
Sources of Income Polarization in Korea: Globalization and Technological Innovation

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Abstract

This study provides empirical evidences for the relationship between income inequality and economic growth, and relationship of income inequality with some of explanatory variables such as technological innovation, trade globalization, financial globalization and fiscal policy. We find out that income inequality has an adverse effect on economic growth, showing its dynamic features, for which we employed the polynomial distributed lags (PDL) model. The effect of income inequality on economic growth lasts over 9 years, and its dynamic effect peaks after 4 years. In addition, we also attempted to find out empirical evidences of sources of income inequality. The results show that income inequality is positively related to technological innovation, financial globalization, and fiscal policy; negatively related to the trade globalization. Many studies employ cross-country data, but it could have serious problems in collecting statistical data. Korean data is used over the time period of 1990-2015 in this study.

Keywords

income polarization, technological innovation, globalization, economic growth

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1. INTRODUCTION

Recently, income polarization has increasingly drawn an attention, as the national economy continues to slow down. Particularly, since Korea's foreign exchange crisis in 1997, the globalization has deepened and accelerated after the world financial crisis in 2008. On the other hand, it is pointed out that the potential growth rate of the Korean economy is also decreasing.

Due to deepening globalization and lower rate of economic growth—less than 3 per cent a year since 2012—the income distribution structure is exacerbated. The income level of the household in the top decile keeps increasing since 1990, and the income gap between top and bottom decile widening over time. It is also pointed out that income inequality would be one of causes for the slow economic growth. It was provoked by Kuznets (1955), and there have been many studies, since then, to investigate the relationship between income distribution and economic growth using cross-country data.

It is argued that income polarization worsened due to recent trends of globalization and technological innovation. The argument is supported by that globalization took away economic opportunities from the poor, while it could provide greater opportunity to the rich. That is, the rich would have a greater opportunity pursuing higher returns in managing their asset in the global market. Meanwhile, globalization continues to deregulate the financial market, which eventually causes an increase in debts of the poor household. The inflow of FDI and foreign capital increases demand for skilled labor, and change the structure of the labor market.

In addition, technological innovation has changed the production system toward labor-saving (Shin, 2005). It brings about a skill-biased labor market. Productivity in the high-tech industry increases with less employment. The rest of workers would be employed in the low-tech industry with lower productivity. In Korea, major part of the household income is formed by wage income, as the base of asset accumulation was weak after liberalization from the Japanese Oppression Period (Hong, 2015).

Therefore, it would be interesting to investigate the relationship between income polarization and economic growth, and furthermore causes of income polarization in this study. Other studies usually employ the cross-country data even though there are a number of statistical problems (Benabou, 1996; Kuznets, 1955). In this study, however, we employ a single country data of Korea. For the empirical investigation, we will also employ the reduced-form equation like other studies, but make a change in the specification for empirical model. In addition, we specify a behavioral equation for investigation of causes of income polarization.

This study is organized in the following. Chapter 2 briefly overviews the trend of income distribution in Korea over the period of 1990-2015, using “Urban Household Survey” of Statistics Ko-

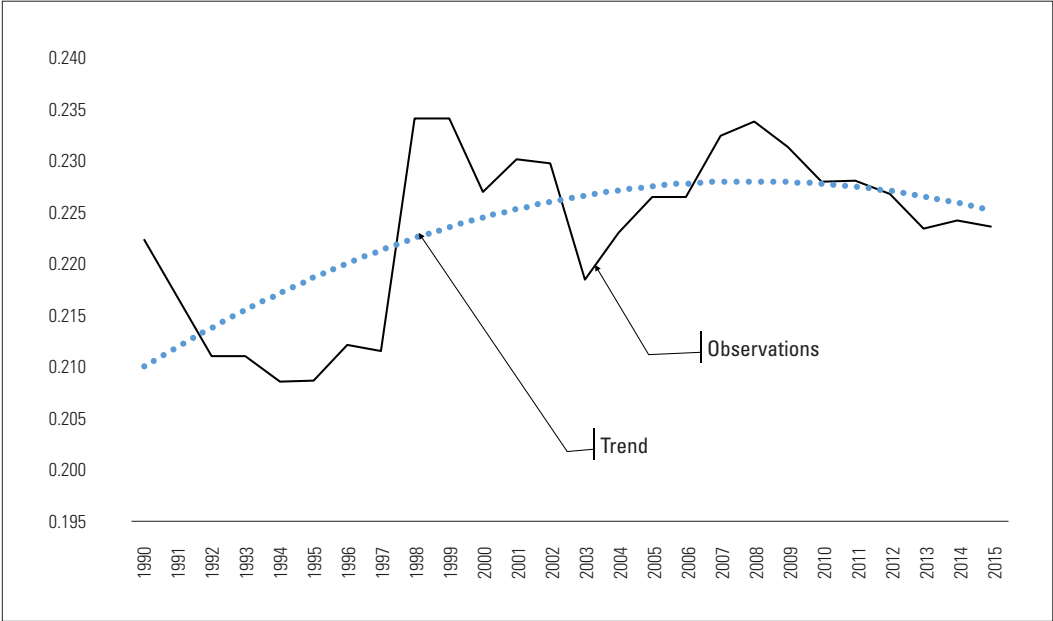
rea. In Chapter 3, using a reduced-form equation, we will make an empirical investigation of the relationship between income inequality and economic growth. The reduced-form equation will be changed by polynomial distributed lags, and find out the long-run effect of income inequality on economic growth. In Chapter 4, to investigate causes of income inequality, we simply regress income inequality onto some of independent variables such as financial globalization, trade globalization, technological change, and government fiscal policy, and test the empirical results. Finally, in Chapter 5, concluding remarks will be made.

