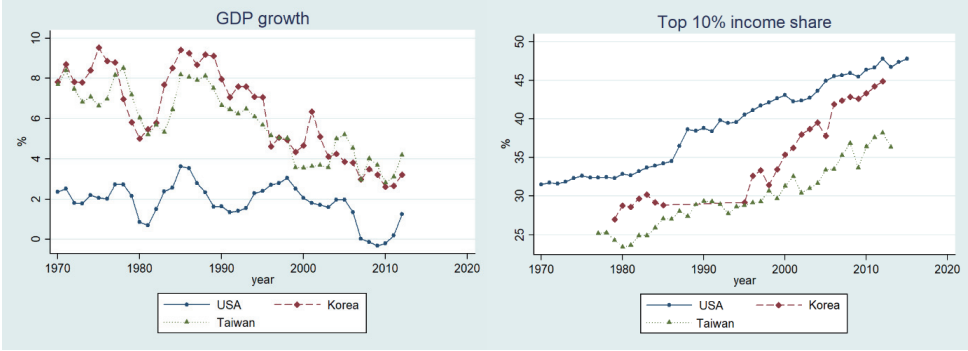
Compared with the average of variables in group 1, group 3 shows lower growth rate and higher inequality. Until the 1980s, no country was in group 3, but the USA moved from group 1 to group 3 in the early 1990s. Canada moved to group 3 in the late 1990s. Japan and Korea moved from group 1 to group 3 in the late 2000s. Thus, the results in Table 2 also suggest that some LMEs, such as the US and Canada, and East Asian countries, such as Korea and Japan, moved to the slower growth and higher inequality cluster over time. Brazil and Russia are also included in group 3. This result suggests that the type of capitalism in some emerging countries is similar to that of the US. However, most European countries in groups 1 and 2 have maintained their specific capitalism types similar to the results in Table 1.

Group 2 in Table 2 is similar to group 3 in Table 1, which shows low employment rate. The only difference is that Germany during the 2000s is included along with France, Italy, and Spain in group 2. Group 4 represents a rapid growth period in East Asia. Japan until the early 1960s, Taiwan in the late 1980s, and China since the 2000s are included in this cluster. This cluster shows rapid growth rate, high employment rate, and relatively low inequality. Group 5 includes Ireland in the late 1990s, which is the same cluster as group 4 in Table 1. Group 6 includes Russia in the early 2000s, a period of fast growth that was mainly driven by a rapid increase in international oil prices.[9] Group 7 includes Turkey and South Africa, which are characterized by low employment rate and very high inequality.

An interesting point is the different paths of Korea and Taiwan. These countries represent an export-led growth model in East Asia from the 1960s to 1990s, but Korea moved from group 1 to group 3 in the late 2000s while Taiwan moved from group 4 to group 1 in the early 1990s and stayed in group 1. It also seems to be driven by the top 10% income share. Figure 7 shows the growth rate of GDP per capita (5-year moving average) and top 10% income share in the US, Korea, and Taiwan.

[9] Spot price of West Texas Intermediate crude oil per barrel increased by 16.5% annually on average from 1999 to 2004 (US Energy Information Administration).

Figure 7. Growth rate of GDP per capita (5-year moving average) and top 10% income share in the US, Korea, and Taiwan from 1970 to 2014



Source : PWT 9.0, World Wealth and Income Database

Figure 7 shows that the growth rate in Korea and Taiwan has almost the same trend in the long run, but the trend of the top 10% income share is different between these two countries. Although the top 10% income share has increased in Taiwan since the 1980s, that in Korea has increased faster since the late 1990s. This result seems to affect the different movements of Korea and Taiwan across clusters over time.

A possible reason for this difference in the evolution of inequality between Korea and Taiwan might be different shocks from the Asian financial crisis. This crisis had a strong effect on the Korean but a minimal effect on the Taiwanese economy because Taiwan was in a better situation than Korea before the crisis. Taiwan has recorded a current account surplus since the early 1980s while Korea has recorded a current account deficit during most of the periods before the crisis. Furthermore, Taiwanese firms had less debt-to-equity ratio than Korean firms before the crisis. Thus, Taiwan could survive a crisis relatively easier than Korea. As a result, rapid liberalization of financial and labor market institutions similar to the Korean case did not occur in Taiwan. It might influence the different evolution pattern of inequality between Korea and Taiwan since the crisis.

2.4. Conclusion

Results in this section partially support the VoC argument. If economic performance is measured by growth, employment, and inequality, then a significant difference exists in the

economic performance between types of capitalism. However, some LMEs such as the US, the UK, and Canada are classified into different types of capitalism with most of European countries since the 1990s, which is similar to the VoC argument.

Most European countries have not followed the evolution pattern of capitalism similar to that of Anglo-Saxon countries. These countries tend to maintain their capitalism types and institutional characteristics over time, especially in labor market institutions, such as collective bargaining coverage and union density, despite the occurrence of the financial crisis and liberalization policies. This condition might be due to the relatively strong institutional complementarity and path dependency because of a long history of capitalism in these European countries.

However, results in this section also show that capitalism types are not fixed and they change over time, which is similar to the findings of Geffen and Kenyon (2006) and Schneider and Paunescu (2012).

In particular, East Asian and emerging countries have shown a dynamic evolution of capitalism over time. Korea, Japan, Brazil, and Russia have converged to the Anglo-Saxon type of capitalism, while Taiwan has converged to the Northern European type over time. This finding suggests the possible occurrence of bifurcation of these economies into two long-standing types of capitalism, namely, the Anglo-Saxon and European types of capitalism over time. Another probable reason for this condition is that capitalism in these countries have a relatively short history, so their institutional complementarity or resilience of capitalism type from external shocks might be weaker than that of European capitalism, which has a long history.

3. Effect of Financial Development, Financialization, and Labor Market Institutions on Inequality, Investment, and Growth: Panel Cointegration Approach

3.1. Literature Review and Hypotheses Development on Financial Institutions

3.1.1. Financial development

The financial system has been regarded as one of the most important factors in economic growth for a long time. Since Schumpeter (1912) emphasized the role of finance in innovation, many scholars have found a significant positive effect of financial development on economic growth (King and Levine, 1993; La Porta, Lopez-de-Silanes, and Shleifer, 2002; Beck, Levine and Loayza, 2000). Financial development generally refers to the improvement of financial functions, which lead to the production of investment information, efficient allocation of capital, firm monitoring, risk management, savings mobilization, and ease of exchange of goods and services (Levine, 2005). These functions of the financial system are crucial for investment and resource allocation; thus, the improvement of these functions is beneficial to economic growth.

Numerous papers have found a significant positive effect of financial development on economic growth using various data types such as cross-country, country panel, industry, and firm data and econometric methods such as OLS, fixed effect, and GMM (King and Levine 1993, 1998; Levine and Zervos, 1998; Beck and Levine, 2004; Rajan and Zingales, 1998; Beck et al., 2005).

Thus, I present the following hypothesis on financial development and growth:

H1: Financial development increases private investment and economic growth in the long run.

In terms of inequality, several scholars have provided theoretical models to show that financial development decreases inequality because it helps the poor to access financial credit

(Banerjee and Newman, 1993; Galor and Zeira, 1993; Aghion and Bolton, 1997). However, Greenwood and Jovanovic (1990) presented a model that shows that financial development increases inequality in the early period of development because the rich can access finance disproportionately at this stage, and then inequality become stable as financial development proceeds because more people can access finance.

Empirical studies on the relationship between financial development and inequality are comparatively fewer than those on financial development and growth. Beck et al. (2004) and Clarke et al. (2013) show the negative effect of financial development on inequality. However, Roine et al. (2009) found a positive relationship between market capitalization and top 1% income share, especially at the early stage of development.

Based on most the studies, the following hypothesis on financial development and inequality is presented:

H2: Financial development decreases inequality in the long run.

3.1.2. Financialization

A. Definition of financialization

As stated, many studies have supported the positive role of financial development on economic growth. However, the last global financial crisis casted doubt on the argument that the increasing dominance of the financial system is always beneficial to the real economy because it started in the well-developed US financial market. In fact, the US financial system efficiently mobilized savings from the rest of the economy and allocated funds efficiently according to the highest expected return and diversified risk by inventing new financial derivatives, such as collateralized debt obligation or credit default swap, but these eventually contributed to a housing market bubble and global deep depression. Thus, critical viewpoints on finance have emerged in academic circles and in public (such as the “Occupy Wall Street” movement) and financialization is one of the crucial ideas.

Financialization is a broadly defined observational concept. It was developed to depict the rapid development or expansion of the financial sector in the US since the 1980s. Many

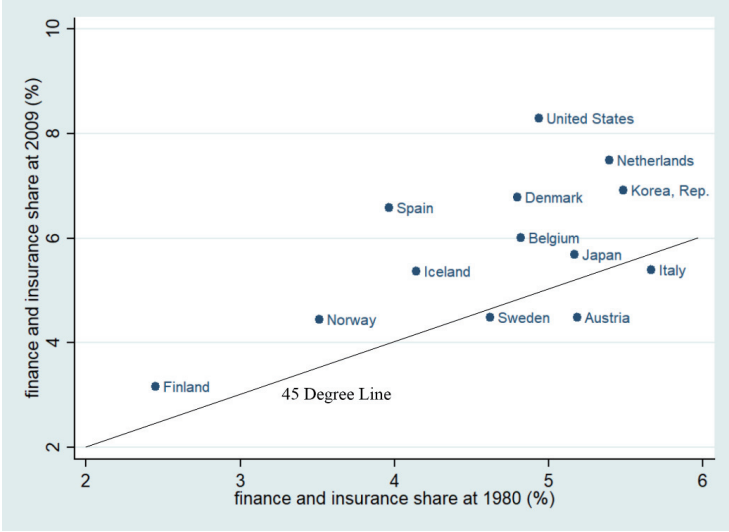
scholars define financialization from a slightly different perspective. Stockhammer (2004) defined financialization as "increased activity of non-financial businesses on financial markets" and Tomaskovic-Devey et al. (2015) defined it as "expansion of both the financial service sector and increased investment in financial instruments by the non-financial sector". Kus (2012) used the following definitions of financialization: (1) "growing share of the financial sector in the economy," (2) "growing reliance of non-financial firms on financial activities as a source of revenue," (3) "emergence of a new corporate governance view that sees the firm as a bundle of tradable assets," (4) "increase of household engagement with financial markets as consumers of credit or as purchasers of investment products, seeking to generate income or sustain living standards".

According to these definitions, financialization generally means a rising share of financial sector or increase of financial activities by non-financial sectors. In this dissertation, I define "financialization" in terms of three factors: (1) expansion of financial sector in the economy, (2) increased share of financial sector or shareholders among profit or resources by non-financial sectors, and (3) increased overseas financial activities (financial globalization). The first two definitions are similar to the previous definition of financialization, and I have added the last definition to reflect the growing importance of international financial activities. Each factor is measured by a different variable of financialization in the following sections.

B. Possible causes of financialization

Shares of the financial sector in the economy have expanded in several developed countries since the 1980s. For example, the share of value-added in the finance and insurance sectors among all sectors increased from 4.94% in 1980 to 8.3% in 2009 in the US. Spain, Denmark, the Netherlands, and Korea also showed a significant expansion of their finance and insurance sectors during the same period. Figure 8 shows the share of value-added in the finance and insurance sectors among 13 OECD countries which data are available in the OECD Structural Analysis (STAN) database in 1980 and 2009.

Figure 8. Share of value-added in the finance and insurance sectors among all sectors in the 13 OECD countries in 1980 and 2009 (%)



Source : OECD Structural Analysis (STAN) Database (ISIC Rev. 3)

The expansion of the finance and insurance sectors, as shown in Figure 8, may be due to various reasons. One possible reason is the decrease of profitability of manufacturing due to globalization in developed countries. As international competition with developing countries, especially China, has intensified in the manufacturing sector since the 1980s, manufacturing firms in developed countries have lost their competitiveness in the labor-intensive manufacturing sectors due to low-priced products from developing countries. Furthermore, some Anglo-Saxon countries such as the US and the UK have also lost their competitiveness in capital-intensive manufacturing, such as automobile and electronics, due to intensified competition with Germany, Japan, or newly industrializing economies since the 1980s. Thus, much of the capital likely went from the manufacturing to the financial sectors. The profitability of the financial sector seems to be higher than that of the manufacturing sector in developed countries since the 1980s because of financial sector deregulation[10], development

[10] For example, the Glass–Steagall Act that separated commercial and investment banks had been weakened since 1987 and was finally repealed in 1999 in the US. This situation led to the expansion of large financial companies, which conduct all financial activities. Using time-series regression from 1909 to 2006, Philippon and Reshef (2012) argued that the change of this regulation significantly increased the relative wage in the financial sector in the US.

of new financial products, and liberalization of capital transactions in many countries. It provided profitable opportunities for overseas financial investments for capital owners in the developed countries.

Another possible cause is the spread of maximization of shareholder value in modern capitalism. Since Milton Friedman argued in 1970 that the only purpose of a firm is to make money for its shareholders (Denning, 2013), corporate management, which has emphasized maximization of shareholder value, spread widely in the US from the 1980s. Jensen and Meckling (1976) provided mathematical and theoretical basis for shareholder value arguments, and many Americans considered Jack Welch of General Electric as the example of the superiority of shareholder value management. The easy way to maximize shareholder value was to increase short-term profit, so many American companies increased the financial activities or portfolios to raise their short-term profit and stock price (Orhangazi, 2008; Lin, 2013; Davis, 2014). This approach was reinforced by high interest rates in the 1980s. As a result, the ratio of financial income to realized profits and ratio of financial assets to total assets doubled from the late 1970s to the early 2000s for non-financial firms in the US (Lin and Tomaskovic-Devey, 2013; Tomaskovic-Devey et al., 2015). For example, GM and Ford earned more than half of their profit from financial subsidiaries such as GM Acceptance Corporation and Ford Credit in 2004 (Lin and Tomaskovic-Devey, 2013; Hakim, 2004).

Development of information and communications technology also seems to affect financialization. Since online stock trading was possible in the mid-1990s, the value of stock traded/GDP ratio in the US increased from 49.9% in 1994 to 296% in 2007, just before the global financial crisis. A significant share of value-added in securities companies comes from brokerage commissions, so an increase of stock traded can affect financialization. Similarly, Godechot (2012) observed that the volume of stock traded on the Paris stock market and the average wage of the top 100 French finance managers are highly correlated (r=0.92) from 1994 to 2007.

C. Relationship between financialization, inequality, investment, and growth

As discussed earlier, several developed countries have experienced an increase of inequality and expansion of the financial sectors since the 1980s. Many studies have investigated whether these two new phenomena are linked by a causal relationship.

Several studies found a significant correlation between financialization and inequality in the US since the 1980s (Hacker and Pierson, 2010; Lin and Tomaskovic-Devey, 2013). Other papers found similar results in other developed economies such as France (Godechot, 2012) and OECD member countries (Kus, 2012).

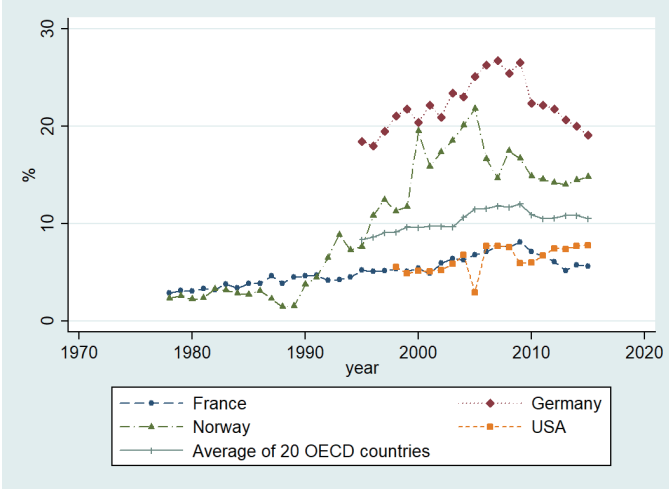
The first channel between financialization and inequality is the spread of maximization of shareholder value across developed countries. As corporate management focuses closely on shareholder value, particularly stock price, a greater share of resources and profits of firms goes to shareholders and CEOs in terms of dividends, stock buybacks, and stock options for chief executives, where a small share goes to workers and other stakeholders. An increase of hostile takeover activities since the 1980s also contributed to this phenomenon because it put pressure on firm managers to increase stock prices to protect their management rights by increasing dividends and stock buybacks.

Lazonick (2014) showed that 54% and 37% of US companies' earning had been spent on stock buybacks and dividends in 449 firms among the S&P 500 firms from 2003 to 2012, respectively, using S&P Compustat data.[11] Tomaskovic-Devey et al. (2015) also argued that financialization is positively correlated with interest paid to debt holders and negatively correlated with labor compensation and taxes using US non-financial sectoral data from 1970 to 2008. Duménil and Lévy (2001, 2004) and Hein and Schoder (2011) argued that dividends and interest paid by non-financial firms increased in the US and France since the 1980s.

Figure 9 supports this argument. The figure shows the share of net payments of distributed income of corporations among net value-added for non-financial corporations in the US, France, Germany, Norway, and average of 20 OECD countries.

[11] "This condition was called "profits without prosperity".

Figure 9. Share of net payments of distributed income of corporations among net value-added for non-financial corporations in the US, France, Germany, Norway, and average of 20 OECD countries.



Source : OECD National Accounts

According to Figure 9, net payments of distributed income of corporations consist of net payments of dividends plus withdrawals from the income of owners of quasi-corporations. Net value-added is gross value-added minus consumption of fixed capital. Thus, this share shows how much share of net value-added is distributed to shareholders and owners of non-financial corporations. France and Norway are the only countries where data are available in the OECD National Accounts since the late 1970s. The share of net payments of distributed incomes of corporations among net value-added for non-financial corporations had increased until the global financial crisis in several OECD countries. Furthermore, this share increased from the late 1980s to the mid-2000s in Norway, from the 1980s to the late 2000s in France, and from the mid-1990s to 2007 in Germany and the US.[12] In particular, the share of Norway increased rapidly from 1.48% in 1988 to 21.8% in 2005. During this period, the top 10% income share also increased significantly from 22.73% to 37.06% in Norway. The average of shares of net payments of distributed income of corporations in 20 OECD countries where data are available since 1995 also increased from 8.4% in 1995 to 12.04% in 2009.

[12] Similarly, using US national accounts data, Dünhaupt (2012) observed that the ratio of net dividend to net national income had increased since the 1970s in the US.

The second channel is that financialization increases the relative bargaining power of capital than that of labor. As firms involve a wider range of financial activities, they focus more closely on financial investment than real investment, which decreases the bargaining power of production workers and restricts wage increases (Alvarez, 2015). Furthermore, capital account liberalization and financial globalization enables firms to invest in foreign countries easily, which also decreases the bargaining power of workers. Using country-level data, Stockhammer (2013) found that financial globalization measured by log of external financial assets plus liabilities divided by GDP is significantly and negatively correlated with labor income share.

The third channel is the rise of financial managers. As financial industries expand in several developed countries, financial managers and workers, such as investment bankers and hedge fund managers, earn large amounts of money. Several studies have observed that a large portion (30%–70%) of the recent increase of the top 0.1%, 1%, or 10% income share comes from the financial industry in the UK, France, and the US (Bell and Van Reenen, 2010; Bakija et al., 2010; Godechot, 2012). Kaplan and Rauh (2010) also estimated that in 2004, the sum of the compensation of the top 25 hedge fund managers is greater than that of CEOs of S&P 500 firms in the US.

One cause of such phenomena seems to be the volume effect. Kaplan and Rauh (2010) reported that the amount of funds managed by hedge funds increased from US$20 billion in 1986 to US$934 billion in 2004. The income of hedge-fund managers usually consists of 2% of managed fund (management fee) and 20% of profit, so the rapid increase of funds generates a large income for them. Furthermore, Godechot (2008) argued that some competent financial managers can increase their income sharply by threatening firms to move key assets, such as social capital with customers or productive teams, to competitor companies.

The fourth channel is the boom in the stock market. As financialization deepens, more firms and households invest their funds in the financial market, particularly the stock market. Thus, financialization likely increases stock prices. The spread of maximization of shareholder value in corporate management can also contribute to an increase of stock price. If stock prices increase, managers and workers in the financial industries can earn more brokerage commissions and shareholders can also obtain increased capital gains and probably larger dividends. Similar to other assets, stocks are highly concentrated in a small number of

individuals and organizations, so the boom in the stock market can increase inequality. Studying US taxpayer data from 1979 to 2005, Bakija et al. (2010) found that the mean income of major occupations such as executive and financial professionals in the top 0.1% of US income distribution are closely related to fluctuations of US stock price. By conducting a regression of panel data from 16 countries for one century, Roine et al. (2009) argued that the top 1% income share is positively correlated with stock market capitalization.

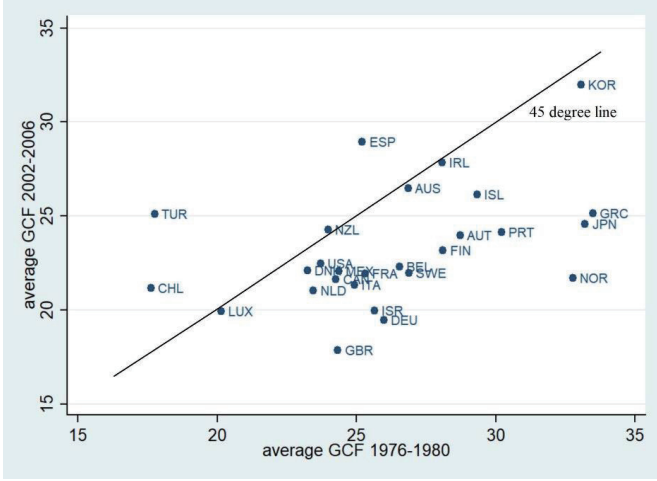
Considering these channels that I have reviewed, I present the following hypothesis on financialization and inequality:

H3: Financialization increases inequality in the long run.

In terms of investment, the argument on the spread of maximization of shareholder value can be applied similarly. As a greater share of resources and profits of firms goes to shareholders and CEOs, the internal funds of firm for investment can be reduced. Furthermore, if the CEOs of firms are pressured to increase short-term profits for maximization of shareholder value, they might increase investment in financial assets and activities rather than in fixed capital because the latter generally takes a longer time to earn profit.

