



University of
Massachusetts
Amherst

Unproductive Activities and the Rate of Surplus Value at the Industry Level in Korea, 1995–2015

Item Type	Working Paper
Authors	Rieu, Dong-Min; Park, Hyun Woong
DOI	10.7275/11975654
Rights	UMass Amherst Open Access Policy
Download date	2026-04-16 08:03:50
Link to Item	https://hdl.handle.net/20.500.14394/22222

Unproductive Activities and the Rate of Surplus Value at the Industry Level in Korea, 1995–2015*

Dong–Min Rieu[†] Hyun Woong Park[‡]

This version: April 13, 2018

Abstract

In order to explain how the Korean economy underwent the structural change through the two crises of 1997–8 and 2008 within the context of globalization, this article focuses on class analysis and inter-sectoral value transfer by estimating the sectoral rates of exploitation along with the sectoral monetary expressions of labor time. Our data indicate the possibility that the expansion of unproductive activities, accompanied by intensification of exploitation within the unproductive sectors, might not have overtaken capital accumulation in Korea during 1995–2015. It can also be concluded that the condition for manufacturing’s capital accumulation steadily improved since the 1997–8 crisis, but started to deteriorate after 2011. Our value–theoretic analysis provides a foundation for understanding the context of the regime change, which may plausibly characterize the Korean economy last couple of decades.

Keywords: Sectoral rates of surplus value, unproductive labor, monetary expression of labor time, Korean economy

JEL Classification: B51

*The authors are grateful to Sangyong Joo and Su Min Jeon for generously providing the data on the labor income share of Korea. This study would have been impossible without their support. We also thank Jonathan F. Cogliano, Jeong Joo Kim, Xiao Jiang, Fred Moseley, Naoki Yoshihara, Jayoung Yun, two anonymous referees, and participants at the 2018 Winter Conference of the Korean Association for Political Economy in Seoul and the 2018 Annual Meeting of the Eastern Economic Association in Boston for useful comments and suggestions. The usual caveat applies.

[†]Chungnam National University, Department of Economics; rieudm@cnu.ac.kr

[‡]Denison University, Department of Economics; parkhw@denison.edu

1 Introduction

The momentum of the neoliberal structuration of the Korean economy critically accelerated as a result of the 1997–8 financial crisis. Two recent decades since the crisis saw an enormous increase in non–regular employment through the flexibilization of labor market, which deepens income inequality, and an ever increasing importance of financial elements in everyday life as well as capital accumulation. Suffice it to say that 2008 global financial crisis gave further impetus to this tendency.

With high exposure to globalization, the internationalization of productive capital such as FDI and market opening came to be crucial explanatory factors for the change in the rate of profit (Hong, 2013). At the same time, some favorable conditions were established for the conventional export–led growth strategy; export–biased productivity growth, suppression of wage and undervalued exchange rate (Uni, 2017).

In this setting, it is important to explain how the Korean economy underwent the structural change through the two crises of 1997–8 and 2008 within the context of economic globalization. We approach this challenging task from the Marxian perspective focusing upon the distinction between productive and unproductive activities and the estimation of the rate of surplus value at the industry level. This article aims to give a sketch of the structural change in the Korean economy during 1995–2015 by providing indicators based upon Marxian labor theory of value.

The main contributions of this article are summarized in two points. First, we estimate Marxian ratios of the Korean economy both at the macro–level and the sectoral level within the framework of the ‘New Interpretation’ (NI) of Marxian value theory as presented in Duménil (1980) and Foley (1982). Based on the central thesis of Marxian labor theory of value that money value added is the result of expenditure of living labor, the NI proposes to accept the equivalence between the two at the aggregate level as an axiom. The associated proportionality coefficient — called the monetary expression of labor time — can be used in converting between price categories and Marx’s labor value categories, thereby allowing one to recover the latter directly from the former. This has opened up new areas of research program in Marxian literature to empirically test Marx’s hypotheses and estimate Marxian ratios, using readily available real world data such as national income accounts as done in

this paper.¹

When applying the NI to the Korean data, we explicitly consider the distinction between productive and unproductive labors and the decomposition of the income of self-employed into capital income and labor income. The latter is particularly crucial since the share of the self-employed sector in the Korean economy is significantly high; around 30% of the total working population during 1995–2015. In the literature of Marxian value theory, labor income of the self-employed is usually counted as the wage equivalent (Shaikh and Tonak, 1994). Considering that most self-employed persons have scarce opportunity for average salary paid jobs, however, this approach necessarily tends to underestimate the rate of surplus value. Per capita income of the self-employed persons started to fall short of the average income of wage workers around 1993 in Korea. Since then, the gap between the two has been widening continuously except for the short period of 1997–8 crisis.