2. TRENDS OF INCOME INEQUALITY

Since 1990s, income polarization has been exacerbated; particularly after the foreign exchange crisis in the end of 1997 and the global financial crisis in 2008. After economic development policy was pursued actively in the early 1960s, income polarization was not an issue until the end of 1980s. Major concern was to move out of the poverty by achieving industrialization.

During the period of 1960s~1980s, the economy grew rapidly and per-capita income had grown as well.¹ Per-capita income was grown from about 80 US dollars (in current price) in 1960 to 6,505 US

FIGURE 1. Shares of Top Decile



¹ The annual growth rate of GDP during the period of 1960-1990 was 9.5 percent.

dollars in 1990. During this period, it can be said that individual household income was increased due to rapid economic growth, and consequently income inequality had been improved. It implies that economic growth would reduce the poverty, and improve the income distribution structure. Mostly, the household income had grown based on wage earning during those time periods, but not on dividends, unlike other capitalist economies.

However, after the foreign exchange crisis in the end of 1997, Korea experienced massive unemployment. In addition, the Korean economy was hit by the global financial crisis in 2008. Such shocks did not cause only sluggish economic growth, but also exacerbate significantly income distribution. Income polarization draws an increasing attention with an argument that income polarization might aggravate the economic growth in the middle of world-wide recession.

Figure 1 exhibits the trend of shares of the 90th household income earner after 1990. It has increased from 0.222 in 1990s, 0.208 in 1994, to 0.234 in 1998 and 2008, and thereafter decreased to 0.223 in 2015. That is, in the early 1990s, the share of the 90th household income earner was be increased, and sharply increased right after the foreign exchange crisis in 1997 as well as the world financial crisis in 2008. Thereafter, the share decreased but still higher than that of 1990. During the time period of observation, the share of the 90th household income earner shows a dramatic fluctuation, and constantly increases.