The other possible channel is financial globalization. As restrictions on international capital transactions have been relaxed and financial globalization has deepened, a larger amount of capital can go overseas to earn higher expected returns rather than domestic investment for fixed capital. The investment rate for fixed capital has decreased since the 1980s not only in the US but also in many developed countries. Figure 10 shows the average share of gross capital formation (GCF) in GDP from 1976 to 1980 and from 2002 to 2006.

Figure 10. Average gross capital formation (GCF, % of GDP) from 1976 to 1980 and from 2002 to 2006 in the 27 OECD countries



Source : Worldbank

In Figure 10, gross capital formation is the sum of fixed capital investment and net changes of inventories as percentage of GDP. Among 27 OECD countries, the average GCF decreased in 23 countries. The average GCF increased in some relatively low-income countries, such as Turkey and Chile, but some European countries such as Norway and Germany experienced a significant decrease of average GCF rate since the late 1970s by 6.5%–11% points. The average change in average GCF among 27 OECD countries is -2.91% points.

Some studies argue that this decrease of investment rate is related to financialization, particularly in the US. Orhangazi (2008) argued that increased payment to financial markets measured by sum of interest, dividends, and stock buyback decreases the internal funds of firms and decreases the ratio of fixed capital investment to fixed capital stock of firms using US non-financial firm data from 1973 to 2003. Davis (2014) also found similar results using industry-level average of gross stock repurchases relative to the total equity in the same Compustat data from 1971 to 2011. Using country-level time-series regression from the 1960s to the 1990s for the US and France, Stockhammer (2004) argued that the share of interest and dividend in value-added in the nonfinancial firms decreases the growth rate of gross business capital stock, but no strong effect of financialization was observed in the UK and Germany.

If financialization affects the level or rate of fixed capital investment, then financialization might affect growth as well. However, studies that analyze this relationship are rare. Tomaskovic-Devey et al. (2015) found a significant negative effect of financialization measured by the ratio of financial assets to total assets on value-added using non-financial industry-level data from the US from 1970 to 2008.

According to possible channels that I have reviewed, I present the following hypotheses on financialization and growth.

H4: Financialization decreases private investment and economic growth in the long run.

3.2. Literature Review and Hypotheses Development on Labor Market Institutions

3.2.1. Wage-led growth

Wage-led growth is proposed by several scholars, particularly those at the ILO (Lavoie and Stockhammer, 2012; Onaran and Galanis, 2012; Stockhammer and Onaran, 2013). Their argument is simple. Marginal propensity of consumption for wage earners is higher than that for profit earners, so the increase of share of wages to GDP can increase aggregate consumption and demand. These scholars admit that the increase of wage share can decrease investment and net export because it can decrease the future profitability of firms, but they argue that these effects are less than the effect on consumption in many countries. These scholars divide the demand regime into two, namely, wage-led and profit-led. If the increase of wage share increases private demand, then the country has a wage-led demand regime and if the increase of wage share decreases private demand, then the country has a profit-led demand regime. The scholars also argued that whether a country is in the wage-led demand regime or profit-led demand regime cannot be determined by theory and is an empirical issue. For example, Onaran and Galanis (2012) conducted time-series econometric analysis for 15 countries in G20 from 1961 to 2007 and argued that Germany, France, Italy, the UK, the US, Japan, Turkey, and Korea have wage-led demand regimes, but Canada, Australia, Argentina,

Mexico, China, India, and South Africa have profit-led demand regimes. However, if the wage share decreases in all countries simultaneously, then private demand in Canada, Argentina, Mexico, and India also decreases due to decreased export prices of trade partners because the diminished wage share of trade partners deteriorates the export competitiveness of these countries. Therefore, these scholars argued that the global economy has a wage-led demand regime.

Although wage-led growth theory is simple and powerful, it is prone to criticism. The first problem is the endogeneity of wage share. Skott (2017) argued that the relationship between wage share and economic growth can be positive with some exogenous shocks, but it can be negative with other exogenous shocks. The second problem is the direction of causality. As Kuznets (1955) argued, income level can affect distribution. As the sectoral transition from agriculture to manufacturing and service has been completed, inequality can decrease with income in developed countries, thereby generating a positive correlation between wage share and GDP. Thus, identifying the effect of wage share on GDP using time-series regression for one country is difficult, such as Onaran and Galanis (2012). The third problem is that it is unclear how much wage share should increase. Obviously, an extremely high wage share cannot be beneficial to GDP or growth because no entrepreneur would invest if the wage share is 100%. Thus, if wage-led growth theory is correct, then an optimal wage-share level likely exists, but it is not clear how much wage share is optimal. Furthermore, this point suggests that an increase of wage share might not be an effective long-term growth strategy and is more like a short-run Keynesian effective demand policy even if wage-led growth theory is correct. The fourth problem is that finding proper policies for wage-led growth is difficult even if many countries have a wage-led demand regime and an increase in wage share can lead to a GDP increase, as argued by proponents of wage-led growth. The easiest policy to implement is an increase of minimum wage, but it is not clear whether such a policy increases GDP or wage share.

3.2.2. Minimum wage

A classical study on minimum wage is that by Card and Krueger (1994), who estimated the effect of minimum wage on employment in the fastfood industry by comparing New Jersey

and Pennsylvania because minimum wage in New Jersey increased from $4.25 to $5.05 in April 1992 while that in Pennsylvania did not change during the same period. The researchers found that a minimum wage increase actually increased fastfood employment rather than decreased it, as the competitive labor market model posits. Card and Krueger (2000) reported similar results based on administrative data on restaurants in these states. Card (1992) also showed that an increase in the federal minimum wage raised the wages of teenage workers but did not affect employment in the US. Metcalf (2008) summarized similar results the case of British minimum wage, which was introduced in 1999.

The aforementioned studies suggest that the labor market for low-paid workers, which is affected by minimum wage, are more similar to a monopsony labor market than to a competitive labor market. This condition is far from being a competitive labor market because most firms do not treat wages as given and they can affect their wages to a certain extent. Metcalf (2008) examined 12 possible reasons for why minimum wage has no or minimal impact on employment in the UK and suggested five plausible reasons. These are increasing labor productivity due to increasing workers' effort or training, passing on higher prices of products, decreasing profit share, decreasing working hours per worker, and modern monopsony in which competition occurs between employers but each employer has labor market power[13] over employees.

However, some studies found a negative effect of minimum wage on employment. For example, using monthly current population survey data from 1979 to 1997 in the US, Burkhauser et al. (2000) found a negative effect of minimum wage on teenage employment. Rama (2001) also observed a negative effect of minimum wage on employment, especially for small firms, by analyzing the doubled minimum wage case in the first half of the 1990s in Indonesia. Sabia et al. (2012) found similar results based on an increase of minimum wage case in New York state from 2004 to 2006; they found that an increase of minimum wage leads to a decrease of employment rate for 16- to 29-year-old workers without a high school degree. Lee and Hwang (2016) observed a negative effect of minimum wage on employment in Korea from 2006 to 2014; this negative effect is stronger on vulnerable groups such as young, old, or female workers, and workers in small businesses than for other worker groups.

[13] Metcalf (2008) argued that this power may come from various factors such as incomplete information, mobility costs, or preferences of workers.

Some studies on labor productivity have been conducted, especially in the UK. Forth and O'Mahoney (2003) tested the effect of national minimum wage on the growth rate of labor productivity and total factor productivity (TFP) using 183 industry data from 1995 to 2000 in the UK and found that these effects were insignificant. However, when the researchers divided industries into four quartiles according to the effect of minimum wage, they found that the growth rate of labor productivity (real value added per hour worked) increased from the period prior to the introduction of the national minimum wage (1995–1998) to the period after the introduction (1998–2000) in the first quartile industries where the minimum wage is least affected, but it decreased from the pre-minimum wage to the period after the introduction of the minimum in other industries where minimum wage was more strongly affected. Draca et al. (2011) also found a similar insignificant effect of minimum wage on labor productivity in the UK using 4,112 firm data from 1997 to 2002. However, Riley and Bondibene (2015) observed significant positive effects of minimum wage on labor productivity and TFP using UK firm data from 1993 to 2013. The researchers argued that these effects might be due to increased training and efforts of workers and organizational change due to increased labor costs by minimum wage. Croucher and Rizov (2012) also found a similar positive effect of minimum wage on labor productivity in low-wage sectors such as retail, hospitality, social care, cleaning, security, and textiles in the UK.

In terms of growth, theoretical studies have been conducted by Fanti and Gori (2011), Askenazy (2003), and Cahuc and Michel (1996). These papers generally suggest the possibility of positive effect of minimum wage on growth under certain conditions. These conditions are existence of externalities related to physical or human capital accumulation or R&D activities.[14] However, the effect of minimum wage on growth is generally negative without these externalities because the minimum wage increases the unemployment rate in these models.

Nevertheless, few empirical studies[15] have been conducted on the effect of minimum wage

[14] Given these externalities, an increase in minimum wage can lead to a change of allocation of skilled labor from manufacturing to R&D sector due to decreased marginal productivity of skilled labor caused by a decrease of employed unskilled labor in the manufacturing sector (Askenazy, 2003), increase of human capital due to an increase of unemployment risk in the low-productivity sector (Cahuc and Michel, 1996), or an increase of investment due to an increase of labor costs (Fanti and Gori, 2011).

[15] Askenazy (2003) found a positive effect of the interaction term between minimum wage and

on macroeconomic outcomes such as wage share, aggregated income, or economic growth although this is the core of wage-led growth theory. Thus, the present study aims to fill the gap in the literature.

3.2.3. Labor Unions

Previous studies using firm-level data tend to report a negative effect of unions on investment and productivity growth (Denny and Nickell, 1992; Addison and Hirsch, 1989; Fernie and Metcalf 1995). One reason cited by previous papers is that unions capture some parts of the expected return of investment or new technology, which reduces the incentive of firms' investment. Another is that unions resist the introduction of new technology and change of working practices because union workers tend to increase their effort level and trade unions lose a certain degree of control over the workplace after the introduction of new technology.

However, limited evidence is available on the effects of unions on studies using country-level data, as Nickell and Layard (1999) pointed out. Most studies do not even consider trade unions as important determinants of growth or productivity. Nickell and Layard (1999) argue that whether the aforementioned negative effect of unions is realized completely depends on management response. If unions and managements have a cooperative relationship, then the introduction of new technology might be even faster due to workers' cooperation.

In terms of inequality, several studies argue that decreasing union density is one reason for the recent increase in wage inequality or top 1% income share in the US (Card, 2001; Volscho and Kelly, 2012). However, in terms of wage share, the effect of union density is not strong. Using country-level data, Stockhammer (2013) found a positive correlation between union density and wage share to GDP, but this effect is not robust. EC (2007) and IMF (2007) also found very small or non-robust effects of union density on wage share. Similar to studies on minimum wage, few empirical studies are available on the effect of union density on economic growth or GDP per capita using country-level data.

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exports on growth using a simple panel regression in the 11 OECD countries.

Hypotheses on wage-led growth and labor market institutions are as follows:

H5: An increase of minimum wage and union density leads to a decrease of inequality in the long run.

H6: An increase of minimum wage and union density leads to an increase of wage share in the long run.

H7: An increase of minimum wage and union density leads to a decrease of private investment, but it leads to an increase of private consumption in the long run.

H8: It is unclear whether an increase of minimum wage and union density leads to an increase or decrease of economic growth in the long run. It will be empirically estimated.

Hypotheses 5–7 are in accordance with wage-led growth theory. I will test these hypotheses empirically in the following sections.

3.3. Data

I will briefly discuss the data for the econometric analysis in this section. Researchers generally measure inequality based on personal income distribution (Gini coefficient), top 1% or 10% income share, or functional income distribution (labor–capital income share). Several papers have investigated the effect of financialization on the Gini coefficient (Kus, 2012), top 1% or 10% income share (Flaherty, 2015; Volscho and Kelly, 2012), and labor income share (Stockhammer, 2013; Alvarez, 2015; Dünhaupt, 2013). Other studies show a positive and significant correlation between financialization and inequality.

I will use the share of top 10% income in the national income, the share of adjusted wages in GDP at factor cost, and Gini coefficient as measures of inequality. As a general measure of inequality, top 1% or 10% income share is derived from administrative tax data and outperforms the other available measures for estimating the income of the rich. I only use the top 10% income share seeing that this measure has more observations in the World Wealth and Income Database (WID). Income refers to gross total income and includes labor, business, and capital income (excluding capital gains) before taxes and transfers. Adjusted wage share refers to compensation per employee as a percentage of GDP at factor cost. I

collect the wage share data from the AMECO database. Gini coefficient is based on the household disposable income and total population of the country, which I collect from the WIID 3.3 database. WIID grades each of these data as high, average, low, or unknown, and I only retain those data with high or average quality.

To measure investment and growth, I use log private gross fixed capital formation (log private GFCF) per capita and log GDP per capita, both of which are measured by using purchasing power parity (PPP). I collect private GFCF data from the IMF and GDP per capita data from the Penn World Table (PWT) 9.0. Investment and growth are usually measured based on the ratio of investment to GDP and GDP growth rate. However, panel unit root tests (PURT) show that both of these measures are stationary[16], so I do not use them in this paper. The panel cointegration approach adopted in this paper 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 and meaningless. In terms of consumption, I use log private consumption per capita, which is household final consumption expenditure as measured by PPP and collected from the World Bank database.

Based on the definition presented in the previous section, I use three variables to measure financialization. There variables include 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 for non-financial corporations (distributed income of corporations), and the ratio of external financial asset plus liability 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 definition of financialization (expansion of the financial sector in the economy). Darcillon (2015) used a similar measure to estimate the effect of financialization on labor market institutions. I collect the finance and insurance share data from the OECD Structural Analysis Database (OECD STAN).

The distributed income of corporations measures how much of the value-added of firms goes to the shareholders and owners in non-financial corporations. This variable represents

[16] The PURT results for these variables are presented in Appendix 4.

the second definition of financialization (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 definition of financialization (increased overseas financial activities). I collect financial globalization data from Lane and Milesi–Ferretti (2007). This variable does not include FDI stock and liabilities.

Apart from financialization, I also use three measures of financial development, namely, the domestic credit provided by financial sectors to the private sector as a percent of GDP (private 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 widely used proxy for 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. Turnover ratio determines how actively a stock is traded and measures the relative trading frictions in the stock market. 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 a widely used measure of minimum wage, I use the ratio of national (or federal) minimum wage to median wage of full-time workers. I collect the related data from OECD Stat. Another possible measure is the ratio of minimum wage to average wage, but given that this variable is affected by wage distribution, I instead use the ratio of minimum wage to median wage.

However, Card and Kruger (1995) criticize these measures because they use average or median wage as denominators, which can be correlated to GDP per capita or unobserved economic activities. They propose log minimum wage as a better measure for minimum wage. However, I do not use this variable because the PURT reveals that log minimum wage is a stationary variable[17]. Furthermore, the panel cointegration methods I have applied are robust to omitted variable bias, such as that resulting from the correlation between median wage and unobserved productivity shock. Nevertheless, I also conduct a robustness check by using the inverse of median wage to see whether the estimated effect of minimum wage comes from

[17] The PURT results for this variable are presented in Appendix 4.

the median wage. I collect both the median wage and trade union density data from OECD Stat.

As mentioned earlier, when the linear combination of a set of non-stationary variables is stationary, then these variables are "cointegrated," that is, they are closely related and do not diverge from their equilibrium relationship in the long run.

The basic estimation equation is illustrated as follows:

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

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

z_{it} denotes a set of control variables that differ according to the dependent variables. For the inequality equation, these control variables include tertiary enrolment ratio, trade openness, and share of ICT capital compensation in the total capital compensation. These variables represent the traditional factors of insufficient supply of high-skilled workers, globalization, and skill-biased technological change, respectively, all of which drive the recent increase in inequality. Due to the cointegration test of Pedroni (1999), the number of control variables is restricted in this paper.

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 a percentage of GDP. These variables are traditional determinants of investment (Ndikumana, 2000) and are non-stationary as shown in the PURT results presented in the following section. The other determinants of investment, such as GDP growth and inflation, are not included in the analysis because of their stationarity[18]. The panel cointegration approach is robust to this omission as will be discussed in the next section.

For the growth equation, the control variables include log private investment per capita, tertiary enrolment ratio, log triadic patent stock per million population, and trade openness. These variables represent the traditional production factors of physical capital, human capital,

[18] The PURT results for these variables are presented in Appendix 4.

technology, and external factors, respectively. I use tertiary enrolment ratio instead of primary or secondary enrolment ratio as a measure of human capital because most OECD countries are providing universal primary and secondary education since the 1980s.[19] Triadic patent refers to the patents filed at three major patent offices, namely, the European Patent Office, the Japan Patent Office, and the United States Patent and Trademark Office. Given that these patents have been filed since 1985, I use the cumulative triadic patent data from 1985 to generate a stock variable.

For the consumption equation, the control variables include log disposable income per capita, deposit interest rate, and trade openness. I include log disposable income per capita following the basic Keynesian consumption function and include deposit interest rate because of its possible influence on the consumption or savings decisions of households. I also include trade openness to control the external factors and increase consumption variety by foreign trade.

α_i is the country fixed effect, $\delta_i t$ is a country-specific linear trend, β is the effect of financial or labor market institutions on the dependent variable, and ε_{it} is an error term that is stationary if cointegration is present. If cointegration is present, then $(\beta', \gamma')'$ denotes the cointegrating vector. The following table presents the detailed definitions of these variables and the sources of data.

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

Table 3. Definitions of variables and sources of data

Variable	Definition	Source
Top 10% income share	Share of top 10% income among national income (%)	World Wealth and Income Database (WID)
Adjusted wage share	Compensation per employee as percentage of GDP at factor cost per person employed (%)	AMECO database
Gini coefficient	Ratio of the area that lies between the line of equality and the Lorenz curve over the total area under the line of equality (%)	World Income Inequality Database (WIID 3.3) database
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
Log private consumption per capita	Log of household final consumption expenditure per capita (PPP, 2016 US$)	Worldbank
Finance and insurance share	Share of value-added in the finance and insurance sectors among all sectors (%)	OECD Structural Analysis Databases (OECD STAN) (ISIC Rev. 3)
Financial globalization	Ratio of external financial asset plus liability to GDP (%)	Lane and Milesi-Ferretti (2007)
Distributed income of corporations	Share of net payments of distributed income of corporations among net value-added for non-financial corporations (%)	OECD National Accounts
Private credit	Domestic credit provided by financial sectors to private sector as percent of GDP (%)	Worldbank
Market capitalization	Market capitalization of listed domestic companies (% of GDP)	Worldbank
Turnover ratio	Domestic shares traded divided by market capitalization (%)	Worldbank
Minimum wage	Ratio of national (or federal) minimum wage to median wages of full-time workers (%)	OECD Stat.
Union density	Trade union density (%)	OECD Stat.
Log disaposable income per capita	Log of real household net disposable income per capita (PPP, 2016 US$)	OECD Stat.
Deposit interest rate	Deposit interest rate paid by commercial or similar banks (%)	Worldbank
Median wage	Median wage (PPP, 2016 US$)	OECD Stat.
ICT compensation	Share of Information and Communication Technology (ICT) capital compensation among total capital compensation (%)	EU-KLEMS database, November 2009 release
Trade openness	Export+import/GDP (%)	Worldbank
Tertiary enrolment ratio	Gross enrolment ratio, tertiary, both sexes (%)	Worldbank
Saving rate	Gross saving as percent of GDP (%)	Worldbank
Lending interest rate	Lending interest rate by banks to the 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 populations	OECD Stat.

3.4. Estimation method

I use the panel cointegration approach to analyze the long-run effect of financial and labor market institutions on the macroeconomic variables. Previous studies that use country- or industry-level data generally apply the panel fixed effect model, GMM, or time series model to estimate such effect. However, the fixed effect model is not robust to endogeneity problems, such as omitted variables or reverse causality, while the GMM estimator shows a poor small sample property (Bun and Windmeijer, 2010).

In addition, the sequential exogeneity of independent variables, which is required for the GMM estimation of the panel data of a small number of OECD countries, cannot be easily assumed. The GMM results presented in Appendix 5 show that the sequential exogeneity assumption is strongly rejected in all specifications. The GMM and fixed effect model are suitable for data with large N (number of cross-sectional units) and small T (length of time dimension) because they derive the asymptotic distribution of estimator as N goes to infinity given a fixed T. These estimators also fit the micro panel data but do not fit the OECD country panel data with similar N and T. However, the panel cointegration approach can be used for data with large N and large T because this method derives the asymptotic distribution of the estimator as both N and T go to infinity either sequentially or jointly. Thus, the panel cointegration approach is highly suitable for estimating OECD country panel data.

Meanwhile, the time series model is suitable for analyzing one country but cannot sufficiently reveal the effect of financial and labor market institutions on several developed countries. By using the panel cointegration method, I can control endogeneity and estimate the long-run effect. I can also investigate the direction of Granger causality of the long- or short-run effect by using panel 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.

In the first step, I check whether the variables are stationary or non-stationary for the panel cointegration approach. I conduct three widely used PURTs, namely, the Levin, Lin, and Chu (2002) test (LLC), the Im, Pesaran, and Shin (2003) test (IPS), and the Pesaran (2007) test.

The LLC test uses the augmented Dicky–Fuller (ADF) test in the panel setting. The corresponding estimation equation is as follows:

$$\Delta y_{it} = \delta y_{it-1} + \sum_{L=1}^{P_i} \theta_{iL} \Delta y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \quad \cdots \quad (2)$$

where y_{it} is the tested variable, Δ is the first difference operator, and d_{mt} is the vector of deterministic variables, such as constant or time. The null hypothesis is $\delta = 0$ for all *i*, while the alternative hypothesis is $\delta < 0$ for all *i*. Thus, the rejection of the LLC test means that the time series are stationary for all countries. The LLC test shows that under the null hypothesis, the t-statistic of $\hat{\delta}$ has an asymptotic standard normal distribution as $T \to \infty, N \to \infty$ and $\sqrt{N}/T \to 0$, where T is the size of the time dimension and N is the size of the cross-sectional unit.