Secondly, based on the confirmation, through panel unit root tests, that the hypothesis of equalization of the sectoral rates of surplus value does not hold for the Korean economy during 1995–2015, we propose a novel approach to estimate the rate of surplus value at the industry level that relies on the method of the ‘inverse transformation’ of price variables into value variables. More specifically, we first estimate the labor share in income of each productive industry — which is a price variable — by using the approach suggested in Joo and Jeon (2014), and then use it to derive the sectoral rates of surplus value — which is a value variable.

As we incorporate the decomposition of income of the self-employed sector to the estimation of the sectoral rates of exploitation, there may be an objection that self-employed do not produce surplus value as they are not ‘capitalistically employed’. However, it can be safely said that they are subsumed under the overarching nexus of the capital–labor relation. In particular, many of them are ‘economically dependent workers’ in that their labor processes

¹This is one of the advantages of the NI over the other interpretations of Marxian value theory and the main reason why we adopt it as a framework for the empirical analysis in this paper. It is well recognized that there is a critique of the NI that it explains values from prices rather than the other way around and thus that “the whole relation between surplus value and profit is turned on its head ” (Shaikh and Tonak, 1994, p. 179). However, this view is misdirected since in the NI the labor value categories are not determined by, but recovered from the price categories.

are controlled and supervised by capital, although their legal statuses are ‘the self-employed’ (Oostveen et al., 2013).

The rest of the article is organized as follows. In section 2, we first compute Piketty (2014)’s capital–income ratio for the Korean economy, and provide an alternative reading based upon the capital–labor class analysis; for this we conduct profit rate analysis for the entire economy and the manufacturing industry. In section 3, Marxian value ratios at the macroeconomic level are measured. Marxian value ratios at the industry level are estimated in section 4. Section 5 concludes the article.

2 An alternative reading of Piketty

We start with outlining how inequality in the Korean economy has developed through the neoliberal structuration. On one hand, the global phenomena of expansion of income and wealth inequality pointed out by Piketty (2014) has been markedly observed in Korea as well during 1995–2015. As displayed in figure 1, Piketty’s β , i.e. capital–income ratio, declined in the aftermath of the 1997–8 crisis and started to rise considerably in early 2000.² It decreased somewhat right after the 2008 crisis but has still been exhibiting an upward trend.

The income distribution can be examined from a different perspective, in relation to productivity and profitability of capital by relying on the following decomposition formula of the rate of profit.

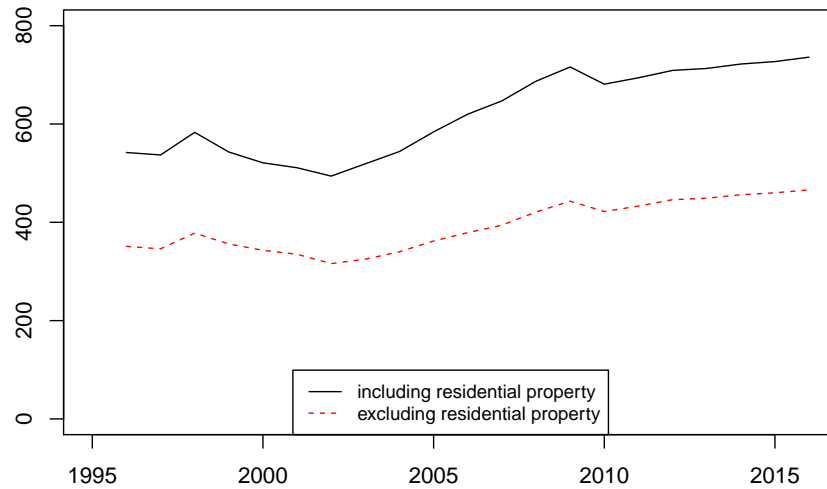
$$r = \frac{P}{K} = \frac{Y}{K} \frac{P}{Y} \quad (1)$$

where r , K , P , and Y , denote the rate of profit, capital stock, profits, and output, respectively. The evolutions of r , $\frac{Y}{K}$, capital productivity, and $\frac{P}{Y}$, profit share, during the sample period are illustrated in figure 2.³ Figure 2 confirms Rieu and Joo (2014)’s result about the profit rate dynamics of the Korean economy that a rise in profit share constantly offset a

²Sources of the data used in the article are explained in appendix and details of estimations are found in the note of each figure.