FIGURE 2. Shares of the Six Lowest Deciles

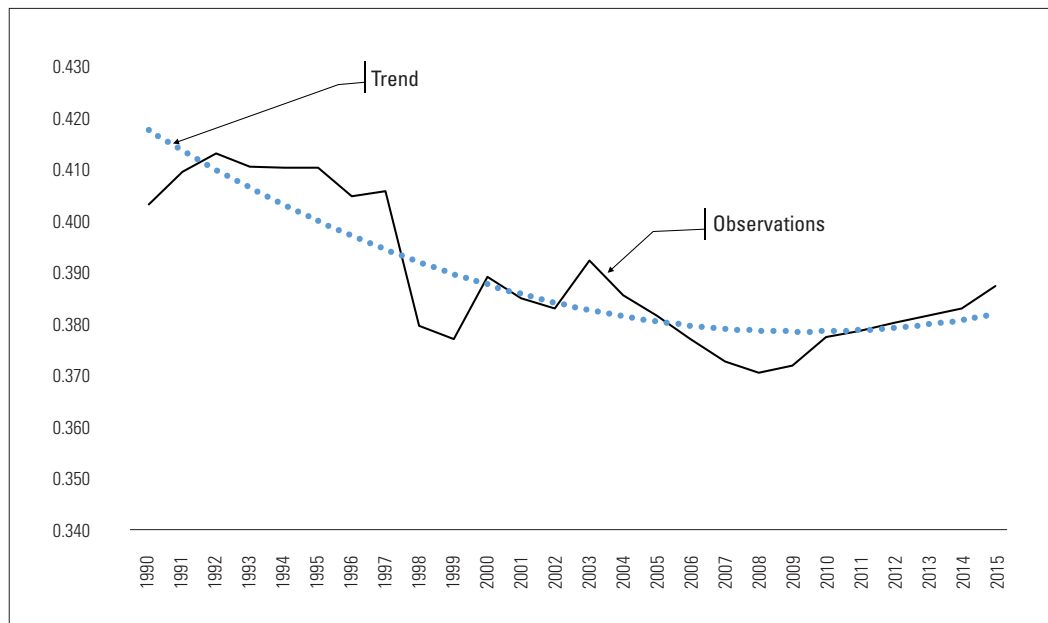
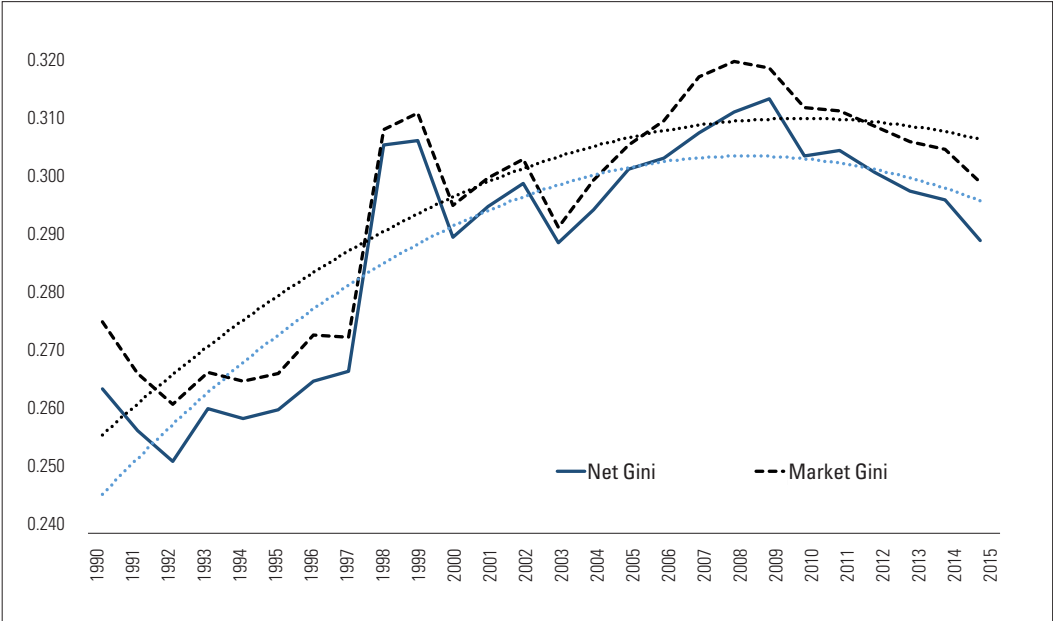


Figure 2 also exhibits that the share of the 60th household income earner has been decreased since 1990, implying that the middle-income class also decreased. The share was 0.403 in 1990, 0.377 in 1999, 0.371 in 2008 and 0.388 in 2015. It implies that after 1990, a part of the middle-income class kept moving into the lower-income class, widening the gap between the rich and the poor. The consumption propensity of additional income of the rich household is not as high as the poor, and therefore domestic consumption expenditure would not rise enough for the growth.

Figure 3 exhibits trends of income inequality in Korea for the past two and a half decades. The Gini coefficient was obtained using the data from the household income survey (provided by Korean Statistical Information Service; KOSIS); in terms of total market income (market Gini) and disposable income (net Gini). The market Gini coefficient increased from 0.274 in 1990 to 0.298 in 2015, and it reached a peak of 0.319 in 2008. Meanwhile, the net Gini coefficient from 0.262 in 1990 to 0.288 in 2015, and it reached a peak of 0.313 in 2009.

The Gini coefficients show in Figure 3 that income inequality has widened during the time period in consideration. The net Gini coefficient (the solid line in the figure) increased over the period of 1990-2015, showing a slight improvement after 2008. The net Gini coefficients show 0.262 in 1990, 0.313 in 2009, and 0.288 in 2015. The same trend is observed in the market Gini coefficient (the dotted line in the figure). The market Gini coefficients are 0.274 in 1990, 0.319 in 2008, and 0.298 in 2015.