However, as one of its main drawbacks, the LLC test assumes that δ is the same for all *i*. Such assumption can be restrictive because each country can have a different rate of adjustment to the long-run equilibrium (Nazlioglu and Soytas, 2012). The IPS test relaxes this assumption, and the corresponding estimation equation is as follows:

$$\Delta y_{it} = \delta_i y_{it-1} + \sum_{L=1}^{P_i} \theta_{iL} \Delta y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \quad \cdots \quad (3)$$

Thus, δ_i can vary with *i* in the IPS test. The null hypothesis of the IPS test is $\delta_i = 0$ for all *i*, and the alternative hypothesis is $\delta_i < 0$ for at least one *i*. Therefore, the rejection of the IPS test means that the time series are stationary in at least one country. The IPS test shows that under the null hypothesis, the cross-sectional average of the individual t-statistic of $\hat{\delta}_i$ (t-bar statistic) has an asymptotic normal distribution as $T \to \infty$ followed by $N \to \infty$ (sequential limit).

However, both the LLC and IPS tests assume the cross-sectional independence of error term ε_{it}. If common international shocks or geographical dependence are present, then these tests can produce misleading results. To check whether a variable has cross-sectional dependence, I perform the cross-section dependence (CD) test of Pesaran (2004), which is estimation equation is expressed as follows:

$$\mathrm{CD} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \quad \cdots \quad (4)$$

where $\hat{\rho}_{ij}$ is the pair-wise cross-section correlation coefficients between countries i and j of the residuals from individual ADF regressions. Pesaran (2004) showed that the CD statistic in equation (4) has an asymptotic standard normal distribution as $\mathrm{N} \to \infty$ if no cross-sectional dependence exists. Therefore, the rejection of the CD test indicates the existence of cross-sectional dependence in a variable. In this case, I perform Pesaran (2007) test, which allows the cross-sectional dependence of the error term.

The Pesaran (2007) test adds the cross-sectional averages of lagged levels and first differences to the ADF regression to control the common effect in the error term. The cross-sectional dependence comes from a single unobserved common factor in the model of Pesaran (2007) and is estimated as follows:

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + \sum_{j=0}^{p} d_{ij} \Delta \bar{y}_{t-j} + \sum_{j=1}^{p} \delta_{ij} \Delta y_{it-j} + \varepsilon_{it} \quad \cdots \quad (5)$$

where $\bar{y}_{t-1}$ and $\Delta \bar{y}_{t-j}$ are the cross-sectional averages of lagged level and first difference that are used to control for the single unobserved factor. Pesaran (2007) showed that the cross-sectional average of the individual t-statistic of $\hat{b}_i$ has a non-standard asymptotic distribution as $\mathrm{N}, \mathrm{T} \to \infty$ under $b_i = 0$ for all i. Pesaran (2007) examined this non-standard distribution through a simulation, and the critical values of the test statistic are also available. The rejection of the Pesaran (2007) test means that the time series are stationary in at least one country.

In the second step, if the non-stationarity of variables is confirmed, then I conduct a panel cointegration test to see whether a cointegration relationship exists between variables in the long run. I perform the Pedroni (1995, 1997) cointegration test, which uses the individual ADF regression for the residuals of each country data. The residual can be obtained by the following simple individual OLS regression:

$$y_{it} = \alpha_i + \delta_i t + \beta_i{}' x_{it} + e_{it} \quad \cdots \quad (6)$$

where $\delta_i t$ is a country-specific linear trend, x_{it} is a vector of variables (including financial or labor market institution variables), β_i is a cointegrating vector that can vary across each country if cointegration exists, α_i is a country fixed effect, and e_{it} is an error term. After estimating the residual $\hat{e}_{it}$ from equation (6), the Pedroni cointegration test checks whether this residual is stationary. This test adopts two regression methods, namely, the AR(1) regression with non-parametric correction and the conventional ADF regression.

The null hypothesis of the Pedroni cointegration test suggests that cointegration does not exist, while its alternative hypothesis suggests that cointegration exists for all countries. Pedroni (1995, 1997) provided seven panel cointegration statistics, of which four are "panel statistics" and three are "group" statistics. The panel statistics assume common AR(1) coefficients for residual $\hat{e}_{it}$, while the group statistics allow heterogeneous AR(1) coefficients across countries. Pedroni (1995, 1997) showed that all these seven statistics have an asymptotic normal distribution as $T \to \infty$ is followed by $N \to \infty$ (sequential limit) under no cointegration. This asymptotic distribution depends on the means and covariance matrixes of the vector of Brownian motion functionals. Pedroni (1995, 1997, 1999) calculated the simulated estimates for these moments, but his estimates are only available for seven variables at most, thereby restricting the number of control variables used in this paper.

In the third step, if the existence of cointegration is confirmed, then I can apply group-mean FMOLS 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, 2001). Thus, omitting those stationary variables that can affect the dependent variable and be correlated to financial or labor market institution variables will not present an issue because these variables cannot be part of the cointegrating relationship.

Group-mean FMOLS is a panel extension of the time series FMOLS developed by Phillips and Hansen (1990), who applied semi-parametric correction to eliminate the bias from the long-run correlation between the error term ε_{it} and the innovation of regressors. This

method applies corrections by estimating the long-run covariance matrix between the error term ε_{it} and the innovation of regressors. Group-mean FMOLS takes the average of the time series FMOLS across countries by using the following estimation equation:

$$\begin{cases} y_{it} = \alpha_i + \delta_i t + \beta' x_{it} + \varepsilon_{it} \\ \Delta x_{it} = e_{it} \end{cases} \quad \cdots \quad (7)$$

where x_{it} is a set of regressors, including financial or labor market institution variables. Given that the error term ε_{it} and the innovation of regressors e_{it} are assumed to be stationary, both y_{it} and x_{it} are non-stationary and are cointegrated. The cointegrating vector β is assumed homogeneous across all i, but group-mean FMOLS consistently estimates the average of cointegrating vectors if these vectors are heterogeneous (β_i) (Pedroni, 2001a). The conventional endogeneity problem comes from the correlation between ε_{it} and x_{it}. In the setting of non-stationary regressors such as equation (7), this endogeneity problem comes from the long-run correlation between $(e_{i1}, e_{i2}, \cdots, e_{it})$ and ε_{it}. The FMOLS estimator eliminates this bias by performing a consistent estimation via the long-run covariance matrix between ε_{it} and e_{it}.

The group-mean FMOLS estimator is expressed as follows:

$$\hat{\beta}_{GFM} = \frac{1}{N}\sum_{i=1}^{N}\left[\left(\sum_{t=1}^{T}(x_{it} - \bar{x}_i)(x_{it} - \bar{x}_i)'\right)^{-1}\left(\sum_{t=1}^{T}(x_{it} - \bar{x}_i)\,\tilde{y}_{it}^{*} - T\hat{\gamma}_i'\right)\right] \quad \cdots \quad (8)$$

where $\bar{x}_i$ is the country-specific mean of regressors, that is, $\bar{x}_i = \frac{1}{T}\sum_{t=1}^{T} x_{it}$, while $\tilde{y}_{it}^{*}$ and $\hat{\gamma}_i$ are related to bias correction. These two terms are defined as follows:

$$\begin{cases} \tilde{y}_{it}^{*} = (y_{it} - \bar{y}_i) - \hat{\Omega}_{12i}\hat{\Omega}_{22i}^{-1}\Delta x_{it} \\ \hat{\gamma}_i = \hat{\Lambda}_{12i} - \hat{\Omega}_{12i}\hat{\Omega}_{22i}^{-1}\hat{\Lambda}_{22i} \end{cases} \quad \cdots \quad (9)$$

where $\hat{\Omega}_i$ and $\hat{\Lambda}_i$ are the non-parametric estimators of long-run covariance matrix Ω_i and the one-sided long-run covariance matrix Λ_i of the vector of error terms $u_{it} = \binom{\varepsilon_{it}}{e_{it}}$. These covariance matrixes are expressed as follows:

$$\Omega_i = \begin{pmatrix} \Omega_{11i} & \Omega_{12i} \\ \Omega_{21i} & \Omega_{22i} \end{pmatrix} = \sum_{j=-\infty}^{\infty} E(u_{it} u_{it-j}') \text{ and } \Lambda_i = \begin{pmatrix} \Lambda_{11i} & \Lambda_{12i} \\ \Lambda_{21i} & \Lambda_{22i} \end{pmatrix} = \sum_{j=0}^{\infty} E(u_{it} u_{it-j}').$$

The above terms are used to eliminate bias from the serial correlation of ε_{it} and from the long-run correlation between ε_{it} and e_{it}. If the number of regressors is k, then Ω_{11i} and Λ_{11i} are scalar and Ω_{22i} and Λ_{22i} are $(\mathrm{k} \times \mathrm{k})$ matrix.

In the last step, I apply panel VECM (Pesaran et al., 1999; Apergis and Payne, 2009) to conduct Granger causality tests. The estimation equation is presented as follows:

$$\Delta \boldsymbol{z_{it}} = \boldsymbol{\delta_i} \hat{\varepsilon}_{it-1} + \sum_{j=1}^{p} \boldsymbol{\Theta_{ij}} \Delta \boldsymbol{z_{it-j}} + \boldsymbol{\alpha_i} + \boldsymbol{\xi_{it}} \quad \cdots \quad (10)$$

Equation (10) is simple type of error-correction model where $\boldsymbol{z_{it}}$ is the $((\mathrm{k}+1) \times 1)$ vector of all variables (including the dependent variable and the financial or labor market institution variables), $\hat{\varepsilon}_{it-1}$ is the estimated error correction term, and $\boldsymbol{\delta_i}$ is the $((\mathrm{k}+1) \times 1)$ speed of adjustment vector of country *i*. The error correction term comes from the residual of group-mean FMOLS in equation (7). $\boldsymbol{\Theta_{ij}}$ is the $((\mathrm{k}+1) \times (\mathrm{k}+1))$ matrix of short-run effect coefficients in country *i* and year *t-j*, while $\boldsymbol{\alpha_i}$ is the $((\mathrm{k}+1) \times 1)$ vector of the country fixed effect. $\boldsymbol{\xi_{it}}$ is the $((\mathrm{k}+1) \times 1)$ vector of the error term.

For example, let $\boldsymbol{z_{it}} = \begin{pmatrix} top\ 10\%\ income\ share_{it} \\ Distributed\ income\ of\ corporations_{it} \\ Tertiary\ enrolment\ ratio_{it} \\ \vdots \\ ICT\ capital\ compensation_{it} \end{pmatrix}$ and $\boldsymbol{\delta_i} = \begin{pmatrix} \delta_{1i} \\ \delta_{2i} \\ \delta_{3i} \\ \vdots \\ \delta_{7i} \end{pmatrix}$ in the top 10% income share equation. If the null hypothesis $H_0 : \delta_{1i} = 0, \forall i$ is rejected, then the top 10% income share responds to the deviation from the long-run relationship of the previous year. In this case, the other variable is the Granger cause of top 10% income share in the long run. Similarly, I can identify the direction of the long-run Granger causality between variables by testing $H_0 : \delta_{1i} = 0, \forall i, \cdots, H_0 : \delta_{7i} = 0, \forall i$.

A short-run Granger causality test can be conducted by estimating $\boldsymbol{\Theta_{ij}} = \begin{pmatrix} \theta_{11ij} & \cdots & \theta_{17ij} \\ \vdots & \ddots & \vdots \\ \theta_{71ij} & \cdots & \theta_{77ij} \end{pmatrix}$. If the null hypothesis $H_0 : \theta_{12ij} = 0, \forall i, j$ is rejected, then the

distributed income of corporations is the Granger cause of top 10% income share in the short run because the first differences of distributed income of corporations in the previous years will affect the first difference of top 10% income share in the current year. The existence of other short-run effects can be also checked by testing the null hypothesis of each element of matrix $\boldsymbol{\Theta_{ij}}$. Thus, I test the existence and direction of long- and short-run Granger causality by using panel VECM.

3.5. Estimation results

3.5.1. Impact on Inequality

The PURT results for the variables in the inequality equations are presented in Table 4.

Table 4. PURT results for the variables in the inequality equations

Test \ Variable			Top 10% income share	Adjusted wage share	Gini	Finance and insurance share	Financial globalization
LLC		With intercept	-0.12 (0.452)	-2.46** (0.007)	-2.26* (0.012)	-1.62 (0.052)	6.27 (1.000)
IPS			2.43 (0.992)	-0.4 (0.344)	-1.71* (0.043)	-0.94 (0.174)	8.89 (1.000)
Pesaran (2007)	lags=0		-2.13* (0.016)	-2.11* (0.017)	-1.97* (0.024)	-1.76* (0.04)	-0.74 (0.229)
	lags=1		-1.89* (0.03)	-2.57** (0.005)	-1.71* (0.044)	-1.34 (0.09)	-1.03 (0.152)
	lags=2		-1.03 (0.152)	-2.23* (0.013)	1.63 (0.948)	0.36 (0.642)	-1.06 (0.144)
LLC		With intercept and trend	-5.07** (0.000)	-0.5 (0.308)	-1.97* (0.025)	-3.58** (0.000)	-0.96 (0.168)
IPS			-3.57** (0.000)	-1.72* (0.043)	-3.2** (0.001)	-2.23* (0.013)	-0.12 (0.452)
Pesaran (2007)	lags=0		-2.23* (0.013)	-0.13 (0.448)	-2.64** (0.004)	-2.14* (0.016)	1.55 (0.94)
	lags=1		-0.19 (0.426)	-0.79 (0.216)	-1.7* (0.045)	-2.49** (0.006)	1.34 (0.91)
	lags=2		0.44 (0.669)	-0.33 (0.372)	3.18 (0.999)	1.57 (0.942)	1.56 (0.94)
Pesaran (2004) CD test			19.68** (0.000)	29.68** (0.000)	0.92 (0.359)	18.47** (0.000)	98.42** (0.000)
Number of countries			13	17	11	28	30
Period			1971-2007	1979-2007	1979-2007	1972-2009	1971-2013
List of countries			Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Austria Denmark Finland France Hungary Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Canada Czech Denmark Estonia Finland France Greece Iceland Ireland Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

Table 4. Panel unit root test (PURT) for the variables in the inequality equations *(continued)*

Test \ Variable			Distributed income of corporations	Private credit	Market capitalization	Turnover ratio	ICT compensation
LLC		With intercept	-3.52** (0.000)	-0.05 (0.481)	-4.49** (0.000)	-7.46** (0.000)	-2.51** (0.006)
IPS		With intercept	-3.29** (0.001)	2.87 (0.998)	-4.32** (0.000)	-7.23** (0.000)	-0.31 (0.377)
Pesaran (2007)	lags=0	With intercept	-4.7** (0.000)	2.6 (0.995)	-3.32** (0.000)	-4.9** (0.000)	-2.92** (0.002)
Pesaran (2007)	lags=1	With intercept	-1.72* (0.043)	0.73 (0.767)	-0.96 (0.168)	-3.69** (0.000)	-5.43** (0.000)
Pesaran (2007)	lags=2	With intercept	-0.16 (0.436)	1.43 (0.924)	-0.2 (0.421)	-2.28* (0.011)	-2.54** (0.006)
LLC		With intercept and trend	-4.63** (0.000)	1.89 (0.97)	-4.94** (0.000)	-6.05** (0.000)	-1.11 (0.133)
IPS		With intercept and trend	-3.48** (0.000)	1.94 (0.974)	-6.12** (0.000)	-7.12** (0.000)	-1.91* (0.028)
Pesaran (2007)	lags=0	With intercept and trend	-3.58** (0.000)	4.62 (1.000)	-2.68** (0.004)	-4.5** (0.000)	-1.55 (0.06)
Pesaran (2007)	lags=1	With intercept and trend	-0.09 (0.463)	3.17 (0.999)	0.97 (0.834)	-1.68* (0.046)	-5.15** (0.000)
Pesaran (2007)	lags=2	With intercept and trend	0.82 (0.795)	4.57 (1.000)	1.74 (0.959)	0.42 (0.663)	-1.2 (0.116)
Pesaran (2004) CD test			4.01** (0.000)	72.32** (0.000)	51.36** (0.000)	29.1** (0.000)	34.43** (0.000)
Number of countries			25	34	32	32	17
Period			1979-2013	1971-2014	1976-2014	1976-2014	1971-2007
List of countries			Austria Belgium Czech Denmark Estonia Finland France Hungary Greece Iceland Ireland Italy Korea Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovak Slovenia Spain Sweden Switzerland Turkey UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Germany Greece Hungary Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovak Slovenia Spain Sweden Switzerland Turkey UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Germany Greece Hungary Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovak Slovenia Spain Sweden Switzerland Turkey UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA

note: .01 - **; .05 - *

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

Table 4. Panel unit root test (PURT) for the variables in the inequality equations *(continued)*

Test \ Variable			Trade openness	Union density	Tertiary enrolment ratio	Minimum wage
LLC		With intercept	0.13 (0.554)	-7.32** (0.000)	4.82 (1.000)	-4.53** (0.000)
IPS		With intercept	3.7 (0.999)	-4.01** (0.000)	11.05 (1.000)	-3.86** (0.000)
Pesaran (2007)	lags=0	With intercept	-1.5 (0.066)	-1.3 (0.097)	4.13 (1.000)	-0.63 (0.265)
Pesaran (2007)	lags=1	With intercept	-2.88** (0.002)	-2.08* (0.019)	2.64 (0.996)	-0.2 (0.42)
Pesaran (2007)	lags=2	With intercept	-1.81* (0.035)	-1.73* (0.042)	2.52 (0.994)	n.a.
LLC		With intercept and trend	-4.63** (0.000)	-8.71** (0.000)	0.81 (0.79)	-1.41 (0.08)
IPS		With intercept and trend	-3.67** (0.000)	-4.64** (0.000)	3.12 (0.999)	-1.08 (0.14)
Pesaran (2007)	lags=0	With intercept and trend	-0.41 (0.339)	1.15 (0.875)	6.34 (1.000)	0.89 (0.814)
Pesaran (2007)	lags=1	With intercept and trend	-2.76** (0.003)	0.6 (0.727)	5.9 (1.000)	0.81 (0.792)
Pesaran (2007)	lags=2	With intercept and trend	-1.58 (0.057)	1.47 (0.93)	4.8 (1.000)	n.a.
Pesaran (2004) CD test			89.62** (0.000)	66.49** (0.000)	110.61** (0.000)	5.2** (0.000)
Number of countries			34	34	30	22
Period			1971-2014	1971-2014	1971-2013	1972-2014
List of countries			Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovak Slovenia Spain Sweden Switzerland Turkey UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovak Slovenia Spain Sweden Switzerland Turkey UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Belgium Canada Chile Czech Estonia France Greece Hungary Ireland Japan Korea Mexico Netherlands New Zealand Poland Portugal Slovakia Slovenia Spain UK USA

note: .01 - **; .05 - *

* null hypothesis : variable is non-stationary

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

* n.a. : not available due to limit of observations

The data coverage of each variable is the widest coverage that is used in the following analysis, including the robustness check. For example, given that trade openness is used in the inequality, investment, growth, and consumption equations, this variable has the widest data coverage among all specifications for every dependent variable. If the IPS or Pesaran (2007) tests do not reject the null hypothesis of non-stationarity and if one variable is confirmed as non-stationary, then the smaller data coverage of the variable is also non-stationary because both of these tests posit in their null hypothesis that each time series of this

variable is non-stationary. It greatly reduces the burden on PURT because I use various specifications in the robustness check.

Table 4 shows that the CD statistic for Gini coefficient is insignificant. Therefore, the IPS test is better than the Pesaran (2007) cointegration test for the Gini coefficient because the former has a better small sample property than the latter if the cross-sectional independence holds (Pesaran, 2007). The IPS test results reject the null hypothesis at the 1% or 5% significance level. Thus, the Gini coefficient is stationary, and I no longer present the cointegration test results for this coefficient.

Second, the CD test reveals a cross-sectional dependence in all variables except for the Gini coefficient. The CD statistics are significant at the 1% level in all variables except for the Gini coefficient. Thus, I perform the Pesaran (2007) test instead of the LLC or IPS test for these variables.

In the Pesaran (2007) test, I use three lag structures of residual serial correlation from no serial correlation to AR(2) ("p" in equation (5)). The Pesaran (2007) test results show that financial globalization, private credit, tertiary enrolment ratio, and minimum wage are all non-stationary regardless of the lag structure or the existence of a linear trend. Thus, I can conclude that these variables are non-stationary. However, Pesaran (2007) test generates mixed results for the remaining nine variables depending on the lag structure or the existence of linear trend. To investigate these results in detail, I conduct the Pesaran (2007) test for these variables up to five lags.