³Two comments: First, we computed the capital share of national income by following Joo and Jeon (2014)’s method, i.e. to decompose the operating surplus of self-employed, unincorporated sector — which is officially categorized as capital income — into capital income and labor income according to the profit–wage ratio of the corporated sector. Second, the measure of the profit rate in figure 2 assumes away the distinction between productive and unproductive labors. When the distinction is taken into consideration,

Figure 1: Piketty's β (1995–2016)



(We used private non-financial assets for capital and, for income, net national income.)

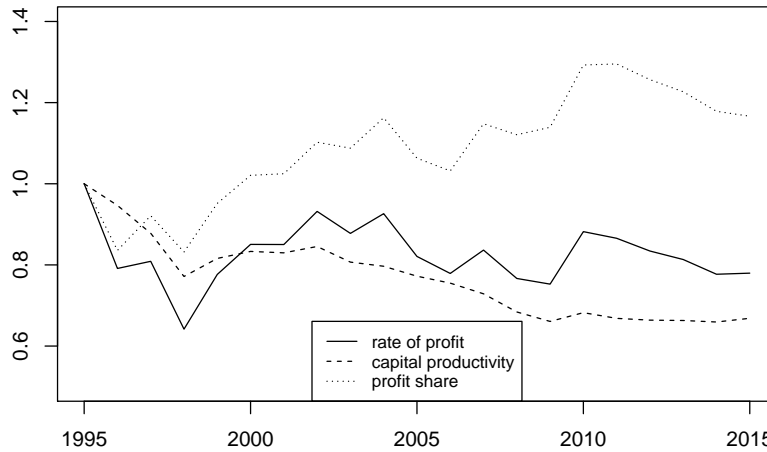
decline in capital productivity thereby preventing the falling tendency of the rate of profit from unfolding. In other words, strengthening of class power of capital played a vital role in avoiding the tendency of the profit rate to fall in the Korean economy. This dynamics has changed since 2010 when the capital productivity leveled off while both the rate of profit and the capital share in income started to decrease.

In all, figures 1 and 2 indicate that the capital-income ratio, the profit share, and the rate of profit shared the similar secular trend during the whole sample period in the Korean economy. This result partly corresponds to Thomas Piketty's thesis on the comovement of wealth-income ratio and profit share. Piketty (2014) suggests that the positive correlation between the two is due to an elasticity of substitution being greater than one. However, data collected in the literature contradict Piketty's argument, making it empirically weak; see, e.g., Semieniuk (2017). Rather, that the class struggle developed in favor of capital through neoliberal structuration provides a better explanation at least for the Korean economy during this period.

As can be seen in figure 3, manufacturing is still a dominant and growing industry

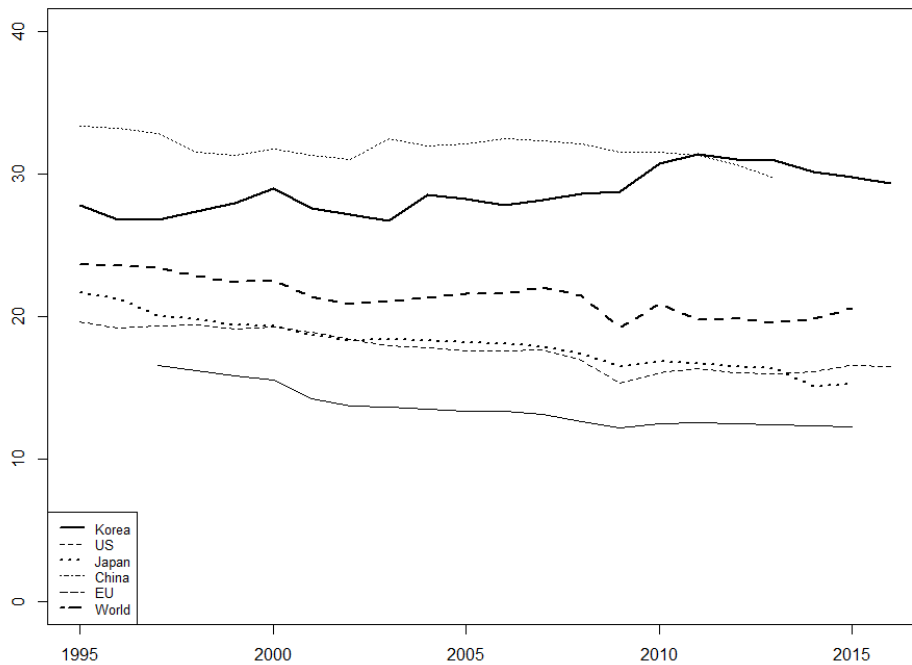
however, the wage of unproductive industries will need to be added to the numerator of the profit rate as part of total surplus value. We will start to incorporate the productive-unproductive labor distinction into our analysis from the next section.