FIGURE 3. Trends of Gini Coefficients



Income inequality has widened mainly due to the outside shocks such as Korea's foreign exchange crisis as well as the global financial crisis. Although the social welfare system and government policy was reinforced to improve the income distribution, the effects are marginal. What is worse is that households are increasing with aged (retired) people. In addition, it seems that the economy is steadily losing its thrust of growth engines, with decreasing consumption expenditure in the domestic market and growth of export.

As a consequence, income polarization draws increasingly greater attention with sluggish economic growth, creating a number of social issues. It is pointed out that regaining the thrust of economic growth is more important because of its positive effect on income distribution. This view mostly focuses on how to regain the competitiveness and increase the export; and therefore focusing on industrial policy. On the other hand, it is argued that government intervention to improve income distribution is more important to increase consumption expenditure and hence aggregate demand in the domestic market. This view rather focuses on the domestic market, including income redistribution, market structure dominated by the large enterprises and others, to find a solution. The latter places a greater emphasis on social welfare policy.

On the other hand, Yoo (2009) made an analysis over the period of 1982-2013, over which both relative and absolute rate of the poverty had increased in Korea. He also argues that inclusive growth improving the income distribution reduces the poverty and that a higher degree of income inequality exacerbates the poverty in Korea. Hong (2015) also analyzes income trend of the top income earners, providing a homogeneous series over the period of 1958-2013 in Korea. According to his work, compressive economic growth generates compressive development of income concentration until the end of 1980s. After 1997, the top wage and income shares increased, and the polarization of business income played a great role of concentration of the income distribution since 2000.

In summary, income inequality was not a serious issue until the 1980s, as the income distribution improved together with the fast growing economy. However, since the 1990s, the growth rate has been slowing down due to the economic crises. The income distribution structure is not improved, which draws greater attention to income inequality in Korea.

3. INCOME INEQUALITY AND ECONOMIC GROWTH

Since Kuznet (1955), there are many studies investigating the relationship between the income distribution and economic growth, using reduced-form equation with cross-country data. Most studies support that income inequality is negatively related to the economic growth. A few is not.²

² For example, see Benaubou (1996).

In many studies, it is pointed out that rising income inequality might curb the sustained economic growth. (For example, refer to IMF, 2015). Kuznets (1955) makes a hypothetical argument that income distribution, whether exogenous or endogenous, could influence growth, comparing between developed and underdeveloped countries. Since then, many studies attempted to obtain empirical evidences of the relationship between income inequality and economic growth. Most studies are carried out using a cross-section data, and many of them support that income inequality would have a negative impact on sustained growth of the economy.

TABLE 1. Estimation Results: Eq.(1)

Independent Variables	$\log\left(\frac{P_{90}}{P_{10}}\right)$		$\log(G_{market})$		$\log(G_{net})$	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	0.380	3.348	-0.626	-3.429	-0.690	-3.383
t+0	-0.013	-0.892	-0.059	-1.698	-0.064	-1.821
t+1	-0.021	-0.992	-0.093	-1.816	-0.101	-1.933
t+2	-0.025	-1.154	-0.106	-1.998	-0.115	-2.105
t+3	-0.025	-1.462	-0.103	-2.317	-0.111	-2.397
t+4	-0.023	-2.227	-0.088	-2.981	-0.095	-2.988
t+5	-0.019	-3.946	-0.065	-4.420	-0.070	-4.376
t+6	-0.013	-1.489	-0.040	-2.409	-0.043	-2.988
t+7	-0.008	-0.570	-0.016	-0.600	-0.017	-0.689
t+8	-0.004	-0.226	0.001	0.038	0.002	0.072
t+9	-0.001	-0.050	0.008	0.342	0.009	0.418
Sum of Lags	-0.152	-3.110	-0.560	-3.611	-0.604	-3.546
R-squared	0.527		0.597		0.619	
S.E. of regression	0.018		0.017		0.017	
Log likelihood	45.429		46.789		47.272	
F-statistic	7.807		10.376		11.393	
Akaike info criterion	-4.992		-5.152		-5.209	
Durbin-Watson stat	2.081		2.370		2.479	