Table 5. Pesaran (2007) test results for the selected variables in the inequality equation

Variable		Top 10% income share	Adjusted wage share	Distributed income of corporations	Finance and insurance share	Market capitalization	Turnover ratio	ICT compen sation	Trade openness	Union density
With intercept	lags=0	-2.13* (0.016)	-2.11* (0.017)	-4.7** (0.000)	-1.76* (0.04)	-3.32** (0.000)	-4.9** (0.000)	-2.92** (0.002)	-1.5 (0.066)	-1.3 (0.097)
	lags=1	-1.89* (0.03)	-2.57** (0.005)	-1.72* (0.043)	-1.34 (0.09)	-0.96 (0.168)	-3.69** (0.000)	-5.43** (0.000)	-2.88** (0.002)	-2.08* (0.019)
	lags=2	-1.03 (0.152)	-2.23* (0.013)	-0.16 (0.436)	0.36 (0.642)	-0.2 (0.421)	-2.28* (0.011)	-2.54** (0.006)	-1.81* (0.035)	-1.73* (0.042)
	lags=3	0.02 (0.508)	-2.23* (0.013)	1.34 (0.91)	-1.1 (0.135)	1.72 (0.957)	1.67 (0.952)	2.65 (0.996)	-1.26 (0.103)	-0.73 (0.233)
	lags=4	2.41 (0.992)	n.a.	5.75 (1.000)	5.9 (1.000)	n.a.	n.a.	n.a.	0.62 (0.733)	-0.79 (0.215)
	lags=5	2.18 (0.985)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.28 (0.9)	3.89 (1.000)
With intercept and trend	lags=0	-2.23* (0.013)	-0.13 (0.448)	-3.58** (0.000)	-2.14* (0.016)	-2.68** (0.004)	-4.5** (0.000)	-1.55 (0.06)	-0.41 (0.339)	1.15 (0.875)
	lags=1	-0.19 (0.426)	-0.79 (0.216)	-0.09 (0.463)	-2.49** (0.006)	0.97 (0.834)	-1.68* (0.046)	-5.15** (0.000)	-2.76** (0.003)	0.6 (0.727)
	lags=2	0.44 (0.669)	-0.33 (0.372)	0.82 (0.795)	1.57 (0.942)	1.74 (0.959)	0.42 (0.663)	-1.2 (0.116)	-1.58 (0.057)	1.47 (0.93)
	lags=3	1.52 (0.936)	4.27 (1.000)	5.09 (1.000)	2.05 (0.98)	3.6 (1.000)	4.92 (1.000)	3.45 (1.000)	-1.48 (0.069)	2.24 (0.987)
	lags=4	3.59 (1.000)	n.a.	6.61 (1.000)	5.16 (1.000)	n.a.	n.a.	n.a.	0.53 (0.703)	4.03 (1.000)
	lags=5	4.71 (1.000)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.27 (0.898)	6.16 (1.000)
Number of countries		13	17	25	28	32	32	17	34	34
Period		1971-2007	1979-2007	1979-2013	1972-2009	1976-2014	1976-2014	1971-2007	1971-2014	1971-2014

note: .01 - **; .05 - *

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* n.a. : not available due to limit of observations

The above table shows that both the Pesaran (2007) statistic and its p-value increase along with lag length for most variables, which indicates that the test statistics cannot reject the null hypothesis of non-stationarity when enough lags of the residual are considered. These findings also imply that the significant statistics in lag 0 or 1 are most likely caused by the inappropriately short lag structure. When two or more lags of the residual are considered, then the Pesaran (2007) statistics are insignificant for top 10% income share, distributed income of corporations, finance and insurance share, and market capitalization regardless of the existence of a linear trend. Thus, these variables tend to be non-stationary. The Pesaran (2007) statistics are also insignificant for the other five variables, namely, adjusted wage share, turnover ratio, share of ICT capital compensation, trade openness, and union density, if the linear time trends and enough number of lags are controlled. Thus, these five variables

seems to be non-stationary data with a linear trend. Given that I use the country-specific linear time trend as a default control variable, these five variables can be considered non-stationary in the following analysis.

The following tables present the results of the Pedroni cointegration test for the inequality equations.

Table 6. Pedroni cointegration test for the top 10% income share equation

Finance and labor variable / Statistics	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio	Minimum wage	Union density
Panel v-Statistic	-1.42 (0.922)	-0.11 (0.544)	-0.92 (0.821)	-1.32 (0.907)	-0.51 (0.696)	-0.72 (0.764)	-1.44 (0.925)	-0.55 (0.710)
Panel rho-Statistic	2.24 (0.988)	2.24 (0.988)	2.61 (0.995)	2.91 (0.998)	2.68 (0.996)	2.56 (0.995)	2.82 (0.998)	2.23 (0.987)
Panel PP-Statistic	-9.23** (0.000)	-0.63 (0.265)	-0.49 (0.311)	0.99 (0.839)	-0.06 (0.475)	-1.10 (0.136)	1.12 (0.868)	-0.69 (0.247)
Panel ADF-Statistic	-5.43** (0.000)	0.18 (0.570)	1.44 (0.925)	2.52 (0.994)	0.45 (0.675)	-1.83* (0.033)	0.55 (0.708)	-0.77 (0.222)
Group rho-Statistic	4.01 (1.000)	2.82 (0.998)	3.37 (1.000)	4.34 (1.000)	4.10 (1.000)	3.78 (1.000)	3.60 (1.000)	2.92 (0.998)
Group PP-Statistic	-15.92** (0.000)	-2.79** (0.003)	-4.06** (0.000)	-0.81 (0.210)	-3.87** (0.000)	-7.54** (0.000)	-0.73 (0.234)	-8.15** (0.000)
Group ADF-Statistic	-4.28** (0.000)	-1.36 (0.087)	-0.13 (0.448)	2.05 (0.980)	-0.97 (0.166)	-3.85** (0.000)	-1.04 (0.148)	-2.08* (0.019)
number of countries	10	13	13	13	13	13	8	13
number of observations per country	11.90	23.77	22.62	22.08	19.31	19.31	21.38	23.77
Period	1979-2007	1971-2007	1972-2007	1971-2007	1976-2007	1976-2007	1972-2007	1971-2007
Countries	Denmark Finland France Ireland Italy Netherlands Spain Sweden UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA	Australia Canada France Japan Netherlands Spain UK USA	Australia Canada Denmark Finland France Ireland Italy Japan Netherlands Spain Sweden UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis

* Null hypothesis : No cointegration

* Three variables (ICT compensation, tertiary enrolment ratio, and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

Table 7. Pedroni cointegration test for the adjusted wage share equation

Finance and labor variable / Statistics	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio	Minimum wage	Union density
Panel v-Statistic	-1.44 (0.925)	-1.54 (0.939)	-0.73 (0.766)	-1.5 (0.934)	-1.14 (0.873)	-0.78 (0.782)	0.17 (0.431)	-1.62 (0.947)
Panel rho-Statistic	2.90 (0.998)	3.48 (1.000)	3.57 (1.000)	3.51 (0.999)	3.44 (0.999)	3.07 (0.999)	2.03 (0.979)	2.8 (0.997)
Panel PP-Statistic	-3.33** (0.000)	1.92 (0.972)	1.47 (0.929)	1.69 (0.955)	1.75 (0.96)	1.18 (0.881)	-0.29 (0.385)	0.08 (0.533)
Panel ADF-Statistic	-3.16** (0.001)	0.83 (0.796)	-0.68 (0.247)	0.83 (0.797)	1.42 (0.922)	-0.07 (0.472)	-1.38 (0.084)	-2.31* (0.011)
Group rho-Statistic	5.07 (1.000)	5.33 (1.000)	5.19 (1.000)	4.56 (1.000)	5.16 (1.000)	5.09 (1.000)	3.26 (0.999)	4.47 (1.000)
Group PP-Statistic	-9.69** (0.000)	-0.41 (0.342)	1.46 (0.927)	-0.34 (0.366)	0.6 (0.727)	0.48 (0.685)	-4.12** (0.000)	-1.92* (0.027)
Group ADF-Statistic	-5.59** (0.000)	0.39 (0.653)	-0.46 (0.323)	-1.23 (0.109)	1.48 (0.931)	-0.07 (0.472)	-2.5** (0.006)	-2.66** (0.004)
number of countries	15	17	17	17	16	16	10	17
number of observations per country	11.80	22.59	21.82	20.94	20.63	20.63	20.6	22.53
Period	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007
Countries	Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Australia Austria Belgium Czech Denmark Finland France Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA	Australia Belgium Czech France Hungary Japan Netherlands Spain UK USA	Australia Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Japan Netherlands Slovenia Spain Sweden UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis

* Null hypothesis : No cointegration

* Three variables (ICT compensation, tertiary enrolment ratio, and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

I control three variables (ICT compensation, tertiary enrolment ratio, and trade openness), country-specific linear trend, and fixed effects in all specifications. Each column in Tables 6 and 7 shows the results of the cointegration test when one of the eight finance or labor variables is included.

The Pedroni cointegration test produces mixed results. When top 10% income share in Table 6 is used as the dependent variable, four statistics (Panel PP and ADF, Group PP and ADF) reject the null hypothesis of no cointegration at the 1% or 5% significance level in some specifications. However, three other statistics (Panel v and rho, Group rho) cannot reject the null hypothesis in all specifications because of their empirical power. Pedroni (2004) computed the empirical power of these statistics by conducting a Monte Carlo simulation and found that the power of v and rho statistics was very poor for a small-sized sample similar to this study. When N=T=20 and the AR(1) coefficient of the residual is 0.9 (which indicates a stationary residual and the existence of cointegration), the empirical power of panel v and group rho statistics is near zero while that of the panel rho statistic is around 0.2 for the 5% test. However, the empirical power of PP and ADF statistics is around 0.6. Such empirical power increases along with N or T, and the difference in the power of statistics becomes negligible when $T > 70$. Among all the cases reported by Pedroni (2004), N=T=20 is the closest to my sample. Thus, using these statistics may generate misleading results because of my selected sample size and the fact that the insignificant results of these statistics as shown in Tables 6 and 7 may be attributed to the low power of v and rho statistics in a small sample.[20] Therefore, I focus on PP and ADF statistics in the following analysis.

The results of PP and ADF statistics in Table 6 imply the existence of panel cointegration between the variables when distributed income of corporations is included because these statistics are significant at the 1% level. Therefore, the results in Table 6 suggest that distributed income of corporations is cointegrated with top 10% income share and other control variables. However, the results for the other finance and labor variables are weak. The 0~3 statistics among PP and ADF statistics are significant when these variables are included in Table 6. Thus, I focus on the relationship between distributed income of corporations and top 10% income share in the following analysis.

[20] The empirical size of PP and ADF statistics is around 0.1 in the 5% test when N=20 and T=40. This case is the closest to our sample among all the cases reported by Pedroni (2004). The empirical size of the other three statistics is less than 0.05 in the 5% test when N=20 and T=40.

The panel cointegration test has produced similar results for adjusted wage share in Table 7. PP and ADF statistics are significant at the 1% level when the distributed income of corporations is included, but the results become weaker when other finance or labor variables are included. Therefore, the results in Tables 6 and 7 suggest that distributed income of corporations, rather than other finance or labor variables, is cointegrated with inequality variables, such as top 10% income share and adjusted wage share.

The following table presents the group-mean FMOLS results for the inequality equation.

Table 8. Pedroni group-mean FMOLS results for the inequality equation

Dependent variable	Top 10% income share		Adjusted wage share	
Variable	Coef.	p-value	Coef.	p-value
Distributed income of corporations	0.093**	0.000	-0.06	0.265
ICT compensation	0.33**	0.000	0.50**	0.000
Tertiary enrolment ratio	-0.043	0.266	0.030	0.724
Trade openness	0.036**	0.005	0.010	0.584
Number of countries	10		15	
Number of observation per country	12.0		11.8	
Number of observation	120		177	
Period	1979-2007		1979-2007	
Countries	Denmark Finland France Ireland Italy Netherlands Spain Sweden UK USA		Austria Belgium Czech Denmark Finland France Hungary Ireland Italy Netherlands Slovenia Spain Sweden UK USA	

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

I also control for the linear country-specific trends and fixed effects in all specifications. I only present the estimation results for the specification that includes distributed income of corporations because results of cointegration test become weak when other finance or labor variables are included.

Table 8 shows the estimates of long-run coefficient β in equation (7). When top 10% income share is used as the dependent variable, distributed income of corporations becomes significant and positive at the 1% significance level. A 1% points increase in distributed

income of corporations corresponds to a 0.093% points increase in top 10% income share in the long run. The other control variables show the expected sign of coefficient even if tertiary enrolment ratio is insignificant.

When adjusted wage share is used as the dependent variable, distributed income of corporations becomes insignificant. Therefore, distributed income of corporations is not related to functional income distribution.

The panel VECM results for top 10% income share are presented as follows.

Table 9. Panel VECM results for top 10% income share

Dependent variable	Source of causation(independent variables)					
	Long-run	Short-run				
	L.ECT	L.ΔTop 10% income share	L.ΔDistributed income of corporations	L.ΔICT compensation	L.ΔTertiary enrolment	L.ΔTrade openness
ΔTop 10% income share	1.26 (0.279)	0.48 (0.892)	2.05* (0.048)	0.60 (0.805)	0.60 (0.809)	1.13 (0.358)
ΔDistributed income of corporations	1.04 (0.429)	2.13* (0.040)	2.71** (0.010)	3.29** (0.003)	2.18* (0.035)	5.23** (0.000)
ΔICT compensation	1.12 (0.373)	1.65 (0.129)	1.05 (0.424)	1.18 (0.330)	1.49 (0.178)	1.98 (0.063)
ΔTertiary enrolment	3.22** (0.003)	0.97 (0.483)	0.66 (0.759)	1.43 (0.197)	0.85 (0.583)	0.79 (0.640)
ΔTrade openness	0.77 (0.655)	0.75 (0.678)	0.58 (0.825)	1.86 (0.074)	0.31 (0.975)	0.62 (0.792)

note: .01 - **; .05 - *

* Wald statistics are presented, p-value is in parenthesis

* Error correction term (ECT) comes from residual of group-mean FMOLS regression with country-specific linear trend in the table 8

* 10 countries from 1980 to 2008

The above table shows the results of the long- or short-run Granger causality test, where Δ is the first difference operator and *L* is the one-year lag operator. Given the limited number of

observations, the length of lag is restricted to 2. In other words, I only use the one-year lag of the first differences of variables in the regression (p=1 in equation (10)).[21]

For the long-run effect, the above table shows that the null hypothesis $H_0 : \delta_{1i} = 0, \forall i$ is not rejected even at the 10% significance level (F stat.=1.26). Therefore, top 10% income share does not respond to the deviation from the long-run relationship of the previous year. Similarly, the null hypothesis $H_0 : \delta_{2i} = 0, \forall i$ cannot be rejected at the 10% significance level (F stat.=1.04), which indicates that the distributed income of corporations does not respond to the deviation from the long-run relationship.

These results suggest the lack of any long-run Granger causality between distributed income of corporations and top 10% income share, which is not in line with the results of the panel cointegration test and group-mean FMOLS.

One possible reason for these results is the limited number of observations. As shown in Figure 9, the data on distributed income of corporations are available from 1995 for all countries, except for France and Norway. Furthermore, the data on the share of ICT capital compensation are available until 2007. In sum, the available data for the regression cover the years 1995 to 2007 for all countries, except for France and Norway. In this case, the average number of observations per country is 12 as shown in Table 8. However, each country has seven estimated parameters in the panel VECM and the limited number of observations significantly reduces the degree of freedom and precision of the estimated coefficient. This problem seems to make most of the statistics in Table 9 insignificant.

However, the results in Table 9 reveal a short-run Granger causality between top 10% income share and distributed income of corporations. Both null hypotheses $H_0 : \theta_{12i} = 0, \forall i$ and $H_0 : \theta_{21i} = 0, \forall i$ are rejected at the 5% significance level (F stat.=2.05 and 2.13).

3.5.2. Impact on Investment and Growth

The PURT results for the variables in the investment and growth equations are presented in the following table. The results for those variables used in all of inequality, investment, and

[21] If I use three lags (p=2), then I need at least 12 observations for each country to run the regression because the number of variables is 5. However, using three lags will significantly reduce the number of countries, so I decided to use two lags.

growth equations (i.e., finance and labor variables, trade openness, and tertiary enrolment ratio) are already presented in Table 4.

Table 10. PURT results for the investment and growth equations

Test \ Variable			Log private GFCF per capita	Log GDP per capita	Saving rate	Lending interest rate	Central government debt	Log triadic patent stock per million populations
LLC		With intercept	-4.06** (0.000)	-10.6** (0.000)	-3.72** (0.000)	-2.73** (0.003)	-0.99 (0.162)	-15.46** (0.000)
IPS		With intercept	-0.41 (0.34)	-1.7* (0.045)	-2.94** (0.002)	-0.98 (0.164)	-0.35 (0.362)	-23.18** (0.000)
Pesaran (2007)	lags=0	With intercept	0.79 (0.784)	0.15 (0.56)	-0.47 (0.318)	-3.88** (0.000)	5.76 (1.000)	-16.4** (0.000)
Pesaran (2007)	lags=1	With intercept	-1.15 (0.126)	-2.17* (0.015)	-0.24 (0.406)	-4.21** (0.000)	3.21 (0.999)	-1.18 (0.12)
Pesaran (2007)	lags=2	With intercept	0.37 (0.643)	-0.9 (0.183)	n.a.	0.65 (0.743)	2.45 (0.993)	2.81 (0.998)
LLC		With intercept and trend	-0.09 (0.463)	-3.31** (0.001)	-3.4** (0.000)	-3.27** (0.001)	-1.48 (0.07)	-1.3 (0.097)
IPS		With intercept and trend	-1.62 (0.053)	-1.28 (0.1)	-2.32* (0.01)	-3.6** (0.000)	-0.05 (0.481)	-12.66** (0.000)
Pesaran (2007)	lags=0	With intercept and trend	2.72 (0.997)	1.56 (0.941)	-0.78 (0.217)	-3.16** (0.001)	2.09 (0.982)	-15.15** (0.000)
Pesaran (2007)	lags=1	With intercept and trend	1.67 (0.953)	0.52 (0.698)	1.19 (0.884)	-5.3** (0.000)	2.45 (0.993)	-1.54 (0.062)
Pesaran (2007)	lags=2	With intercept and trend	3.24 (0.999)	2.1 (0.982)	n.a.	1.04 (0.85)	4.36 (1.000)	2.77 (0.997)
Pesaran (2004) CD test			87.52** (0.000)	99.92** (0.000)	12.09** (0.000)	57.83** (0.000)	13.37** (0.000)	106.97** (0.000)
Number of countries			30	30	29	27	29	30
Period			1981-2013	1986-2013	1981-2010	1981-2010	1981-2010	1986-2013
List of countries			Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* n.a. : not available due to limit of observations

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

Similar to Table 4, the data coverage of each variable is the widest coverage that is used in the following analysis, including the robustness check. The CD test reveals a cross-sectional dependence in all variables, while the Pesaran (2007) test shows that log private GFCF per capita, savings rate, and central government debt are non-stationary regardless of the linear trend and lag structure. The following table presents the Pesaran (2007) test results for log GDP per capita, lending interest rate, and log triadic patent stock per million population up to five lags.

Table 11. Pesaran (2007) test results for selected variables in the investment and growth equations

Variable		Log GDP per capita	Lending interest rate	Log triadic patent stock per million populations
With intercept	lags=0	0.15 (0.56)	-3.88** (0.000)	-16.4** (0.000)
	lags=1	-2.17* (0.015)	-4.21** (0.000)	-1.18 (0.12)
	lags=2	-0.9 (0.183)	0.65 (0.743)	2.81 (0.998)
	lags=3	-3.3** (0.000)	n.a.	0.7 (0.757)
	lags=4	-2.09* (0.018)	n.a.	-2.82** (0.002)
	lags=5	-1.8* (0.036)	n.a.	-0.82 (0.207)
With intercept and trend	lags=0	1.56 (0.941)	-3.16** (0.001)	-15.15** (0.000)
	lags=1	0.52 (0.698)	-5.3** (0.000)	-1.54 (0.062)
	lags=2	2.1 (0.982)	1.04 (0.85)	2.77 (0.997)
	lags=3	0.6 (0.725)	n.a.	0.59 (0.722)
	lags=4	3.2 (0.999)	n.a.	-2.52** (0.006)
	lags=5	5.11 (1.000)	n.a.	-0.66 (0.255)
Number of countries		30	27	30
Period		1986-2013	1981-2010	1986-2013

note: .01 - **; .05 - *

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* n.a. : not available due to limit of observations

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

Log GDP per capita is non-stationary with a linear trend, while log triadic patent stock per million population is non-stationary in most cases. Thus, both of these variables are non-stationary depending on the linear trend.

The Pesaran (2007) statistics for lending interest rate are significant if the lag of the residual is either 0 or 1 but become insignificant if the lag is 2. The significant results in lag 0 or 1 may be attributed to the inappropriately short lag structure, but the test results for more than two lags are unavailable because of the limited number of observations. Thus, I use lending interest rate with caution and provide the results of the test excluding this variable in the robustness check.

The following tables show the cointegration test results for the variables in the investment and growth equations.

Table 12. Pedroni panel cointegration test for log private GFCF per capita

	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio	Minimum wage	Union density
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)	3.72** (0.000)	1.63 (0.052)
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)	3.49 (1.000)	3.62 (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)	-0.81 (0.209)	-0.72 (0.236)
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)	-1.21 (0.114)	-0.47 (0.319)
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)	5.78 (1.000)	6.42 (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)	-7.33** (0.000)	-8.11** (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)	-2.81** (0.003)	-2.42** (0.008)
number of countries	20	27	24	27	25	25	17	27
number of obs. per country	13.70	21.30	20.25	20.33	19.08	18.92	19.06	21.26
Period	1983-2010	1981-2010	1981-2009	1981-2010	1981-2010	1981-2010	1981-2010	1981-2010
Countries	Czech Estonia Finland France Germany Greece Iceland Italy Korea Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Czech Denmark Estonia Finland France Germany Greece Iceland Italy Japan Korea Mexico Netherlands Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Chile Czech Denmark Finland France Germany Greece Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Chile Czech Denmark Finland France Germany Greece Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Canada Czech Estonia France Greece Israel Japan Korea Netherlands New Zealand Poland Portugal Slovakia Spain UK USA	Australia Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis, Null hypothesis : No cointegration

* Four variables (saving rate, lending interest rate, central government debt, and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances, Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length, Newey-West automatic bandwidth selection and Bartlett kernel

Table 13. Pedroni panel cointegration test for log GDP per capita

	Distributed income of corporations	Financial globalization	Finance and insurance share	Private credit	Market capitalization	Turnover ratio
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)
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)
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)
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)
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)
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)
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)
number of countries	24	30	28	30	28	28
number of obs.per country	16.92	24.30	19.64	22.87	21.04	20.82
Period	1986-2013	1986-2013	1986-2009	1986-2013	1986-2013	1986-2013
Countries	Austria Belgium Czech Denmark Estonia Finland France Greece Iceland Ireland Italy Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Czech Denmark Estonia Finland France Greece Iceland Ireland Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Greece Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Greece Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis

* Null hypothesis : No cointegration

* Four variables (log private GFCF per capita, tertiary enrolment, log triadic patent stock per million populations, and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

Table 13. Pedroni panel cointegration test for log GDP per capita *(continued)*

	Minimum wage	Union density	None
Panel v-Statistic	1.60 (0.055)	5.60** (0.000)	5.75** (0.000)
Panel rho-Statistic	3.69 (1.000)	4.25 (1.000)	2.40 (0.992)
Panel PP-Statistic	0.36 (0.640)	-1.04 (0.149)	-2.03* (0.021)
Panel ADF-Statistic	0.68 (0.753)	-0.31 (0.378)	-2.03* (0.021)
Group rho-Statistic	5.66 (1.000)	5.89 (1.000)	4.71 (1.000)
Group PP-Statistic	-6.06** (0.000)	-6.34** (0.000)	-2.14* (0.016)
Group ADF-Statistic	-1.65* (0.050)	-1.77* (0.038)	-1.02 (0.155)
number of countries	20	30	30
number of observations per country	21.15	23.80	24.47
Period	1986-2013	1986-2013	1986-2013
Countries	Australia Belgium Canada Czech Estonia France Greece Ireland Israel Japan Korea Luxembourg Netherlands New Zealand Poland Portugal Slovakia Spain UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis

* Null hypothesis : No cointegration

* Four variables (log private GFCF per capita, tertiary enrolment, log triadic patent stock per million populations, and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

When log private GFCF per capita is the dependent variable, the cointegration test results are relatively strong in the specification that includes financial globalization. Panel v and ADF, group PP, and ADF statistics are significant at the 1% or 5% level in this specification. Meanwhile, weak cointegration test results are obtained in the specification that includes other finance or labor variables. Therefore, I focus on the relationship between financial globalization and investment in the following group-mean FMOLS and panel VECM.