Sample period: 1999–2013

Constraints: 1. Polynomial degree of three

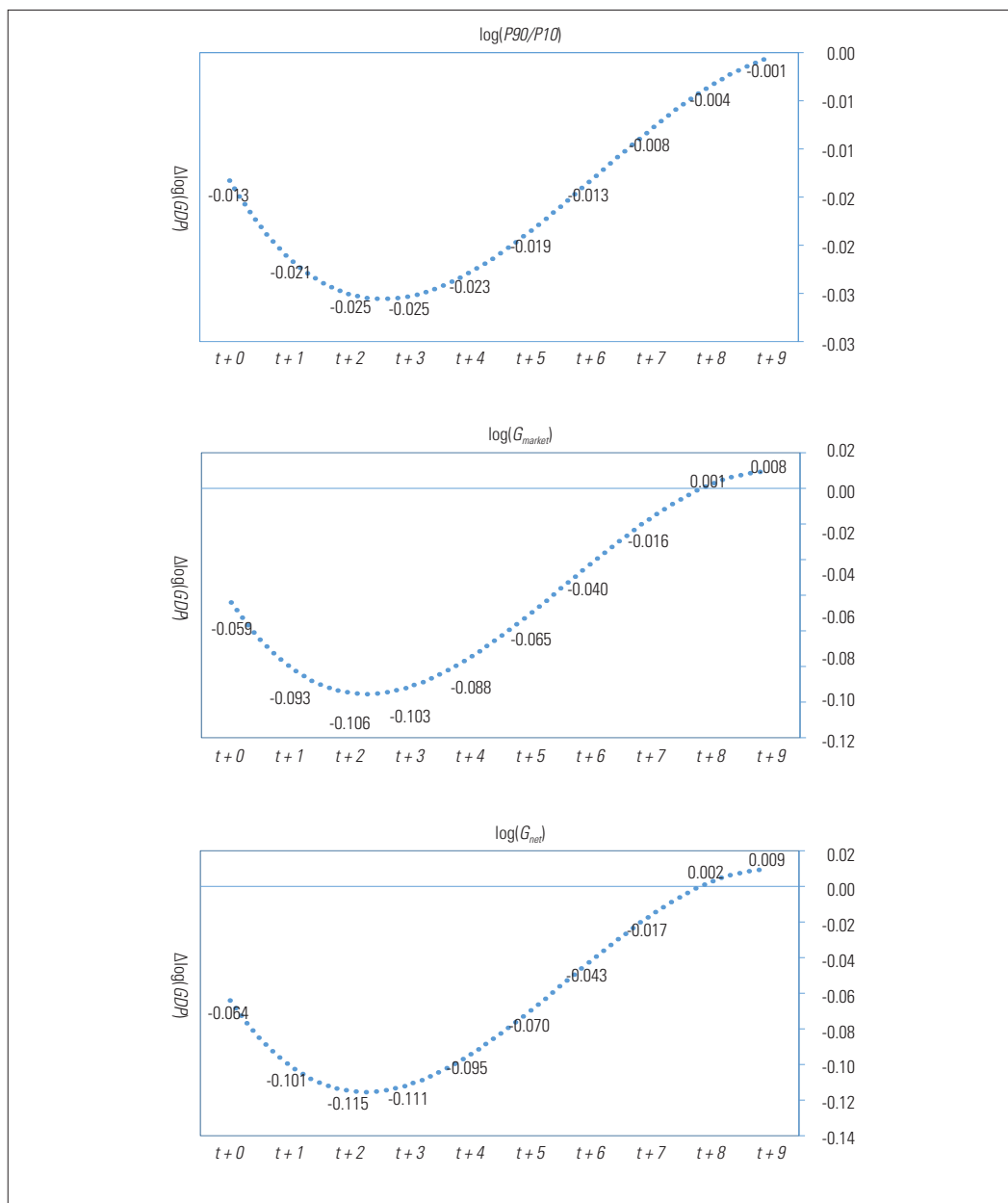
2. Both ends are zero.

Bernabou (1996) attempts to answer why economic performance was significantly different between Korea and Philippines in the 1970s and 1980s in the viewpoint of income or wealth inequality. He also showed empirical evidences of a positive effect of inequality on growth, using the data of the seven major world regions in the period of 1970~1990.

When the cross-country data is employed, the estimates may not directly assess a question how changes in a country's level of inequality relates to changes in that country's growth performance. It would be difficult to draw any conclusions about the long-term relationship between inequality and growth within a given country. In this study, we directly estimates how changes in inequality are correlated with changes in growth within a given country.