When log GDP per capita is the dependent variable, the cointegration test results are generally weak in all specifications that include finance and labor variables. The 1~3 statistics are significant in these specifications. Meanwhile, these results become stronger if no finance or labor variable is included. As shown in the last column of Table 13, panel v, PP, ADF, and group PP statistics are significant at the 1% or 5% level, thereby suggesting that financial or labor market institution variables are not cointegrated with log GDP per capita because the cointegration test results become weak when these variables are added.

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

Table 14. Pedroni group-mean FMOLS results for the investment equation

Variable	Coef.	p-value
Financial globalization	-0.0015**	0.000
Trade openness	0.001	0.174
Saving rate	0.021**	0.000
Lending interest rate	-0.001	0.578
Central government debt	-0.021**	0.000
Number of countries	27	
Number of observation per country	21.3	
Number of observation	575	
Period	1981-2010	
Countries	Australia Canada Chile Czech Denmark Estonia Finland France Germany Greece Iceland Israel Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

I also control for linear country-specific trends and fixed effects in the regression. The estimation results in the above table show that financial globalization is negatively correlated to log private GFCF per capita in the long run. Financial globalization is significant and negative at the 1% significance level. A 1% points 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, savings rate is positive and significant, and both trade openness and lending interest rate are not significant.

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

Table 15. Pedroni group-mean FMOLS results for the growth equation

Variable	Coef.	p-value
Log private GFCF per capita	0.243**	0.000
Tertiary enrolment ratio	0.000	0.851
Log triadic patent stock per million populations	0.022	0.188
Trade openness	0.001**	0.000
Number of countries	30	
Number of observation per country	24.5	
Number of observation	734	
Period	1986-2013	
Countries	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Greece Iceland Ireland Israel Italy Japan Korea Luxembourg Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Spain Sweden Switzerland UK USA	

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

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 significant.

The estimation results in Tables 14 and 15 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 I multiply the two

coefficients in Tables 14 and 15, then a 1% points 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 are presented as follows.

Table 16. Panel VECM results for log private GFCF per capita

Dependent variable	Source of causation(independent variables)						
	Long-run	Short-run					
	L.ECT	L.ΔLog private GFCF per capita	L.ΔFinancial globalization	L.ΔSaving rate	L.ΔLending interest	L.ΔCentral government debt	L.ΔTrade openness
ΔLog private GFCF per capita	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)
ΔFinancial globalization	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)
ΔSaving rate	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)
ΔLending interest	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)
ΔCentral government debt	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)
ΔTrade openness	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: .01 - **; .05 - *

* Wald statistics are presented, p-value is in parenthesis

* Error correction term (ECT) comes from residual of group-mean FMOLS with country-specific linear trend in the table 14.

* 27 countries from 1982 to 2011

These results differ from those presented in the previous section. The null hypothesis $H_0 : \delta_{1i} = 0, \forall i$ is rejected at the 1% significance level (F stat.=2.58), which indicates that log private GFCF per capita responds to the deviation from the long-run relationship of the previous year, thereby supporting the results of the panel cointegration test and group-mean FMOLS. The null hypothesis $H_0 : \delta_{2i} = 0, \forall i$ cannot be rejected even at the 10% significance level (F stat.=0.41), which means that financial globalization does not respond to the deviation from the long-run relationship of the previous year. These results suggest a unilateral Granger causality from financial globalization to private investment in the long run.

In terms of short-run effect, the null hypothesis $H_0 : \theta_{12i} = 0, \forall i$ is rejected at the 1% level (F stat.=4.29), while the null hypothesis $H_0 : \theta_{21i} = 0, \forall i$ 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 difference between Tables 9 and 16 can be attributed to the number of observations. An average of 12 observations are available for each country in Table 8 (top 10% income share and distributed income of corporations), but an average of 21.3 observations are available for each country in Table 14 (log private GFCF per capita and financial globalization). Therefore, the estimates in Table 14 are more precise than those in Table 8.

3.5.3. Impact on Consumption

The PURT results for the consumption equation are presented in the following table. The data coverage of each variable is the widest coverage that is used in the following analysis, including the robustness check.

Table 17. PURT results for the consumption equation

Test \ Variable			Log private consumption per capita	Log disposable income per capita	Deposit interest rate
LLC		With intercept	-6.82** (0.000)	-8.34** (0.000)	-16.19** (0.000)
IPS		With intercept	0.51 (0.695)	-3.65** (0.000)	-8.21** (0.000)
Pesaran (2007)	lags=0	With intercept	-0.87 (0.191)	0.32 (0.624)	-6.79** (0.000)
Pesaran (2007)	lags=1	With intercept	-1.89* (0.029)	-0.96 (0.17)	-7.91** (0.000)
Pesaran (2007)	lags=2	With intercept	-4.63** (0.000)	2.27 (0.988)	-5.07** (0.000)
LLC		With intercept and trend	3.05 (0.999)	1.54 (0.938)	-11.68** (0.000)
IPS		With intercept and trend	3.17 (0.999)	2.64 (0.996)	-4.8** (0.000)
Pesaran (2007)	lags=0	With intercept and trend	1.38 (0.917)	1.9 (0.971)	-4.37** (0.000)
Pesaran (2007)	lags=1	With intercept and trend	0.45 (0.673)	1.53 (0.936)	-5.85** (0.000)
Pesaran (2007)	lags=2	With intercept and trend	-1.27 (0.102)	6.43 (1.000)	-2.43** (0.008)
Pesaran (2004) CD test			103.81** (0.000)	87.03** (0.000)	37.78** (0.000)
Number of countries			31	31	18
Period			1990-2014	1990-2014	1990-2014
List of countries			Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Belgium Canada Czech Estonia France Greece Hungary Ireland Japan Korea Mexico Netherlands New Zealand Poland Portugal Slovakia Spain

note: .01 - **; .05 - *
* p-value is in the parenthesis, null hypothesis : variable is non-stationary
* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

The CD test reveals a cross-sectional dependence in all variables, and the CD statistics are significant at the 1% level in these variables. Thus, the Pesaran (2007) test is preferable than the LLC or IPS test for these variables.

The Pesaran (2007) test shows that log disposable income per capita is non-stationary regardless of the lag structure or the existence of a linear trend. However, all PURT statistics for deposit interest rate are significant at the 1% level, thereby suggesting that deposit interest rate is stationary. Therefore, I exclude deposit interest rate from the control variables for the consumption equation.

The PURT statistics for log private consumption per capita are mixed depending on the existence of a linear trend. When a linear trend exists, none of these statistics is significant.

Given that I use country-specific linear trend as a default control in the following analysis, this variable is considered non-stationary with a linear trend.

The following table shows the cointegration test results for the consumption equations. I do not use financialization variables for the analysis because these variables are highly unlikely to influence private consumption. Instead, I use three financial development variables (private credit, market capitalization, and turnover ratio) and two labor variables (minimum wage and union density).

Table 18. Pedroni panel cointegration test for the consumption equation

	Private credit	Market capitalization	Turnover ratio	Minimum wage	Union density
Panel v-Statistic	-1.29 (0.901)	2.25* (0.012)	0.72 (0.237)	-1.09 (0.861)	-0.85 (0.802)
Panel rho-Statistic	3.22 (0.999)	2.41 (0.992)	2.84 (0.998)	2.60 (0.995)	3.80 (1.000)
Panel PP-Statistic	-0.96 (0.168)	-1.20 (0.115)	-0.83 (0.203)	-0.14 (0.446)	1.22 (0.888)
Panel ADF-Statistic	-1.60 (0.055)	-1.05 (0.147)	-1.30 (0.096)	-0.20 (0.420)	-0.88 (0.190)
Group rho-Statistic	4.17 (1.000)	4.40 (1.000)	4.75 (1.000)	3.85 (1.000)	4.74 (1.000)
Group PP-Statistic	-5.64** (0.000)	-6.92** (0.000)	-3.95** (0.000)	-3.64** (0.000)	-1.41 (0.080)
Group ADF-Statistic	-3.22** (0.001)	-2.68** (0.004)	-1.46 (0.073)	-1.81* (0.035)	-1.67* (0.047)
number of countries	31	29	29	22	31
number of obs. per country	17.19	16.69	16.55	17.59	18.16
Period	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014
Countries	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Germany Greece Hungary Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Austria Belgium Canada Chile Czech Denmark Finland France Germany Greece Hungary Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA	Australia Belgium Canada Chile Czech Estonia France Greece Hungary Ireland Japan Korea Mexico Netherlands New Zealand Poland Portugal Slovakia Slovenia Spain UK USA	Australia Austria Belgium Canada Chile Czech Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Japan Korea Mexico Netherlands New Zealand Norway Poland Portugal Slovakia Slovenia Spain Sweden Switzerland UK USA

note: .01 - **; .05 - *

* p-value is in parenthesis, Null hypothesis : No cointegration

* Two variables (log disposable income per capita and trade openness), linear country-specific trends and fixed effects are controlled.

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

The table shows that the existence of cointegration is supported by weak evidence. The 1~3 statistics are significant according to the specifications in the above table. Thus, the cointegration test provides weak evidence to support the cointegration between private consumption and financial development or labor market institution variables if a finance or labor variable is included in the specification.

3.5.4. Robustness check

The results of the panel cointegration test suggest a cointegration relationship between distributed income of corporations and top 10% income share as well as between financial globalization and log private GFCF per capita in the long run. However, the cointegration between other finance or labor variables and macroeconomic outcomes is supported by weak evidence. Specifically, minimum wage and union density do not show any cointegration relationship with any macroeconomic outcomes, such as inequality, investment, growth, and consumption.

However, a cointegration may exist if the control variables are changed. One problem of the panel cointegration approach is that there is no method which shows whether the variables to be cointegrated with a dependent variable in advance. Therefore, I check the other specifications to see whether the effect of financial or labor market institution variables is robust across different specifications and whether financial development or labor market institutions has any effect on inequality, investment, growth, and consumption.

My adopted method for the robustness check is similar to the extreme bound analysis methodology of Leamer (1985). First, same as what has been done in the previous section, I fix two to four control variables. Given the limited number of regressors that are included in the Pedroni cointegration test, two to four independent variables can be added. I test all possible combinations by choosing one to four out of the eight available finance and labor variables. These eight variables include two labor variables (minimum wage and union density), three financial development variables (private credit, market capitalization, and turnover ratio), and three financialization variables (distributed income of corporations, finance and insurance share, and financial globalization). Given the control variables, I make all combinations that include the eight aforementioned variables and test whether a

cointegration relationship exists in any of these combinations. This method also allows me to check the robustness of the finance and labor variables. Note that all specifications in the previous section are considered in the robustness check.

When top 10% income share is the dependent variable, three control variables (share of ICT capital compensation, tertiary enrolment ratio, and trade openness) are used and three variables remain. I then make all combinations that include one to three finance and labor variables and test the existence of cointegration in each combination. The total number of combinations is ${}_8C_3+{}_8C_2+{}_8C_1=92$. All cointegration tests and group-mean FMOLS regressions include country-specific linear trend and country fixed effect. A total of 25 combinations have passed the cointegration test. Selection criteria for the cointegration test is the significant statistics among the 7 available statistics must be equal to or more than 4 at the 5% level. Given the large number of possible combinations, I summarize the robustness check results in the following table. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 19. Summary of the robustness check for top 10% income share

Variable		Distributed income of corporations	Market capitalization	Financial globalization	Private credit	Union density	Minimum wage	Finance and insurance share	Turnover ratio
Total number of combinations		92							
Total number of cointegration		25							
Number of combinations for each variable		29							
Number of cointegration for each variable		24	7	8	4	6	6	6	5
Significant	+	18	5	4	1	1	1(1)	0	0
	-	0	1	0	1	1	0	0	1
Insignificant	+	6	1	3	1	2	4	1	2
	-	0	0	1	1	2	1	5	2
Robustness (Expected significant effect/number of cointegration)		75.0%	71.4%	50.0%	25.0%	16.7%	0.0%	0.0%	0.0%
Share of cointegration (number of cointegration/number of combinations for each variable)		82.8%	24.1%	27.6%	13.8%	20.7%	20.7%	20.7%	17.2%
Range of coefficient	min	0.039	-0.011	-0.001	-0.029	-0.129	-0.072	-0.365	-0.004
	max	0.182	0.019	0.012	0.030	0.296	0.056	0.023	0.005

* Number in parenthesis is the number of specification which is robust to group-mean FMOLS regression using inverse of median wage
* Three variables (ICT compensation, tertiary enrolment ratio, trade openness), linear country-specific trends and fixed effects are controlled in all specifications.

Among the 92 possible combinations, 25 specifications have passed the cointegration test. Twenty-four of these specifications include the distributed income of corporations, and the FMOLS coefficient is significant and positive in 18 or 75% of these 24 specifications. Therefore, the long-run correlation between dividend tendency and top 10% income share is robust. Similar to the findings of Roine et al. (2009), market capitalization shows a relatively robust positive correlation with top 10% income share. Seven cointegrated specifications include market capitalization, and five coefficients of market capitalization are significant and positive.

However, the effect of minimum wage and union density on top 10% income share is not robust. Six cointegrated specifications include minimum wage, but this variable is significant

in only one specification. Similarly, six cointegrated specifications include union density, but this variable is significant and positive in one specification, significant and negative in one specification, and insignificant in the remaining four specifications.

The same robustness check is conducted with adjusted wage share as the dependent variable. The same control variables and number of combinations (92) are used. The following table summarizes the robustness check results for adjusted wage share. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 20. Summary of robustness check for adjusted wage share

Variable		Finance and insurance share	Financial globalization	Private credit	Market capitalization	Union density	Distributed income of corporations	Turnover ratio	Minimum wage
Total number of combinations		92							
Total number of cointegration		11							
Number of combinations for each variable		29							
Number of cointegration for each variable		4	3	4	1	5	11	0	0
Significant	+	0	0	1	0	1	0	0	0
	-	3	2	0	1	0	0	0	0
Insignificant	+	0	0	3	0	4	1	0	0
	-	1	1	0	0	0	10	0	0
Robustness (Expected significant effect/number of cointegration)		75.0%	66.7%	25.0%	100.0%	20.0%	0.0%		
Share of cointegration (number of cointegration/number of combinations for each variable)		13.8%	10.3%	13.8%	3.4%	17.2%	37.9%	0.0%	0.0%
Range of coefficient	min	-0.761	-0.017	0.030	-0.034	0.006	-0.245		
	max	-0.619	-0.011	0.142	-0.034	0.303	0.022		

* Three variables (ICT compensation, tertiary enrolment ratio, trade openness), linear country-specific trends and fixed effects are controlled in all specifications.

Among the 92 combinations, 11 specifications have passed the cointegration test. Finance and insurance share is relatively robust and is included in four specifications that have passed the cointegration test. The FMOLS estimates for this variable is significant and negative in three or 75% of these four specifications, thereby suggesting that financialization may affect functional income distribution by changing the bargaining power of labor. Financial globalization is also significant and negative in two of the three specifications with significant and negative FMOLS estimates for finance and insurance share.

However, the effect of union density and minimum wage is not robust. Five of the specifications that have passed the cointegration test include union density, but this variable is significant in only one of these specifications. Minimum wage is not included in any of the specifications that have passed the cointegration test.

The estimation results presented in the previous section and this section suggest that financialization is positively correlated to inequality in the long run, thereby supporting hypothesis 3. Meanwhile, the argument that financial development decreases inequality lacks supporting evidence, thereby rejecting hypothesis 2. Market capitalization is positively correlated to top 10% income share in the long run, and similar results can be found in the literature (Bakija et al., 2010; Roine et al. 2009). Market capitalization is a general measure of the stock market development, but it also measures the boom or bust of the stock market. This variable can be correlated with top 10% income share because of its relation to the higher pay for financial workers or the higher dividends for shareholders.

For labor market institutions, the estimation results suggest that minimum wage and union density are not highly correlated to the inequality measures in the long run. Thus, hypotheses 5 and 6 are not confirmed.

When log private GFCF per capita is the dependent variable, four control variables (savings rate, lending interest rate, central government debt, and trade openness) are used and two variables remain. The total number of combinations that can be made from these eight variables is ${}_8C_2+{}_8C_1=36$. The following table summarizes the robustness check for log private GFCF per capita. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 21. Summary of the robustness check for log private GFCF per capita with four control variables

Variable		Financial globalization	Union density	Minimum wage	Market capitalization	Distributed income of corporations	Finance and insurance share	Private credit	Turnover ratio
Total number of combinations		36							
Total number of cointegration		5							
Number of combinations for each variable		29							
Number of cointegration for each variable		1	1	3	1	2	1	0	0
Significant	+	0	0	0	0	0	0	0	0
	-	1	1	3(2)	1	0	0	0	0
Insignificant	+	0	0	0	0	2	0	0	0
	-	0	0	0	0	0	1	0	0
Robustness (Expected significant effect/number of cointegration)		100.0%	100.0%	66.7%	0.0%	0.0%	0.0%		
Share of cointegration (number of cointegration/number of combinations for each variable)		3.4%	3.4%	10.3%	3.4%	6.9%	3.4%	0.0%	0.0%
Range of coefficient	min	-0.0015	-0.0298	-0.0111	0.0035	0.0035	-0.0026		
	max	-0.0015	-0.0298	-0.0090	0.0041	0.0041	-0.0026		

* Number in parenthesis is the number of specification which is robust to group-mean FMOLS regress using inverse of median wage
* Four variables (saving rate, lending interest rate, central government debt, and trade openness), linear country-specific trends and fixed effects are controlled in all specifications.

Among the 36 combinations, 5 specifications have passed the cointegration test. Minimum wage is relatively robust and is included in three of these five specifications. This variable is negative and significant at the 1% level in these specifications. When I replace minimum wage with inverse of median wage in the same specifications, the latter shows a different sign or an insignificant effect compared with the estimated coefficient of minimum wage in two cointegrated specifications. Thus, the estimated negative effect of minimum wage on private investment is unlikely to come from the effect of median wage in these two specifications. For the other finance and labor variables, the number of cointegrated specifications is too small or their effects are not robust. As shown in Table 14, only one cointegrated specification includes financial globalization, thereby making it impossible to check the robustness of this variable on private investment across different specifications.

I then test additional specifications by changing the number of control variables from four to two. These two control variables are savings rate and central government debt. I drop lending interest rate and trade openness variables in the control variables because they are insignificant in the group-mean FMOLS regression results in Table 14 and the former has mixed PURT results as shown in Table 11. After dropping these two control variables, I choose four variables from the eight finance and labor variables.

The total number of combinations from these eight finance and labor variables is ${}_8C_4+{}_8C_3+{}_8C_2+{}_8C_1=162$. The following table summarizes the robustness check for log private GFCF per capita using two control variables. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 22. Summary of robustness check for log private GFCF per capita with two control variables

Variable		Financial globalization	Market capitalization	Private credit	Finance and insurance share	Union density	Minimum wage	Turnover ratio	Distributed income of corporations
Total number of combinations		162							
Total number of cointegration		31							
Number of combinations for each variable		64							
Number of cointegration for each variable		12	18	6	9	24	15	5	13
Significant	+	0	15	4	0	0	0	0	1
	-	11	0	0	6	8	4(4)	3	0
Insignificant	+	0	3	1	0	5	7	1	8
	-	1	0	1	3	11	4	1	4
Robustness (Expected significant effect/number of cointegration)		91.7%	83.3%	66.7%	66.7%	33.3%	26.7%	0.0%	0.0%
Share of cointegration (number of cointegration/number of combinations for each variable)		18.8%	28.1%	9.4%	14.1%	37.5%	23.4%	7.8%	20.3%
Range of coefficient	min	-0.0024	0.0009	-0.0008	-0.0704	-0.0345	-0.0150	-0.0056	-0.0050
	max	-0.0003	0.0034	0.0062	-0.0013	0.0084	0.0153	0.0000	0.0082

* Number in parenthesis is the number of specification which is robust to group-mean FMOLS regression using inverse of median wage
* Two variables (saving rate, central government debt), linear country-specific trends and fixed effects are controlled in all specifications.

Among 162 combinations, 31 specifications have passed the cointegration test. Financial globalization is the most robust variable and is included in 12 of the 31 specifications that have passed the cointegration test. This variable is negative and significant at the 5% level in all specifications except one, thereby supporting the results presented in the previous section. In this case, an increase in international financial investment triggered by financial globalization may crowd out the domestic investment for fixed capital.

Market capitalization, private credit, and finance and insurance share show relatively robust results. Market capitalization is significant and positive at the 5% level for 15 of the 18 cointegrated specifications that include this variable. Private credit is positive and significant at the 1% level for four of the six cointegrated specifications that include this variable. Finance and insurance share is negative and significant at the 5% level for six of the nine cointegrated specifications that include this variable. These results highlight the positive effect of financial development and the negative effect of financialization on private investment in the long run.

However, how the spread of maximization of shareholder value decreases the domestic investment for fixed capital lacks supporting evidence. Distributed income of corporations is included in 13 of the 31 specifications that have passed the cointegration test but is only significant in one specification.

Meanwhile, the labor variables show less robust results. Union density is included in 24 specifications that have passed the cointegration test, but this variable is significant and negative at the 5% level in only eight of these specifications. Similarly, minimum wage is significant and negative at the 5% level in 4 of the 15 cointegrated specifications that include this variable. None of the cointegrated specifications include union density and minimum wage that are positive and significant at the 5% level. Therefore, a negative long-run correlation may exist between labor institutions and private investment, but these correlations are not robust across different specifications. The estimation results in Appendix Table 16 show that minimum wage and union density tend to be insignificant when the financial development variables are controlled. Therefore, financial development may be a more important factor for private investment than labor market institutions.

When log GDP per capita is the dependent variable, four control variables (log private GFCF per capita, tertiary enrolment ratio, log triadic patent stock per million population, and

trade openness) are used and two variables remain. The total number of combinations made by the eight finance and labor variables is ${}_8C_2+{}_8C_1=36$. The following table summarizes the robustness check for log GDP per capita. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 23. Summary of robustness check for log GDP per capita

Variable		Union density	Turnover ratio	Distributed income of corporations	Financial globalization	Finance and insurance share	Minimum wage	Private credit	Market capitalization
Total number of combinations		36							
Total number of cointegration		6							
Number of combinations for each variable		8							
Number of cointegration for each variable		2	2	4	2	1	1	0	0
Significant	+	0	0	0	0	0	0	0	0
	-	1	1	0	0	0	0	0	0
Insignificant	+	1	0	3	1	1	1	0	0
	-	0	1	1	1	0	0	0	0
Robustness (Expected significant effect/number of cointegration)		50.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Share of cointegration (number of cointegration/number of combinations for each variable)		25.0%	25.0%	50.0%	25.0%	12.5%	12.5%	0.0%	0.0%
Range of coefficient	min	-0.0055	-0.0004	-0.0015	0.0000	0.0021	0.0005		
	max	0.0002	0.0000	0.0009	0.0000	0.0021	0.0005		

* Four variables (log private GFCF per capita, tertiary enrolment ratio, log triadic patent stock per million populations, and trade openness), linear country-specific trends and fixed effects are controlled in all specifications.

Among the 36 specifications, only 6 have passed the cointegration test. Similar to the results in the previous section, most of the variables are not significant to log GDP per capita when log private GFCF per capita is controlled. Union density and turnover ratio are significant and negative at the 5% level in one specification but are not robust across different specifications. The other finance and labor variables are insignificant or do not have a cointegration relationship with log GDP per capita. The above results suggest that finance or labor institutions have no direct effect on GDP per capita given the private investment.

However, financialization or financial development may have an indirect effect on GDP per capita via private investment because log private GFCF per capita is significantly and

positively correlated to log GDP per capita for all cointegrated specifications listed in Appendix Table 18. Therefore, hypotheses 1 and 4 can be supported.

The same cannot be said for labor market institutions because they are not robustly correlated to private investment. If an increase in minimum wage or union density leads to an increase in wage share and consumption, then the GDP per capita will increase given the private investment as argued by the proponents of wage-led growth theory. If this channel works, then this effect can be detected by the significant positive estimated coefficient of these variables given the private investment, but the results presented in the above table offer a different explanation.

The following robustness test for log private consumption per capita also supports the results presented in Table 23. Given that two control variables, namely, log disposable income per capita and trade openness, are included in the consumption equation, four variables remain.

As I have mentioned in the previous section, given that financialization is highly unlikely to affect private consumption, I make combinations by using three financial development variables (private credit, market capitalization, and turnover ratio) and two labor variables (union density and minimum wage). The total number of combinations made by these five variables is ${}_5C_4+{}_5C_3+{}_5C_2+{}_5C_1=30$. The following table summarizes the robustness check for log private consumption per capita. The results of the panel cointegration test and group-mean FMOLS for each specification that passes the cointegration test are presented in Appendix 6.

Table 24. Summary of robustness check for log private consumption per capita

Variable		Market capitalization	Private credit	Turnover ratio	Minimum wage	Union density
Total number of combinations		30				
Total number of cointegration		18				
Number of combinations for each variable		15				
Number of cointegration for each variable		11	11	10	9	13
Significant	+	11	10	5	3(3)	2
	-	0	0	0	0	2
Insignificant	+	0	1	5	2	3
	-	0	0	0	4	6
Robustness (Expected significant effect/number of cointegration)		100.0%	90.9%	50.0%	33.3%	15.4%
Share of cointegration (number of cointegration/number of combinations for each variable)		73.3%	73.3%	66.7%	60.0%	86.7%
Range of coefficient	min	0.0004	0.0005	0.0002	-0.0013	-0.0066
	max	0.0013	0.0011	0.0006	0.0031	0.0038

* Number in parenthesis is the number of specification which is robust to group-mean FMOLS regress using inverse of median wage
* Two variables (log disposable income per capita and trade openness), linear country-specific trends and fixed effects are controlled in all specifications.

Among the 30 specifications, 18 have passed the cointegration test. The above tables show that financial development has a robust positive correlation with log private consumption per capita in the long run. Market capitalization is positive and significant at the 5% level in all cointegrated specifications that include this variable. Private credit is also positive and significant at the 5% level in all cointegrated specifications except for one.

The labor variables have a weaker robustness than the financial development variables. Minimum wage is positive and significant at the 5% level in three of the nine cointegrated specifications that include this variable. Similar to the robustness check of private investment, minimum wage tends to be insignificant if the financial development variables are controlled. Union density is positive and significant in two specifications but is negative and significant in other two specifications.

In sum, the results in the above table support the traditional positive effect of financial development on consumption, but the long-run correlation among wage-led growth policies, investment, and consumption is weak. Thus, hypothesis 7 is weakly supported by the estimation results.

3.6. Conclusion

The estimation results presented in this section suggest that the distributed income of corporations, which indicates the dividend tendency in non-financial corporations, is positively correlated to top 10% income share in the long run. This variable is robust to the changes in specifications. Financial globalization is negatively correlated to log private GFCF per capita in the long run, and this relationship is robust to the changes in specifications. The panel VECM results also show a unilateral Granger causality from financial globalization to log private GFCF per capita in the long run. Similar to the findings of previous studies, financial development variables, such as private credit and market capitalization, are positively correlated to log private GFCF per capita in the long run. Financialization and financial development have no direct effect on log GDP per capita, but an indirect effect is possible in the long run via private investment.

For wage-led growth, the estimation results show that minimum wage and union density are not robustly correlated to any macroeconomic outcome in the long run. Minimum wage is positively correlated to log private consumption per capita in some specifications but is not robust to the changes in specifications. Moreover, the financial development variables show a highly robust correlation with log private consumption per capita in the long run. Minimum wage and union density are also negatively correlated with log private GFCF per capita in some specifications but are not robust to the changes in specifications.

4. Overall Conclusion

4.1. Main finding

This paper investigated the long-run relationship between financial and labor market institutions and macroeconomic variables, such as inequality, investment, growth and consumption.

In Section 2, I analyzed the long-run evolution of various capitalism types via cluster analysis. The results partially supported the arguments of VoC. Some LMEs, such as the USA, UK, and Canada, are classified into different clusters with most European countries since the 1990s. Capitalism types tend to be stable in most European countries over time.

However, East Asian countries and emerging countries, such as Brazil and Russia, show a highly dynamic evolution of capitalism. Korea, Japan, Brazil, and Russia converge to Anglo-Saxon capitalism, which is known for its slow growth and high inequality over time, while Taiwan converges to Northern European capitalism, which is known for its moderate growth and low inequality over time. Therefore, emerging economies may bifurcate into these two long-standing types of capitalism over time.

This different pattern of evolution seems to be mainly driven by the rapidly increasing inequality in East Asian and emerging countries since the 1990s. Such rapid increase may be ascribed to the relatively short history of these capitalism types. Given that these countries may have a relatively weak path dependency or institutional complementarity, external shocks, such as the Asian financial crisis, may easily change their financial and labor market institutions. However, deep-rooted European capitalism tends to be stable and maintain specific institutional elements, such as high collective bargaining coverage and union density, despite the recent globalization and technological advancements.

In Section 3, I estimated the long-run effect of financial and labor market institutions on macroeconomic outcomes, such as inequality, investment, growth, and consumption, by using the panel cointegration approach.

The main findings from the estimations in Section 3 are summarized in Table 25.

Table 25. Summary of the main findings from the estimations

Economic Outcomes	Finance and Labor Variables (Dividend tendency, Finance and insurance share, Financial globalization, Private credit, Market capitalization, Turnover ratio, Minimum wage, Union density)	
	Robust Positive and Significant Long-Run Correlation	Robust Negative and Significant Long-Run Correlation
Inequality	Dividend tendency, Market capitalization	None
Labor income share	None	Finance and insurance share, Financial globalization
Investment	Market capitalization, Private credit	Finance and insurance share, Financial globalization (Minimum wage: weakly negative, Union density: weakly negative)
Consumption	Market capitalization, Private credit (Minimum wage: weakly positive)	None
Growth	None	None

* Source: See Section 3.5.4.
* Robust finance and labor variables must satisfy the following conditions: (1) these variables must be significant in more than half of the cointegrated specifications that include these variables, and (2) the number of cointegrated specifications that include these variables must be greater than one.

The estimation results presented in Section 3 show that financialization, especially dividend tendency, is positively correlated to inequality in the long run. Therefore, a higher dividend can explain the recent increase in inequality in developed countries. To the best of my knowledge, this is the first finding obtained from country-level data. However, how financial development reduces inequality by relaxing the credit constraints of the poor lacks supporting evidence.

The results also reveal a negative significant correlation between financial globalization and investment in the long run. A unilateral Granger causality is also observed from financial globalization to investment, thereby suggesting that increasing international financial investment can crowd out domestic investment. To the best of my knowledge, this paper is the first to identify such causality. Similar to previous studies, financial development is positively correlated to investment.

Overall, the estimation results in Section 3 suggest that various aspects of financialization can explain the problems resulting from modern capitalism, such as increasing inequality, decreasing investment rate, and sluggish growth.

The estimation results for wage-led growth provide weak support for the argument of wage-led growth strategy. As shown in Table 25, minimum wage and union density are not robustly correlated to any macroeconomic outcomes in the long run.

Minimum wage is positively correlated with consumption in some specifications but is not robust to the changes in specifications. Minimum wage and union density are also negatively correlated to investment in some specifications but are not robust to the changes in specifications. The estimation results in Appendix Tables 16 and 20 show that the effect of minimum wage and union density on investment and consumption tends to be insignificant if the financial development variables are controlled.

Various reasons may explain why minimum wage is not robustly correlated to consumption in the long run. First, increasing the minimum wage may decrease employment or working hours per employee in the long run (Bazen and Marimoutou, 2002; Burkhauser et al. 2000; Stewart and Swaffield, 2002, 2008). Increased minimum wage may have a negative long-run effect on employment because employers can adjust labor easily by adopting new technologies or increasing the capital-labor ratio in the long run. If an increase in minimum wage cannot can drive an increase in wage share by reducing employment or working hours per employee, then the main channel for wage-led growth does not work. This finding is in line with the estimation results for the effect of minimum wage on labor income share because these variables have no cointegration relationship as shown in Table 20.

Second, the effect of minimum wage on labor income share can be minimal even if the increase in minimum wage drives an increase in labor income share because a small share of workers in total employment is affected by minimum wage. The share of workers affected by minimum wage in total employment varies along with the level of minimum wage and tends to increase as the minimum wage policy reaches maturity, but this share is less than 20% at most because minimum wage relative to median wage is less than two thirds at most and the self-employed is not covered by minimum wage.[22] Thus, the share of wage for affected workers in the total GDP tends to be very small and can minimize the effect of minimum

[22] For example, the share of workers affected by minimum wage in total employment in Korea gradually increased from 0.65% in 2001 to 13% in 2016. Similarly, only 3% of workers in the UK (about 1.4 million in 47 million total employed) were affected by the national minimum wage in 1999 (Forth and O'Mahoney, 2003). In the USA, it is between 1.15% and 7.54% from 1979 to 2014 (U.S. Bureau of Labor Statistics, 2017). OECD (2015) also showed that it is less than 15% in all 20 OECD countries in 2010.

wage on labor income share even if minimum wage does not affect both employment and working hours per employee.[23]

These same reasons may explain why minimum wage is not robustly correlated to investment in the long run. However, in this paper, minimum wage has an economy-wide effect on investment, and this effect may be highly robust for those firms or sectors that heavily depend on low-wage labor (i.e., small firms, retailers, or restaurants).

The same reasons may also explain why union density is not robustly correlated to investment in the long run. As pointed out by Nickell and Layard (1999), the establishment of a cooperative relationship between union and management may be a more important factor for investment and productivity than the simple density of the trade union.

In sum, these estimation results suggest that minimum wage and union density may not be good policy instruments for equality and growth in the long run and that wage-led growth theory may not have a strong empirical basis. However, the criticisms directed toward wage-led growth theory also lacks a strong empirical basis because the negative effect of minimum wage and union density on investment and GDP is not robust.

Many governments and scholars have recently shown interest in wage-led growth theory and minimum wage, but the results of this paper imply that the policy instruments for simultaneously achieving long-run equality and growth are very difficult to find.

However, given that this paper focuses on the long-run effect of labor market institutions, an increase in minimum wage or union density may possibly lead to an increase in GDP in the short run similar to other Keynesian effective demand policies.

4.2. Contribution

The contributions of this paper are outlined as follows.

[23] The ratio of minimum wage to median wage is 48% on average in the 26 OECD countries where data from 1970 are available. Therefore, the share of wage for affected workers in the total labor income is likely to be less than 10% because the share of workers affected by minimum wage in the total number of employees is less than 20% at most. Furthermore, the share of adjusted wage in the total GDP is 64% on average in 31 OECD countries since 1970, which means that the share of wage for affected workers in the total GDP is likely to be less than 6.4%.

First, VoC argues that LMEs and CMEs demonstrate similar performances in the long run and that significant differences exist in their institutions than in their performances (Soskice and Hall, 2001). As a result, previous studies tend to use economic institution variables to classify capitalism (Geffen and Kenyon, 2006; Schneider and Paunescu, 2012).

However, the results in Section 2 indicate that the economic performances of various capitalism types show significant differences if the growth, employment, and inequality variables are used to measure economic performance. Some persistent differences are also observed between Europe and Anglo-Saxon countries, and East Asian countries tend to converge into Anglo-Saxon capitalism.

Second, previous studies have analyzed the effect of financialization or financial development on a sole outcome variable, such as inequality or growth (King and Levine, 1993, 1998; Rajan and Zingales, 1998; Beck et al., 2004; Clarke et al., 2013; Hacker and Pierson, 2010; Lin and Tomaskovic-Devey, 2013). Meanwhile, this paper has analyzed the effect of financialization and financial development not only on inequality but also on investment and growth by using various measures of financialization and financial development in Section 3. In this way, this paper highlights the overall effect of financialization and financial development on the society.

Third, previous studies have only used the domestic or international aspect of financialization (Duménil and Lévy, 2001, 2004; Hein and Schoder, 2011; Stockhammer, 2013), while this paper has used both of these aspects. Domestic financialization is measured by finance and insurance share and dividend tendency, while international financialization is measured by financial globalization.

Fourth, previous studies on wage-led growth have tested the effect of wage share on growth by using time series techniques (Onaran and Galanis, 2012; Onaran and Obst, 2016). However, given that wage share is not a policy variable, how the policies from wage-led growth actually function in practice remains unknown. Meanwhile, this paper tests the effect of minimum wage and union density, which are representative policies for wage-led growth, in order to show the long-run effect of policies for wage-led growth.

Fifth, this paper employs improved econometric methods to analyze the long-run effect of financial and labor market institutions on macroeconomic variables. Previous studies that use country- or industry-level data have generally employed the panel fixed effect model, GMM, or time series model to estimate the effect of these variables. However, the fixed effect

estimator is not robust to endogeneity problems, such as omitted variables or reverse causality. Meanwhile, GMM estimation requires a sequential exogeneity assumption, which is difficult to hold in OECD country panel data as I have discussed in Section 3.4. By using the panel cointegration method, this paper controls endogeneity and estimates the long-run effect of financial and labor market institutions on important macroeconomic outcomes, such as inequality, investment, and growth.

4.3. Limitations

This paper uses OECD country data beginning from the 1970s, but more countries or time series data need to be considered in future studies to conduct a more powerful panel cointegration analysis. If enough time series data are available, then the country-specific effects on various outcomes can be investigated in future research.

Firm-level analyses, such as Alvarez (2015) and Orhangazi (2008), can be conducted to understand the effect of financial or labor market institutions at the micro level.

In addition, case studies must analyze the fundamental causes of the movements of specific countries across different capitalism types as mentioned in Section 2.

Appendix

Appendix 1 - Calinski-Harabasz pseudo-F statistics of cluster analysis in the table 1 and 2

Appendix table 1. Calinski-Harabasz pseudo-F statistics of cluster analysis in the table 1.

Number of cluster	Calinski-Harabasz pseudo-F statistics
2	19.98
3	11.19
4	21.34
5	39.16
6	34.52
7	30.33
8	36.87
9	37.01
10	33.5

Appendix table 2. Calinski-Harabasz pseudo-F statistics of cluster analysis in the table 2.

Number of cluster	Calinski-Harabasz pseudo-F statistics
2	15.53
3	28.55
4	20.53
5	28.83
6	23.53
7	37.66
8	34.31
9	35.69
10	34.67

Appendix 2 – Cluster analysis using GDP growth rate, employment rate, unemployment rate, top 10% income share, and adjusted wage share

I performed a cluster analysis by using GDP growth rate, employment rate, unemployment rate, top 10% income share, and adjusted wage share as a robustness check. I collected the unemployment rate data from ILO and the adjusted wage share (compensation per employee as a percentage of GDP at factor cost per person employed) data from the AMECO database. "Adjusted" means that the labor income of the self-employed is assumed to be the same as the labor income of an employee. Calinski-Harabasz pseudo-F statistics are maximized at 8 in 2 to 10 clusters. Thus, eight clusters are available for the analysis. The results of the Calinski-Harabasz pseudo-F statistics are presented as follows.

Appendix table 3. Calinski-Harabasz pseudo-F statistics of the cluster analysis using GDP growth rate, employment rate, unemployment rate, top 10% income share, and adjusted wage share

Number of cluster	Calinski-Harabasz pseudo-F statistics
2	5.81
3	4.73
4	11.37
5	16
6	15.54
7	14.23
8	20.99
9	18.99
10	17.55

The five-year averaged data are used, and 18 OECD countries (Australia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and USA) have available data from 1960 to 2014. The number of observations is 94. The estimation details are the same as those presented in the text. The results of the cluster analysis are presented as follows.

Appendix table 4. Cluster analysis using GDP growth rate, employment rate, unemployment rate, top 10% income share, and adjusted wage share

Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
1960-1964	**USA**			**Japan**				
1965-1969	**USA**			**Japan**				
1970-1974	**USA**				**Japan**			
1975-1979	**USA**				**Japan**			
1980-1984	Australia **USA**				**Japan**			**Korea**
1985-1989	Australia Denmark France Italy New Zealand **USA**				**Japan**	**Ireland** Spain		
1990-1994	Australia Denmark France Italy **Japan** Netherlands New Zealand **Portugal**	UK **USA**				**Ireland** Spain		
1995-1999	Australia Denmark Finland France Italy Netherlands New Zealand **Portugal** Sweden Switzerland	**Japan** UK **USA**	Norway		**Korea**	Spain	**Ireland**	
2000-2004	Australia Denmark Finland France **Germany** Italy Netherlands New Zealand Spain Sweden Switzerland	**Japan** **Portugal** UK **USA**	Ireland Norway		**Korea**			
2005-2009	Australia Denmark Finland France Italy Netherlands New Zealand Spain Sweden Switzerland	**Germany** **Ireland** **Japan** **Korea** UK **USA**	Norway					
2010-2014	Australia France Netherlands New Zealand Sweden	**Korea** UK **USA**				Spain		
Average of variables for each groups								
GDP growth (%)	1.67	1.32	2.38	9.31	4.25	2.41	8.95	5.69
Employment (%)	56.94	59.22	66.65	66.01	61.20	42.28	50.48	53.60
Unemployment (%)	7.22	5.85	3.99	1.30	2.67	19.17	9.48	4.38
Top 10% income share (%)	30.31	40.44	30.31	30.25	32.82	33.03	35.44	29.29
Adjusted wage share (%)	63.64	64.48	53.04	72.39	74.49	65.28	57.92	91.98

* Cluster analysis used hierarchical agglomerative average linkage method.

* Measure of dissimilarity is Euclidean distance.

* Number of clusters is determined by Calinski-Harabasz pseudo-F statistics from 2 to 10 clusters

* 18 countries from 1960 to 2014, 94 observations

* bold font : countries which moves from other groups to group 2 over time

The countries written in boldface in the above table have moved from other groups to group 2 over time. Group 2 is the cluster of countries with a low growth rate and a high top 10% income share. Similar to the cluster analysis results presented in the text, the USA, Japan, Korea, Portugal, Ireland, and Germany have moved from other groups to group 2 since the 1990s.

Appendix 3 – Cluster analysis using 10-year averaged data

I also conducted a cluster analysis by using 10-year averaged data as a robustness check. The same variables are used in the analysis, including the 10-year average annual growth rate of GDP per capita, employment rate, and top 10% income share. The data covered the years 1960 to 1969, 1970 to 1979, ⋯, 2000 to 2009. I performed averaging if a country has at least 6 observations within a 10-year period. Calinski-Harabasz pseudo-F statistics were maximized at 9 in 2 to 10 clusters. Thus, nine clusters were available for the analysis. The results of the Calinski-Harabasz pseudo-F statistics are presented as follows.

Appendix table 5. Calinski-Harabasz pseudo-F statistics of cluster analysis using 10-year averaged data

Number of cluster	Calinski-Harabasz pseudo-F statistics
2	10.7
3	13.3
4	15.12
5	12.34
6	20.42
7	17.81
8	15.8
9	22.02
10	20.77

A total of 25 countries (Australia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, USA, Brazil, Russia, China, Turkey, Malaysia, and Taiwan) have available data from 1960 to 2009. South Africa was included in the cluster analysis in the text but was not included in this section. Given that the country has available top 10% income share data from 2008 to 2012, they can be included in the five-year period (2010-2014) but cannot be included in the 10-year period (2000-2009). The number of observations is 52. The estimation details are the same as those presented in the text. The results of the cluster analysis are presented as follows.