The reduced-form relationships between income distribution and growth are employed in empirical estimation. By its nature, a reduced form estimate cannot shed light on the underlying mechanisms. Hence, it is importance to evaluate the specific channels of operation of income distribution by estimating the structural models behind the reduced form.

FIGURE 4. Lag Effects of Income Inequality on Growth Rate



In this study, an empirical investigation of the relationship between income inequality and economic growth, in this study, is made using the polynomial distributed lags (PDL) model. If the model is given as follows, the coefficient of INQ will represent the lag effect, and once-and-for-all (long-run) effect of income inequality.

$$(1) \quad \Delta \log(GDP)_t = \alpha + \beta \sum_{i=0}^k \omega_i INQ_{t-i} + \varepsilon_t$$

where INQ denotes income equality; α and β parameters; ω_i weights; ε_t statistical errors.

The estimation results are shown in Table 1. We regress the rate of economic growth on variables representing income inequality, such as the ratio of the household income of top decile to bottom decile, the market Gini coefficient, and the net Gini coefficient. According to the estimation results, the long-run effect of income inequality is negatively related at the 1 percent level of the significance. The dynamic features of the lag distribution are exhibited in Figure 4 in all cases, where the effect of income inequality continues over 9 years. It is also shown that the effect of income inequality is at maximum after 3 years and tails out. In the case of the independent variable, $\log\left(\frac{P90}{P10}\right)$, all lag variables have negative coefficients, but both Gini coefficients show a positive coefficient in last two periods.

Empirical results for the relationship between income inequality and economic growth implies apparently that during the sample period, 1990-2015, income inequality might have a negative effect on economic growth. As discussed before, higher economic growth may have a positive effect on the income distribution, but during this period the growth rates are relatively lower. On the other hand, widening income gap continues to contract the domestic market, and curbs economic growth. Since we employed a reduced-form equation, the empirical investigation does not illuminate the mechanism between two variables.

4. SOURCES OF INCOME INEQUALITY

Dabla-Norris, Kochhar, Suphaphiphat, Ricka, and Tsounta (2015) pointed out that sources of income inequality are technological progress, trade globalization, financial globalization, changes in labor market, government policy for income distribution, education, and others. Paunov and Guellec (2016) made an empirical investigation, focusing on technological innovation and ICT. Jaumotte, Lall, and Papageorgiou (2008) employed ICT capital for the variable of technological innovation, influencing income inequality.

In view of technological innovation and/or progress, changes in not only the production system but also social welfare took place through, so called IT revolution. The skill premium has been increased in the labor market due to ICT innovation, widening the wage gap between the skilled and the unskilled workers. As technology advances in the production sector, the labor market increases the demand for the skilled as well as for the level of skills (Acemoglu, 1998). A report of OECD

(2011) points out that about one third of the additional income gap between top decile and the bottom decile is caused by technological progress. In Korea, ICT development has changed not only the structure of the manufacturing sector but also other areas of the national economy, since 1990s, shifting the nation into the knowledge-based economy.

On the other hand, Korea pursued trade globalization from the beginning of economic development in the early 1960s. Korea's strategy was to develop heavy-petrochemical industries through large-scale investment. However, to finance the investment, Korea depended heavily on foreign loans. The continuous investment in the development of heavy petrochemical industries would be possible through promoting exports. Those industries had to find out the way of survival and compete with advanced enterprises in the international market, due to the limited size of the domestic market. Eventually, the strategy proved successful, and the Korean economy grew rapidly, improving the income distribution structure.

Unlike the manufacturing sector in the course of economic development, the financial sector was vulnerable—there used to be a strong intervention of the government. However, after the foreign exchange crisis in 1997, a wide-ranging reform of the economy was inevitable and the Korean government opened country's financial market open, according to the recommendation of the International Monetary Fund (IMF). A number of regulations on the financial market was lifted, attracting a great deal of foreign investment, and increasing financial asset, skills and wages in the financial sector. In addition, the deregulation of the financial market eventually increased household debts significantly.

In a more equal society, there would be less demand for income redistribution (the political mechanism), and therefore lower taxation and more investment and higher rate of growth (the economic mechanism). The fiscal policy approach can then be summarized with regard to income inequality and economic growth in the following. Through the economic mechanism, growth increases as distortionary taxation decreases. In the political mechanism, redistributive government expenditure and therefore distortionary taxation decrease as equality increases. In the reduced form, growth increases as equality increases. Thus, the fiscal policy approach should posit a positive reduced form relationship between equality and growth.

Other variables but the variable for technological innovation can be collected from reported statistics. In this study, we obtained the indicator for the technological innovation from the aggregate production function. Total factor productivity accounts for the technological innovation and/or progress, we obtain the level indicator of the total factor productivity, after estimating the aggregate production function.

TABLE 2. Estimation Results: Eq.(2)

	Coefficient	t-Statistic
Constant	0.646	12.204
$\log K_t$	0.743	49.275
R-squared		0.991
S.E. of regression		0.090
Log likelihood		46.321
F-statistic		4986.614
Durbin-Watson stat		0.111
Sample period: 1970-2015		

The aggregate production function is given by

$$(2) \quad Y_t = A_t K_t^\beta L_t^{(1-\beta)} \varepsilon_t$$

or
$$\log Y_t = \log A_t + \beta_1 \log K_t + (1-\beta_1) \log L_t + \varepsilon_t$$

where Y_t denotes real GDP; K_t capital stocks; L_t labor; A_t total factor productivity

Then, total factor productivity can be obtained as follows;

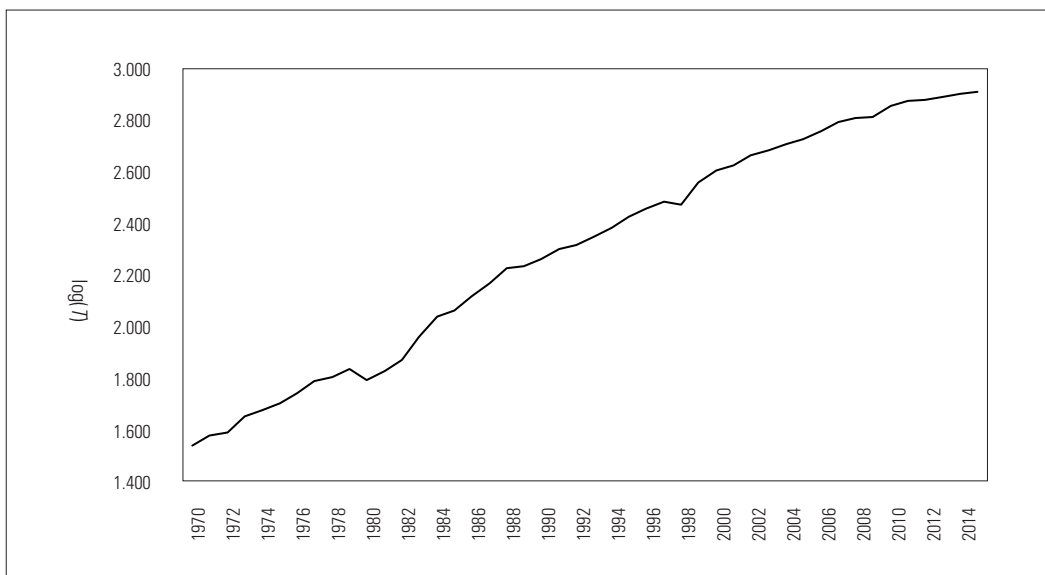
$$(3) \quad A_t = K_t^{\hat{\beta}} L_t^{(1-\hat{\beta})} Y_t^{-1}$$

or
$$\log A_t = \log Y_t - \hat{\beta} \log K_t - (1-\hat{\beta}) \log L_t$$

Thus, Eq.(3) represents the level variable for total factor productivity.

The estimation results are shown in Table 2. The capital share ($\hat{\beta}$) is about 74 per cent. Using the estimation results, we obtain the level variable for total factor productivity, which is shown as $\log T$ in Figure 5. It can be said that Korean economy exhibits fast-growing technology level over time period of 1970-2014. Such indicator can be employed as the variable for technological innovation.

FIGURE 5. Technological Change: Level Variable



Then, we specify a model for investigating income inequality with a set of the independent variables. Assuming that income inequality is influenced by the variables such as technological innovation, financial globalization, trade globalization and fiscal policy of the government, we have

$$(4) \quad INQ_t = \beta_0 + \beta_1 LOGT_t + FOP_t + TOP_t + GFS_t + \varepsilon_t$$

where INQ_t denotes income equality; $LOGT_t$ technological change in logarithm; FOP_t Financial globalization (the ratio of foreign assets plus foreign liabilities to GDP); TOP_t trade globalization (the ratio of exports plus imports to GDP); GFS_t fiscal policy (the ratio of government expenditure to GDP).