Appendix table 6. Cluster analysis using 10-year averaged data

Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9
1960-1969	**USA**								**Japan**
1970-1979	**Japan USA**								
1980-1989	Australia **Canada** Denmark **Japan USA**		France Ireland Italy	**Korea** Taiwan					
1990-1999	Australia Denmark **Japan** Netherlands New Zealand **Portugal**	**Canada** UK **USA**	France Italy Spain	Ireland Taiwan					
2000-2009	Australia Denmark Finland Ireland Malaysia Netherlands New Zealand Norway Sweden Switzerland Taiwan	**Japan Korea Portugal** UK **USA**	France Germany Italy Spain		Brazil	Russia	Turkey	China	
Average of variables for each groups									
GDP growth (%)	2.03	1.53	1.46	6.49	2.03	5.65	2.26	8.37	9.31
Employment (%)	60.13	59.46	47.25	54.54	57.07	60.78	43.03	72.91	66.01
Top 10% income share (%)	30.33	39.96	32.31	29.70	55.25	48.95	51.84	40.34	30.25

* Cluster analysis used hierarchical agglomerative average linkage method.

* Measure of dissimilarity is Euclidean distance.

* Number of clusters is determined by Calinski-Harabasz pseudo-F statistics from 2 to 10 clusters

* 25 countries from 1960 to 2009, 52 observations

* bold font : countries which moves from other groups to group 2 over time

* Korea in the 1990s is absent because top 10% income share in Korea is not available from 1986 to 1994. It is because there is no data of tax withheld for wage income in the Korean Statistical Yearbook of National Tax from 1986 to 1994.

The countries written in boldface in the above table have moved from other groups to group 2 over time. Group 2 is the cluster of countries with a low growth rate and a high top 10% income share. Similar to the results of the cluster analysis as presented in the text, the USA, Canada, Japan, Korea, and Portugal have moved from the other groups to group 2 since the 1990s. In the 2000s, Taiwan moved from another group to group 1, which includes Northern European countries, Australia, and New Zealand. These results are similar to those presented in Table 2.

Appendix 4 – Results of panel unit root test (PURT) for selected variables

Appendix table 7. Panel unit root test (PURT) for growth rate of GDP per capita, gross capital formation (GCF, % of GDP), inflation and log real hourly minimum wage (PPP, 2015 US$)

Test / Variables	LLC	IPS	Pesaran (2007)			LLC	IPS	Pesaran (2007)			Pesaran (2004) CD test
			lags=0	lags=1	lags=2			lags=0	lags=1	lags=2	
	With intercept					With intercept and trend					
GDP growth	-17** (0.000)	-19** (0.000)	-15.4** (0.000)	-9.6** (0.000)	-4.5** (0.000)	-14.5** (0.000)	-16.2** (0.000)	-13.6** (0.000)	-8.2** (0.000)	-2.8** (0.000)	32.28** (0.000)
GCF	-3.9** (0.000)	-4.9** (0.000)	-2.81** (0.002)	-3.98** (0.000)	-1.34 (0.091)	-2.1* (0.017)	-4.8** (0.000)	-1.79* (0.037)	-2.9** (0.002)	-0.3 (0.381)	29.5** (0.000)
Inflation	-9.2** (0.000)	-7.6** (0.000)	-6.19** (0.000)	-4.67** (0.000)	-3.03** (0.001)	-11.2** (0.000)	-7.6** (0.000)	-4.78** (0.000)	-2.89** (0.002)	-1.27 (0.102)	57.93** (0.000)
Log real hourly minimum wage	-1.85* (0.032)	-0.01 (0.494)	-3.48** (0.000)	-2.82** (0.002)	-2.04* (0.02)	-3.06** (0.001)	-2.4** (0.008)	-3.1** (0.001)	-4.29** (0.000)	-2.3** (0.01)	3.21** (0.001)

note: .01 - **; .05 - *

* data : GDP growth, GCF : 34 countries, 1970-2007, inflation : 27 countries, 1975-2010, real hourly minimum wage : 8 countries, 1970-2007

* p-value is in the parenthesis

* null hypothesis : variable is non-stationary

* LLC, IPS : lag length selection based on SIC, maximum lag length is observation-based, Newey-West automatic bandwidth selection and Bartlett kernel

Appendix 5 – Results of GMM estimation

Appendix table 8. Results of GMM estimation

Dependent variable	Top 10% income share		Adjusted wage share		GCF		GDP growth	
Variable	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Distributed income of corporations	0.346**	0.000	0.015	0.957	-0.182*	0.026	-0.004	0.884
Financial globalization	0.003	0.478	-0.003	0.676	-0.004*	0.011	-0.000	0.689
Finance and insurance share	1.072	0.129	-0.954	0.354	1.101	0.069	0.027	0.870
Private credit	-0.015	0.557	0.037	0.386	0.037	0.131	0.001	0.934
Market capitalization	-0.014	0.700	-0.030	0.612	-0.07**	0.000	0.001	0.851
Turnover ratio	-0.006	0.729	-0.093	0.140	-0.023	0.053	0.004	0.473
Trade openness	-0.049	0.248	-0.091	0.103	0.000	0.991	0.018	0.379
Tertiary enrolment ratio	0.165**	0.002	0.047	0.828			0.030*	0.017
ICT compensation	0.834*	0.032	0.647	0.598				
Union density	-0.13**	0.003	-0.050	0.638				
Saving rate					0.330*	0.011		
Lending interest rate					0.064	0.879		
Central government debt					-0.025	0.402		
Inflation					0.034	0.941		
GDP growth					0.099	0.818		
Log triadic patent stock per million							-0.038	0.909
GCF							0.028	0.698
Lag of log GDP per capita							-2.272	0.051
Number of observations	29		43		31		31	
Number of countries	11		16		22		21	
Number of periods per country	2.64		2.69		1.41		1.48	
AR(2) p-value	0.411		0.755		0.108		0.71	
Sargan p-value	0.000		0.000		0.000		0.000	

note: ** p<0.01, * p<0.05

* Five-year average data is used
* GCF : gross capital formation (% of GDP), GDP growth : annual average growth rate of GDP per capita
* Constant and period dummies are omitted
* Robust standard error is used
* One-step system GMM estimator used

Appendix 6 – Estimation results of Pedroni cointegration test and Group-mean FMOLS in the robustness check

Appendix table 9. Pedroni cointegration test for top 10% income share in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Distributed income of corporations, Union density	-1.88	2.79	-8.77**	-4.84**	4.04	-10.67**	-3.69**	8	12.63	1979-2007
Distributed income of corporations, Financial globalization, Union density	-1.76	3.13	-9.89**	-3.83**	4.27	-9.25**	-3.29**	7	13.43	1979-2007
Distributed income of corporations, Finance and insurance share, Union density	-2.33	3.26	-8.89**	-3.34**	4.06	-13.07**	-4.02**	7	13.43	1979-2007
Distributed income of corporations, market capitalization, Union density	4.02**	1.70	-7.73**	-4.22**	2.30	-22.80**	-5.86**	3	17.00	1979-2007
Financial globalization, turnover ratio, Union density	-2.61	3.58	-1.87*	-3.02**	4.16	-7.26**	-5.16**	12	20.25	1979-2007
Distributed income of corporations, minimum wage, Union density	1.50	1.26	-8.64**	-2.04*	2.01	-11.44**	-2.79**	2	19.50	1979-2007
Distributed income of corporations, market capitalization, turnover ratio	0.69	1.51	-4.48**	-1.84*	2.55	-8.64**	-1.82*	3	17.00	1979-2007
Distributed income of corporations, private credit, market capitalization	-1.10	1.29	-5.06**	-2.04*	1.89	-5.44**	-2.97**	2	17.50	1979-2007
Distributed income of corporations, finance and insurance share, market capitalization	0.12	1.98	-5.57**	-2.65**	2.61	-13.26**	-3.57**	3	17.00	1979-2007

Appendix table 9. Pedroni cointegration test for top 10% income share in the robustness check *(continued)*

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Distributed income of corporations, finance and insurance share, private credit	-2.85	2.79	-7.38**	-3.89**	3.48	-8.81**	-5.01**	5	13.20	1979-2007
Distributed income of corporations, finance and insurance share, turnover ratio	-0.99	1.68	-4.01**	-1.88*	2.38	-5.48**	-2.03*	3	17.00	1979-2007
Distributed income of corporations, financial globalization, market capitalization	-0.28	1.72	-4.92**	-2.18*	2.35	-11.8**	-4.77**	3	17.00	1979-2007
Distributed income of corporations, financial globalization, private credit	-2.59	2.72	-7.75**	-2.30*	3.75	-9.61**	-3.07**	5	13.20	1979-2007
Distributed income of corporations, financial globalization, finance and insurance share	-1.48	3.08	-10.1**	-3.27**	4.06	-12.3**	-3.91**	7	13.43	1979-2007
Distributed income of corporations, financial globalization, minimum wage	1.55	1.08	-8.37**	-3.06**	1.47	-10.4**	-5.34**	2	19.50	1979-2007
Distributed income of corporations, finance and insurance share, minimum wage	1.02	1.23	-6.56**	-3.65**	1.89	-12.7**	-4.55**	2	19.50	1979-2007
Distributed income of corporations, market capitalization, minimum wage	2.28*	1.08	-6.09**	-3.97**	1.71	-7.53**	-4.23**	2	19.50	1979-2007
Distributed income of corporations, turnover ratio, minimum wage	2.49**	1.16	-4.91**	-2.55**	2.06	-8.30**	-2.22*	2	19.50	1979-2007
Distributed income of corporations, financial globalization	-1.68	2.55	-9.20**	-4.00**	4.08	-8.93**	-3.04**	8	12.88	1979-2007
Distributed income of corporations, finance and insurance share	-2.63	2.81	-10.9**	-3.03**	3.98	-12.6**	-2.78**	8	12.88	1979-2007
Distributed income of corporations, private credit	-3.10	2.82	-7.98**	-3.08**	4.00	-8.71**	-1.85*	7	11.86	1979-2007
Distributed income of corporations, market capitalization	1.01	2.04	-8.38**	-4.15**	3.02	-15.1**	-5.69**	5	13.80	1979-2007
Distributed income of corporations, turnover ratio	-0.38	2.35	-5.42**	-2.52**	3.43	-7.79**	-2.17*	5	13.80	1979-2007
Distributed income of corporations, minimum wage	1.36	0.98	-6.74**	-4.62**	1.88	-11.8**	-5.04**	3	16.00	1979-2007
Distributed income of corporations	-1.42	2.24	-9.23**	-5.43**	4.01	-15.9**	-4.28**	10	11.90	1979-2007

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

* Three variables (ICT compensation, tertiary enrolment ratio, and trade openness), linear country-specific trends and fixed effects are controlled.

Appendix table 10. Group-mean FMOLS for top 10% income share in the robustness check

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distributed income of corporations	0.063*	0.062*	0.076**	0.182**		0.090	0.165**	0.140	0.165**
Financial globalization		0.004**			0.009**				
Finance and insurance share			-0.065						-0.127
Private credit								0.030*	
Market capitalization				0.012**			0.016**	0.019**	0.005
Turnover ratio					0.005		0.000		
Union density	-0.044	0.044	0.000	0.296**	-0.129*	0.111			
Minimum wage						0.007			
Inverse of median wage									
ICT compensation	0.047	0.044	0.077	-0.027	0.468**	-0.158**	-0.285*	0.371**	0.077
Tertiary enrolment ratio	-0.005	0.022	0.004	0.076	-0.027	0.046	0.087*	0.072	0.020
Trade openness	0.051**	-0.009	-0.019	-0.075**	0.000	-0.072**	-0.077**	-0.019	-0.036
Number of countries	8	7	7	3	12	2	3	2	3
Number of observation per country	13.0	13.6	13.6	17.0	20.8	19.5	17.0	17.5	17.0
Number of observation	104	95	95	51	250	39	51	35	51
Period	1979-2007	1979-2007	1979-2007	1979-2007	1976-2007	1979-2007	1979-2007	1979-2007	1979-2007

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 10. Group-mean FMOLS for top 10% income share in the robustness check *(continued)*

Specification	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(17)-2
Distributed income of corporations	0.086	0.119*	0.134*	0.101*	0.059*	0.063	0.099	0.155*	-0.007
Financial globalization		0.002	-0.001	0.012**	0.004**	0.000			
Finance and insurance share	-0.365				-0.016		-0.020		
Private credit	0.008			-0.029*					
Market capitalization			0.009**					-0.011*	0.006
Turnover ratio		0.001							
Union density									
Minimum wage						0.011	0.010	0.056*	
Inverse of median wage									-13,444
ICT compensation	0.247	0.007	-0.092	0.070	0.024	-0.182**	-0.188**	0.098	-0.371*
Tertiary enrolment ratio	0.007	0.028	0.012	0.028	0.029	-0.005	0.000	-0.071	0.038
Trade openness	-0.024	-0.046	-0.079**	0.051*	-0.009	-0.084**	-0.062**	-0.016	-0.055*
Number of countries	5	3	3	5	7	2	2	2	2
Number of observation per country	13.2	17.0	17.0	13.2	13.6	19.5	19.5	19.5	14.5
Number of observation	66	51	51	66	95	39	39	39	29
Period	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1991-2007

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

* Long-run covariance estimates : Bartlett kernel, Newey-West fixed bandwidth, d.f. adjustment
* Specification (17)-2 is the specification which replace minimum wage with inverse of median wage in the specification (17) to see the robustness of minimum wage.

Appendix table 10. Group-mean FMOLS for top 10% income share in the robustness check *(continued)*

Specification	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Distributed income of corporations	0.140*	0.047*	0.066*	0.079*	0.086*	0.099*	0.039	0.093**
Financial globalization		0.002						
Finance and insurance share			0.023					
Private credit				-0.011				
Market capitalization					0.010**			
Turnover ratio	-0.004**					-0.002		
Union density								
Minimum wage	0.006						-0.072	
Inverse of median wage								
ICT compensation	-0.224**	-0.013	0.015	0.061	-0.153*	0.022	-0.285**	0.326**
Tertiary enrolment ratio	0.012	0.013	0.035	0.044	0.073**	0.055	0.039*	-0.043
Trade openness	-0.056**	0.059**	0.066**	0.080**	0.085**	0.128**	0.149**	0.036**
Number of countries	2	8	8	7	5	5	3	10
Number of observation per country	19.5	13.0	13.0	11.9	13.8	13.8	16.0	12.0
Number of observation	39	104	104	83	69	69	48	120
Period	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 11. Pedroni cointegration test for adjusted wage share in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Distributed income of corporations, union density	-2.00	3.64	-4.79**	-3.52**	5.47	-10.32**	-4.81**	13	12.38	1979-2007
Distributed income of corporations, Financial globalization, union density	-2.15	3.85	-7.22**	-4.02**	5.29	-13.66**	-4.89**	11	13.09	1979-2007
Distributed income of corporations, finance and insurance share, union density	-0.65	4.30	-5.60**	-2.93**	5.81	-12.75**	-2.63**	11	13.09	1979-2007
Distributed income of corporations, private credit, union density	-2.24	3.47	-4.49**	-3.47**	4.75	-7.83**	-4.57**	9	12.00	1979-2007
Distributed income of corporations, market capitalization, union density	-0.37	2.42	-2.56**	-1.99*	3.59	-5.23**	-1.84*	5	15.00	1979-2007
Distributed income of corporations, finance and insurance share, private credit	-2.63	3.48	-4.70**	-2.57**	4.78	-9.63**	-3.15**	9	12.00	1979-2007
Distributed income of corporations, financial globalization, private credit	-2.44	3.47	-3.36**	-2.38**	4.78	-7.61**	-3.69**	9	12.00	1979-2007
Distributed income of corporations, financial globalization, finance and insurance share	-2.44	4.27	-2.00*	-1.83*	5.58	-12.07**	-2.89**	11	13.09	1979-2007
Distributed income of corporations, finance and insurance share	-1.97	3.87	-2.21*	-3.01**	5.65	-10.35**	-4.96**	13	12.38	1979-2007
Distributed income of corporations, private credit	-2.52	3.31	-4.01**	-2.40**	5.14	-9.74**	-3.09**	12	12.08	1979-2007
Distributed income of corporations	-1.44	2.90	-3.33**	-3.16**	5.07	-9.69**	-5.59**	15	11.80	1979-2007

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

* Three variables (ICT compensation, tertiary enrolment ratio, and trade openness), linear country-specific trends and fixed effects are controlled.

Appendix table 12. Group-mean FMOLS for adjusted wage share in the robustness check

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Distributed income of corporations	-0.031	-0.019	-0.062	-0.130	0.022	-0.245	-0.203	-0.082	-0.085	-0.040	-0.061
Financial globalization		-0.017**					-0.011	-0.011*			
Finance and insurance share			-0.761**			-0.679		-0.714**	-0.619**		
Private credit				0.142*		0.038	0.081			0.030	
Market capitalization					-0.034*						
Turnover ratio											
Minimum wage											
Union density	0.205	0.124	0.006	0.193	0.303*						
ICT compensation	0.297*	0.204	0.249	0.743	0.261	0.012	0.566	0.141	0.219	0.325	0.502**
Tertiary enrolment ratio	0.072	0.108**	0.068	0.063	0.213**	0.128	0.076	0.103**	0.054	0.085*	0.030
Trade openness	-0.025	0.016	-0.012	-0.009	-0.035	0.009	-0.008	0.007	-0.013	-0.003	0.010
Number of countries	13	11	11	9	5	9	9	11	13	12	15
Number of observation per country	12.4	13.1	13.1	12.0	15.0	12.0	12.0	13.1	12.4	11.1	11.8
Number of observation	161	144	144	108	75	108	108	144	161	133	177
Period	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007	1979-2007

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 13. Pedroni cointegration test for log private GFCF per capita with four control variables in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Financial globalization	3.03**	4.13	-0.20	-1.73*	6.70	-3.20**	-2.43**	27	21.30	1981-2010
Distributed income of corporations, union density	-0.92	4.44	-6.48**	-3.04**	7.34	-12.91**	-3.98**	20	13.70	1983-2010
Minimum wage, distributed income of corporations	1.86*	4.32	-5.11**	-3.17**	6.16	-13.58**	-3.94**	13	12.77	1993-2010
Minimum wage, finance and insurance share	3.94**	3.53	-2.48**	-2.21*	5.09	-10.02**	-4.44**	13	19.77	1981-2009
Minimum wage, market capitalization	3.47**	3.41	-1.47	-2.34**	5.00	-7.85**	-2.73**	12	20.58	1981-2010

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

* Four variables (saving rate, lending interest rate, central government debt, trade openness), linear country-specific trends and fixed effects are controlled.

Appendix table 14. Group-mean FMOLS for log private GFCF per capita with four control variables in the robustness check

Specification	(1)	(2)	(3)	(3)-2	(4)	(4)-2	(5)	(5)-2
Financial globalization	-0.0015**							
Distributed income of corporations		0.003	0.004	0.001				
Finance and insurance share					-0.003	0.008		
Private credit								
Market capitalization							-0.004*	-0.002*
Turnover ratio								
Union density		-0.030**						
Minimum wage			-0.009**		-0.009**		-0.011**	
Inverse of median wage				9,984		-11,623**		-2,957
Saving rate	0.021**	0.009**	-0.003	0.008	0.028**	0.023**	0.023**	0.019**
Lending interest rate	-0.001	0.006	-0.005	-0.009	0.002	0.010*	0.002	-0.009
Central government debt	-0.021**	-0.018**	-0.037**	-0.025*	-0.010**	-0.007**	-0.009**	-0.010**
Trade openness	0.001	0.004**	0.003**	0.003*	0.001	0.004**	0.002	0.007**
Number of countries	27	20	13	13	13	12	12	12
Number of obs. per country	21.3	13.7	12.8	12.8	19.8	15.8	20.6	16.9
Number of observation	575	274	166	166	257	190	247	203
Period	1981-2010	1983-2010	1993-2010	1993-2010	1981-2009	1991-2009	1981-2010	1991-2010

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

* Specifications (3)-2, (4)-2, (5)-2 are the specification which replace minimum wage with inverse of median wage in the specification (3), (4), (5) to see the robustness of minimum wage, respectively.