The estimation results of Eq.(3) can be seen in [Table 3]. The dependent variables representing income inequality are the market Gini coefficient, the net Gini coefficient and the ratio of household income of the top decile to the bottom decile. The estimated coefficients are mostly significant. In the second column of [Table 3], for the dependent variable of the market Gini coefficient, trade globalization is significant at a 1 percent level and shows a negative coefficient. The estimated coefficients of technological innovation and fiscal policy are significant at a 5 percent level. Both coefficients are positive. The coefficient of financial globalization is significant at a 10 percent level and has a positive sign. Similar result can be shown in the third column. The coefficients of technological innovation and trade globalization are significant at 1 percent level, and have a positive sign. The coefficients of financial globalization and fiscal policy are significant at 10 percent level. Likewise the first column, the coefficient of fiscal policy has a positive sign. Finally, in the last column,

all coefficients are significant at 5 percent level. The signs of the estimated coefficients are the same as other equations.

TABLE 3. Total Factor Productivity : Level Variable

Dependent Variable	Market Gini		Net Gini		$\log\left(\frac{P_{90}}{P_{10}}\right)$	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	-0.019	-0.221	-0.073	-0.829	-0.157	-0.235
LOGT	0.106**	2.749	0.133***	3.356	0.704**	2.351
FOP	0.031*	1.776	0.033*	1.827	0.324**	2.363
TOP	-0.139***	-3.451	-0.164***	-3.932	-0.811**	-2.579
GFS	0.727**	2.333	0.638*	1.986	5.100**	2.103
R-squared	0.856		0.857		0.912	
S.E. of regression	0.008		0.009		0.066	
Log likelihood	83.261		82.518		34.006	
F-statistic	28.181		28.357		49.367	
Durbin-Watson stat	1.562		1.632		1.801	
Sample period	1990-2013		1990-2013		1990-2013	

Note: *'s are significant at 10 percent level; **'s are significant at 5 percent level; and ***'s are significant at 1 percent level.

Such empirical results may imply that income inequality is positively related to technological innovation and financial globalization. As the government lifted regulations in the financial sector, the household debt has increased sharply. Loans increased in the lower income class, while the rich provide funding sources for lending. This situation has proven typical with the globalization.

But, as expected, trade globalization is negatively related to income inequality. It is interesting that the fiscal policy is positively related to income inequality. Supposedly, government fiscal policy would have a positive effect in improving the income distribution structure towards a more equal society. But, in Korea, fiscal policy seems not to be dominated by the political mechanism but by the economic mechanism. That is, the government has favored a “growth first” policy since the last government. There has been a big debate about “tax cuts for the rich,” with the former government cutting the corporate tax and lowering tax rates, which are in turn maintained by the current government. Consequently, the corporate earnings rose significantly, but a trickle-down effect is hardly perceived. It has been argued that such tax cuts have had an adverse effect with unfavorable indirect tax system—for example an increase in cigarette tax—on the income distribution.

5. CONCLUDING REMARKS

So far, we have looked into the trend of income inequality in Korea, and made an empirical investigation into the relationship of income inequality and economic growth, and the relationship

between income inequality and other explanatory variables such as technological innovation, trade globalization, financial globalization and fiscal policy. The empirical results are satisfactory and significant.

Using Koran data, income inequality is evidently shown to relate negatively to the economic growth. Income inequality exhibits its effect on economic growth continuing over 9 years. An increase of income inequality might have the greatest dynamic effect after 3 years.

Also, income inequality is exacerbated by the financial globalization, technological innovation and fiscal policy—although fiscal policy remains controversial regarding income inequality. The trade globalization appears to have a positive effect on improving income inequality.

The implications of these findings is that the government should pay greater attention to income inequality in the current economic situation. Korea is one of the countries that make a greatest investment in R&D relative to the size of GDP in the world. Recently, technological innovation policy is strongly driven by the government. However, in view of the income distribution structure, appropriate policy mix might be required, for both promoting innovation and improving income distribution. Otherwise, Korea would pay greater social costs in transition. The same is holds for financial globalization.

Lastly, fiscal policy is a controversial and ongoing issue. By the empirical findings, we may suggest that the government should pay greater attention to the income distribution, rather than economic growth. As the potential growth rate stagnates, it is increasingly unlikely for the economy to move back on the track. If so, the effect of income inequality on economic growth would be considered more seriously in managing public policy.

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