Appendix table 15. Pedroni cointegration test for log private GFCF per capita with two control variables in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Financial globalization	3.57**	2.88	-0.07	-3.10**	4.95	-2.96**	-3.82**	29	21.55	1981-2010
Financial globalization, private credit, market capitalization	2.31*	5.26	-0.72	-3.33**	6.55	-16.49**	-6.65**	26	18.38	1981-2010
Financial globalization, market capitalization	6.08**	4.53	0.13	-2.51**	6.07	-7.33**	-4.44**	27	19.11	1981-2010
Market capitalization	4.53**	3.16	-0.33	-1.91*	5.05	-6.88**	-2.64**	27	19.11	1981-2010
Minimum wage, distributed income of corporations, finance and insurance share, market capitalization	3.05**	3.34	-2.47**	-1.08	4.30	-13.05**	-2.52**	7	13.00	1993-2009
Minimum wage, distributed income of corporations, finance and insurance share, private credit	2.93**	4.12	-3.46**	-1.49	4.31	-11.53**	-4.08**	7	12.29	1993-2009
Minimum wage, distributed income of corporations, financial globalization, finance and insurance share	2.07*	3.96	-1.95*	-1.00	5.05	-12.48**	-2.41**	9	12.78	1993-2009
Union density, financial globalization, market capitalization, turnover ratio	4.39**	5.24	-1.74*	-0.05	7.00	-24.91**	-7.80**	24	19.71	1981-2010
Union density, financial globalization, private credit, market capitalization	2.05*	4.92	-1.91*	-1.35	6.53	-12.99**	-4.76**	22	19.50	1981-2010
Union density, financial globalization, finance and insurance share, market capitalization	2.85**	4.70	-2.49**	-1.99*	5.89	-17.62**	-6.60**	20	19.45	1981-2009
Union density, distributed income of corporations, market capitalization, turnover ratio	1.65*	5.24	-2.20*	-1.16	6.30	-12.00**	-2.90**	14	14.07	1983-2010
Union density, distributed income of corporations, finance and insurance share, market capitalization	-0.03	4.18	-4.37**	-3.95**	5.25	-10.13**	-3.93**	11	14.09	1983-2009
Union density, distributed income of corporations, financial globalization, minimum wage	0.81	5.13	-4.16**	-1.65*	6.63	-11.69**	-3.62**	13	13.08	1993-2010
Union density, distributed income of corporations, finance and insurance share, minimum wage	0.74	3.38	-6.36**	-3.11**	5.08	-12.02**	-2.00*	9	12.78	1993-2009
Union density, distributed income of corporations, private credit, minimum wage	-0.89	4.81	-9.68**	-2.44**	6.45	-10.52**	-1.98*	12	12.33	1993-2010
Union density, distributed income of corporations, market capitalization, minimum wage	1.06	3.36	-7.66**	-4.64**	5.27	-9.13**	-2.38**	9	13.56	1993-2010
Union density, distributed income of corporations, turnover ratio, minimum wage	2.53**	3.95	-4.05**	-1.50	4.97	-14.52**	-3.23**	9	13.11	1993-2010
Union density, financial globalization, finance and insurance share, minimum wage	2.51**	3.90	-2.38**	-2.92**	5.00	-8.31**	-3.84**	14	19.29	1981-2009
Union density, financial globalization, private credit, minimum wage	-0.93	3.94	-4.01**	-1.73*	5.64	-10.04**	-2.61**	16	18.88	1981-2010

Appendix table 15. Pedroni cointegration test for log private GFCF per capita with two control variables in the robustness check *(continued)*

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Union density, financial globalization, market capitalization, minimum wage	3.51**	3.90	-3.02**	-4.58**	5.34	-5.41**	-3.14**	13	20.08	1981-2010
Union density, finance and insurance share, market capitalization, minimum wage	2.50**	3.68	-3.23**	-4.10**	4.44	-12.38**	-6.25**	12	19.17	1981-2009
Union density, distributed income of corporations, market capitalization	1.72*	4.88	-3.20**	-4.05**	6.61	-15.00**	-3.95**	18	13.17	1983-2010
Union density, distributed income of corporations, turnover ratio	1.85*	5.48	-0.62	-1.66*	6.70	-13.31**	-3.36**	18	12.94	1983-2010
Union density, financial globalization, market capitalization	4.26**	4.54	-2.19*	-2.26*	6.43	-10.91**	-5.89**	26	19.04	1981-2010
Union density, finance and insurance share, market capitalization	2.33**	3.49	-2.63**	-2.15*	5.44	-16.92**	-5.93**	22	18.50	1981-2009
Union density, market capitalization, turnover ratio	3.49**	3.96	-1.96*	-1.35	6.62	-13.23**	-4.24**	26	18.88	1981-2010
Union density, distributed income of corporations, minimum wage	0.80	4.12	-6.60**	-2.75**	5.80	-9.41**	-3.80**	13	13.08	1993-2010
Union density, private credit, minimum wage	-0.57	3.65	-4.35**	-2.27*	5.65	-11.14**	-3.20**	18	17.78	1981-2010
Union density, market capitalization, minimum wage	2.28*	3.57	-3.51**	-4.47**	5.58	-10.57**	-4.24**	17	17.47	1981-2010
Union density, market capitalization	4.07**	2.60	-3.17**	-2.39**	5.48	-12.91**	-3.79**	27	18.63	1981-2010
Union density	1.27	1.77	-2.04*	-3.37**	4.66	-6.33**	-3.77**	29	21.10	1981-2010

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

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

Appendix table 16. Group-mean FMOLS for log private GFCF per capita with two control variables in the robustness check

Specification	(1)	(2)	(3)	(4)	(5)	(5)-2	(6)	(6)-2	(7)	(7)-2
Financial globalization	-0.0012**	-0.0019**	-0.0019**						-0.0007*	-0.0010*
Distributed income of corporations					0.003	0.000	-0.003	0.001	0.005	-0.002
Finance and insurance share					-0.049**	-0.036**	-0.070**	-0.063**	-0.023*	-0.019
Private credit		0.002**					-0.001	-0.001		
Market capitalization		0.001	0.001**	0.001*	0.001	0.002				
Turnover ratio										
Union density										
Minimum wage					-0.014**		-0.015**		-0.015**	
Inverse of median wage						-2,141		-29,674		27983**
Saving rate	0.023**	0.031**	0.026**	0.025**	0.013**	0.023**	0.018**	0.017**	0.005	0.025**
Central government debt	-0.021**	-0.008**	-0.009**	-0.009**	-0.010**	-0.012**	-0.011**	-0.015**	-0.015**	-0.013**
Number of countries	29	26	27	27	7	7	7	7	9	9
Number of observation per country	21.6	18.4	19.1	19.1	13.0	13.0	12.3	12.3	12.8	12.8
Number of observation	625	478	516	516	91	91	86	86	115	115
Period	1981-2010	1981-2010	1981-2010	1981-2010	1993-2009	1993-2009	1993-2009	1993-2009	1993-2009	1993-2009

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

* Specifications (5)-2, (6)-2, (7)-2 are the specification which replace minimum wage with inverse of median wage in the specification (5), (6), (7) to see the robustness of minimum wage, respectively.

Appendix table 16. Group-mean FMOLS for log private GFCF per capita with two control variables in the robustness check *(continued)*

Specification	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(14)-2	(15)	(16)
Financial globalization	-0.002**	-0.002**	-0.002**			0.000				
Distributed income of corporations				0.000	-0.005	0.007	0.004	0.002	0.008	-0.001
Finance and insurance share			-0.025**		-0.048**		-0.015	-0.009		
Private credit		0.002**							0.005	
Market capitalization	0.003**	0.002**	0.003**	0.003**	0.002*					0.001
Turnover ratio	-0.002			-0.005**						
Union density	-0.004	-0.009	-0.017**	0.004	-0.018*	-0.034**	-0.004	0.002	-0.007	-0.001
Minimum wage						-0.004	-0.011**		0.015	-0.003
Inverse of median wage								-3,962		
Saving rate	0.031**	0.030**	0.031**	0.021**	0.022**	0.006	0.008	0.013**	0.006	0.016**
Central government debt	-0.008**	-0.005*	-0.011**	-0.007**	-0.011**	-0.033**	-0.016**	-0.016**	-0.077**	-0.018**
Number of countries	24	24	20	14	11	13	9	9	12	9
Number of observation per country	19.7	18.6	19.5	14.1	14.1	13.1	12.8	12.8	12.3	13.6
Number of observation	473	447	389	197	155	170	115	115	148	122
Period	1981-2010	1981-2010	1981-2009	1983-2010	1983-2009	1993-2010	1993-2009	1993-2009	1993-2010	1993-2010

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

* Specifications (14)-2 is the specification which replace minimum wage with inverse of median wage in the specification (14) to see the robustness of minimum wage, respectively.

Appendix table 16. Group-mean FMOLS for log private GFCF per capita with two control variables in the robustness check *(continued)*

Specification	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
Financial globalization		-0.001**	-0.001**	-0.001**				-0.002**		
Distributed income of corporations	0.000					-0.002	0.002			
Finance and insurance share		-0.001			-0.015				-0.024**	
Private credit			0.006**							
Market capitalization				0.002**	0.002**	0.002**		0.002**	0.002**	0.002**
Turnover ratio	-0.006**						-0.003**			0.000
Union density	0.008	-0.008	-0.002	-0.015**	-0.005	-0.016*	0.005	-0.005	-0.007	0.005
Minimum wage	-0.007	0.004	0.010	0.002	0.004					
Inverse of median wage										
Saving rate	0.018**	0.031**	0.013*	0.029**	0.025**	0.013**	0.019**	0.032**	0.029**	0.028**
Central government debt	-0.013**	-0.015**	-0.066**	-0.019**	-0.012**	-0.010**	-0.006**	-0.010**	-0.007**	-0.010**
Number of countries	9	14	16	13	12	18	18	26	22	26
Number of observation per country	13.1	19.3	18.9	20.1	19.2	13.2	12.9	19.0	18.5	18.9
Number of observation	118	270	302	261	230	237	233	495	407	491
Period	1993-2010	1981-2009	1981-2010	1981-2010	1981-2009	1983-2010	1983-2010	1981-2010	1981-2009	1981-2010

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 16. Group-mean FMOLS for log private GFCF per capita with two control variables in the robustness check *(continued)*

Specification	(27)	(28)	(29)	(30)	(31)
Financial globalization					
Distributed income of corporations	0.008*				
Finance and insurance share					
Private credit		0.006**			
Market capitalization			0.002**	0.002**	
Turnover ratio					
Union density	-0.024**	0.004	-0.019*	-0.005	-0.014**
Minimum wage	-0.001	0.008	0.000		
Inverse of median wage					
Saving rate	0.008*	0.013*	0.023**	0.027**	0.024**
Central government debt	-0.035**	-0.055**	-0.015**	-0.011**	-0.019**
Number of countries	13	18	17	27	29
Number of observation per country	13.1	17.8	17.5	18.6	21.1
Number of observation	170	320	297	503	612
Period	1993-2010	1981-2010	1981-2010	1981-2010	1981-2010

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 17. Pedroni cointegration test for log GDP per capita in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
Distributed income of corporations, Finance and insurance share	1.53	5.25	-5.91**	-2.43**	7.05	-25.49**	-5.71**	20	13.50	1986-2009
Distributed income of corporations, turnover ratio	2.59**	4.97	-2.72**	-1.78*	6.49	-18.89**	-4.12**	19	15.58	1986-2013
Financial globalization, turnover ratio	-0.73	5.53	-1.80*	-2.88**	7.59	-6.45**	-3.38**	28	20.75	1986-2013
Minimum wage, distributed income of corporations	1.02	4.35	-3.29**	-2.00*	5.96	-13.80**	-3.30**	15	16.20	1986-2013
Union density, distributed income of corporations	5.27**	5.77	-2.34**	-1.82*	7.56	-13.55**	-4.45**	24	16.79	1986-2013
Union density, financial globalization	3.04**	5.69	-1.98*	-1.69*	6.76	-7.72**	-4.17**	30	23.70	1986-2013

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

* Four variables (log private GFCF per capita, tertiary enrolment ratio, log triadic patent stock per million populations, trade openness), linear country-specific trends and fixed effects are controlled.

Appendix table 18. Group-mean FMOLS for log GDP per capita in the robustness check

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Distributed income of corporations	0.001	-0.002		0.001	0.001	
Financial globalization			0.000			0.000
Finance and insurance share	0.002					
Private credit						
Market capitalization						
Turnover ratio		-0.000**	0.000			
Minimum wage				0.001		
Union density					-0.005**	0.000
Log private investment per capita	0.197**	0.146**	0.206**	0.185**	0.241**	0.243**
Tertiary enrolment ratio	-0.003	-0.002*	0.002	-0.001*	-0.005**	-0.003**
Log triadic patent stock per million	0.108	0.167*	0.030	0.267**	0.142**	0.016
Trade openness	0.001	0.002	0.001**	0.001**	0.001*	0.001**
Number of countries	20	19	28	15	24	30
Number of observation per country	13.5	15.6	20.8	16.2	16.8	23.7
Number of observation	270	296	581	243	403	711
Period	1986-2009	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

Appendix table 19. Pedroni cointegration test for log private consumption per capita in the robustness check

Finance and labor variables	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	number of countries	number of obs. per country	Period
minimum wage, union density, private credit	-1.82	4.58	-3.02**	-2.24*	5.47	-11.08**	-4.83**	20	16.50	1990-2014
minimum wage, union density, private credit, market capitalization	0.59	3.68	-5.87**	-3.91**	5.57	-16.80**	-5.68**	17	15.94	1990-2014
minimum wage, union density, private credit, turnover ratio	-2.36	5.09	-6.98**	-4.22**	6.35	-18.59**	-5.40**	17	15.71	1990-2014
minimum wage, union density, market capitalization, turnover ratio	-0.01	4.70	-5.79**	-4.17**	5.96	-10.52**	-4.69**	17	17.24	1990-2014
minimum wage, private credit, market capitalization, turnover ratio	-1.67	5.43	-1.89*	-2.37**	6.24	-13.55**	-3.84**	17	16.41	1990-2014
union density, private credit, market capitalization, turnover ratio	-1.89	5.69	-8.81**	-6.03**	7.56	-20.92**	-7.66**	26	15.08	1990-2014
private credit, market capitalization, turnover ratio	-0.97	4.37	-3.84**	-3.62**	6.27	-17.89**	-6.83**	27	15.44	1990-2014
union density, market capitalization, turnover ratio	-0.18	4.19	-4.55**	-3.92**	6.48	-8.89**	-3.79**	28	16.25	1990-2014
union density, private credit, turnover ratio	-1.16	4.72	-4.94**	-4.27**	6.59	-13.30**	-5.96**	27	14.85	1990-2014
union density, private credit, market capitalization	0.91	3.75	-7.06**	-5.43**	5.96	-16.30**	-8.00**	27	15.00	1990-2014
minimum wage, private credit, market capitalization	-0.02	3.64	-4.15**	-2.76**	5.83	-12.80**	-3.03**	20	15.50	1990-2014
minimum wage, union density, turnover ratio	0.13	3.82	-4.54**	-4.06**	5.54	-8.43**	-4.66**	19	16.37	1990-2014
minimum wage, union density, market capitalization	0.17	2.67	-6.10**	-4.61**	5.05	-9.08**	-4.33**	19	16.58	1990-2014
private credit, turnover ratio	0.01	3.67	-2.50**	-1.87*	5.40	-15.93**	-5.33**	28	15.18	1990-2014
private credit, market capitalization	1.28	2.80	-5.04**	-3.43**	5.12	-15.24**	-6.16**	28	15.32	1990-2014
union density, turnover ratio	-0.98	3.25	-3.87**	-3.01**	5.46	-6.27**	-3.18**	29	15.97	1990-2014
union density, market capitalization	1.30	3.16	-4.31**	-3.58**	5.31	-9.42**	-4.95**	29	16.10	1990-2014
minimum wage, union density	-0.79	3.11	-3.60**	-2.88**	4.25	-5.24**	-3.67**	21	17.43	1990-2014

note: .01 - **; .05 - *

* Null hypothesis : No cointegration

* Use d.f. corrected Dickey-Fuller residual variances

* Automatic lag length selection based on SIC with lags from 0 to observation-based maximum lag length

* Newey-West automatic bandwidth selection and Bartlett kernel

* Two variables (log disposable income per capita, trade openness), linear country-specific trends and fixed effects are controlled.

Appendix table 20. Group-mean FMOLS for log private consumption per capita in the robustness check

Specification	(1)	(1)-2	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Minimum wage	0.002**		0.000	-0.001	0.000	-0.001					
Inverse of median wage		-2618									
Union density	-0.006**	-0.007**	0.001	-0.007**	-0.001		-0.002		0.001	-0.002	0.001
Private credit	0.001**	0.001**	0.001**	0.001**		0.001**	0.001	0.001**		0.001*	0.001*
Market capitalization			0.001**		0.001**	0.001**	0.000*	0.001**	0.001**		0.001**
Turnover ratio				0.000	0.000**	0.000*	0.000	0.000	0.000	0.001**	
Log disposable income per capita	0.791**	0.644**	0.736**	0.699**	0.821**	0.729**	0.654**	0.680**	0.678**	0.615**	0.673**
Trade openness	0.001**	0.001**	0.001**	0.001*	0.000	0.001**	0.001**	0.001**	0.000	0.001**	0.001**
Number of countries	20	20	17	17	17	17	26	27	28	27	27
Number of observation per country	16.70	16.50	16.18	15.94	17.47	16.65	15.27	15.63	16.43	15.04	15.19
Number of observation	334	330	275	271	297	283	397	422	460	406	410
Period	1990-2014	1991-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

* Specification (1)-2 is the specification which replace minimum wage with inverse of median wage in the specification (1) to see the robustness of minimum wage, respectively.

Appendix table 20. Group-mean FMOLS for log private consumption per capita in the robustness check *(continued)*

Specification	(11)	(12)	(13)	(13)-2	(14)	(15)	(16)	(17)	(18)	(18)-2
Minimum wage	0.000	0.000	0.001*						0.003**	
Inverse of median wage				-1201						-1527
Union density		0.000	0.004*	0.002			-0.001	0.004**	-0.003	-0.005*
Private credit	0.001*				0.001**	0.001*				
Market capitalization	0.001**		0.001**	0.001**		0.001**		0.001**		
Turnover ratio		0.000			0.000*		0.000**			
Log disposable income per capita	0.755**	0.804**	0.815**	0.760**	0.655**	0.719**	0.646**	0.668**	0.887**	0.714**
Trade openness	0.001**	0.000	0.001**	0.001**	0.001**	0.001**	0.001*	0.001**	0.001**	0.001*
Number of countries	20	19	19	19	28	28	29	29	21	21
Number of observation per country	15.70	16.58	16.79	16.58	15.36	15.50	16.14	16.28	17.62	17.43
Number of observation	314	315	319	315	430	434	468	472	370	366
Period	1990-2014	1990-2014	1990-2014	1991-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1991-2014

note: .01 - **; .05 - *

* Linear country-specific trends and fixed effects are controlled

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

* Specifications (13)-2 and (18)-2 are the specification which replace minimum wage with inverse of median wage in the specification (13) and (18) to see the robustness of minimum wage, respectively.

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국문 초록

금융화와 노동 시장 제도가 불평등, 투자, 성장에 미치는 장기적 효과 : 패널 공적분 방식 접근

본 논문은 금융 및 노동 시장 제도가 불평등, 투자, 성장에 미친 장기적 영향을 실증적으로 분석하였다. 첫 번째 장에서는 1970년대 이후 자본주의 유형의 동태적 변화를 분석하기 위해 클러스터 분석을 사용하였다. 그 결과 최근의 세계화와 전세계적인 불평등 증가에도 불구하고 90년대 이후 영미형의 자본주의와 유럽형의 자본주의는 서로 다른 유형으로 분류됨을 확인할 수 있었으며 대부분의 유럽 국가들에서는 자본주의 유형이 상대적으로 안정적이었다. 그러나 동아시아 국가들과 주요 신흥국들의 자본주의 유형은 유럽에 비해 좀 더 동태적인 변화를 보였다. 한국, 일본, 브라질, 러시아 등의 국가는 성장, 고용, 분배의 측면에서 시간이 지남에 따라 불평등 수준이 높고 성장률이 낮은 영미식의 자본주의 유형으로 수렴하고 있었으며 대만은 불평등 수준이 낮고 중간 수준의 성장률을 보이는 북유럽식의 자본주의 유형으로 수렴했다. 이러한 차이는 신흥국에서 자본주의 역사가 짧고 이로 인해 제도의 경로 의존성이나 각 제도간 상보성(complementarity)이 낮아 외부 충격 등으로 자본주의 유형이 좀 더 쉽게 바뀔 수 있다는 점에 기인한 것으로 추정된다.

두 번째 장에서는 1970년대 이후 OECD 국가들의 데이터를 이용하여 금융화와 금융 발전, 노동 시장 제도가 불평등, 투자, 성장, 소비에 미친 장기적 영향을 분석하였다. 여기서 금융화란 경제 전체에서 금융 부문의 팽창, 비금융부문 내의 자원이나 이윤 중 금융 부문이나 주주에게 돌아가는 몫의 증가 및 금융 세계화의 진전을 말한다. 금융화를 측정하기 위해 세 가지 지표가 사용되었는데 첫 번째 지표는 전산업 대비 금융, 보험업의 부가가치 비중이고 두 번째 지표는 비금융 기업 내의 순부가가치 대비 배당의 순지출 비중, 세번째 지표는 해외 금융 자산과 부채의 합

을 GDP로 나눈 금융 세계화 변수이다. 금융 발전을 측정하는 지표로는 GDP 대비 민간 신용 공급, GDP 대비 시가총액 비율, 시가총액 대비 거래된 주식 가치 비율을 사용하였다.

노동 시장 제도 중 본 논문에서 분석된 제도는 최저 임금과 노조 조직률이다. 최저임금과 노조에 관한 정책은 최근 주목받고 있는 소득 주도 성장론의 핵심 정책으로 이들 노동 시장 제도의 장기적 효과를 추정함으로써 소득 주도 성장론의 주장과 함의를 검증할 수 있다.

이들 변수들의 장기적 효과를 분석하기 위해 본 논문에서는 패널 공적분 (panel cointegration) 기법을 사용하였다. 분석 결과 금융화 변수 중 배당 비중 변수가 불평등 변수와 공적분 관계를 가지고 있었으며 내생성 문제로부터 자유로운 Group-mean FMOLS 추정 결과 두 변수는 유의한 양의 연관성을 가지고 있었다. 더불어 금융 세계화 변수는 민간 투자 변수와 유의한 음의 연관성을 가지고 있었으며 패널 벡터 오차수정 모형(Panel VECM)을 추정한 결과 금융 세계화에서 민간 투자 쪽으로 Granger causality가 존재하는 것으로 나타났다. 한편 금융 발전 변수는 기존 문헌의 내용과 유사하게 민간 투자와 장기적으로 양의 연관성을 가지고 있는 것으로 나타났다. 또한 금융화와 금융 발전이 성장에 미치는 직접적인 효과는 존재하지 않았지만 이들 변수는 민간 투자를 통하여 성장에 간접적인 영향을 주는 것으로 추정되었다.

그러나 노동 시장 제도에 대한 추정 결과는 소득 주도 성장론과 그에 대한 반론 모두를 뒷받침하지 않았다. 중위 임금 대비 최저 임금 비율로 측정된 최저 임금을 올리거나 노조 조직률이 상승할 때 장기적으로 불평등이 완화되거나 노동 소득 비중이 올라간다는 강건한(robust) 증거는 없었다.

유사하게 소득 주도 성장론의 핵심 주장인 최저임금의 증가나 노조 조직률의 신장이 수요 증대를 이끌고 이를 통해 GDP의 증가를 달성할 수 있다는 주장에 대한 강건한 증거 역시 존재하지 않았다. 소득 주도 성장론의 주장과 같이 최저임금이 민간 소비와 장기적 양의 연관성을 가지고 있다는 추정 결과가 몇몇 모형에서 나

타났지만 이들 결과는 추정 모형의 변화에 대해 강건하지 않았다. 한편 소득 주도 성장론의 반론과 유사하게 최저임금과 노조 조직률이 민간 투자와 장기적인 음의 연관성을 가지고 있다는 결과 역시 몇몇 모형에서 나타났지만 이 역시 추정 모형의 변화에 대해 강건하지 않았다.

핵심어 : 금융화, 금융 발전, 불평등, 투자, 성장, 최저임금, 노동조합, 소득주도성장, 패널 공적분, 소비
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