Figure 2: The rate of profit, capital productivity, and profit share: all industries, 1995–2016 (1995=1)



(Capital = structures + equipment. Capital can be measured differently; for instance, net financial assets can be added or residential property can be subtracted. We tried various combinations of these and there wasn't any significant difference in the overall trends.)

Figure 3: Manufacturing's value added as a percentage of GDP: South Korea and the other major trading partners



(Data source: World Bank)

in Korea; while the world and the major trading partners experienced a decline in the share of manufacturing in GDP during 1995–2015, it increased in Korea during the same period except for 2011 and after. By implication, understanding the performance of the manufacturing industry would provide an essential clue in explaining the structural change of the Korean economy which took place during 1995–2015.

In this setting, the profit rate of manufacturing is analyzed in the similar manner as above and the result is reported in figure 4.⁴ There are a couple of interesting results to note in comparison to the case of the whole industries. First, manufacturing’s capital productivity stabilized after the 1997–8 crisis, which contrasts to the significant downfall of the capital productivity in the case of the whole industries. Second, the upward trend of profit share of manufacturing is more pronounced than that of the entire industries. As a consequence, the performance of manufacturing’s profitability has been stronger and less volatile than that of the whole industries; over the entire sample period, it has witnessed an upward trend followed by stabilization until 2011 when it started to fall; however, the decline was not as severe as that of the whole industries.

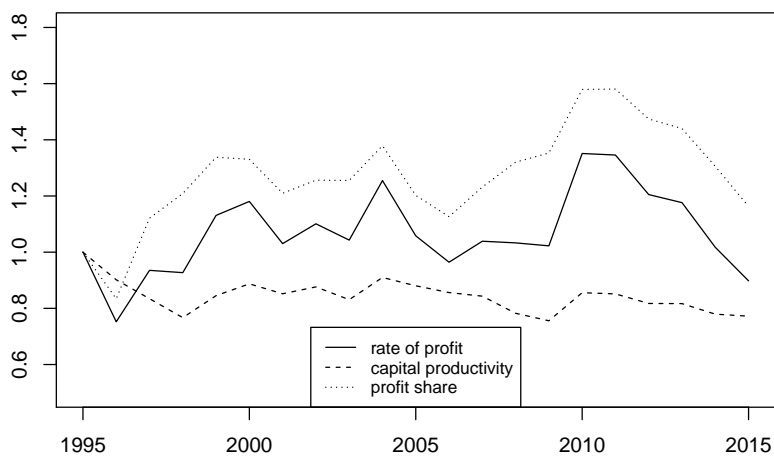
By inspecting the average annual rates of change of each variable, the entire sample period can be divided into two sub-periods, 1996–2010 and 2011–2015, while the first sub-period can be further divided into 1996–1998 and 1999–2010, as summarized in table 1.

First of all, the impact of the 1997–8 crisis on the profitability of manufacturing, reflected in the average annual rate of -0.44% during 1996–1998, was mild compared to -13.1% for the economy, whereas the consequence on the capital productivity was fatal for both the whole economy and manufacturing, -8.24% and -8.46% , respectively. It was due to the considerably strong profit share, 8.55% , the manufacturing industry achieved during this crisis episode.

Second, the sub-period 1999–2010 was a long phase of recovering from, and reversing, the crisis effects on profitability and productivity of capital for both manufacturing and the economy; but this trend was more pronounced in the manufacturing sector. In either case,

⁴In Hong (2013), the manufacturing industry’s output–capital ratio, which corresponds to our capital productivity, was in an upward trend from the 1997–8 crisis to 2009. This difference can possibly be explained by that Hong (2013) measures the ratio in real terms while we uses nominal terms, and that Hong (2013) uses value added while we use net national income.

Figure 4: The rate of profit, capital productivity, and profit share: manufacturing, 1995–2016 (1995=1)



Capital = structures + equipment + intellectual property products.

Table 1: The annual rates of change of the rate of profit, capital productivity, and profit share: whole industries and manufacturing (%)

	Whole economy			Manufacturing		
	profit rate	capital productivity	profit share	profit rate	capital productivity	profit share
1996–2010	−0.10	−2.42	2.12	3.20	−0.79	3.80
1996–1998	−13.11	−8.24	−5.30	−0.44	−8.46	8.55
1999–2010	3.15	−0.96	3.96	4.11	1.12	2.61
2011–2015	−2.42	−0.40	−2.02	−7.70	−2.01	−5.85

however, the recovery of the profit rate from the 1997–8 crisis was possible mainly due to the profit share.

Third, the increase in the profitability of manufacturing at the average annual rate of 3.20% during 1996–2010 stands out in comparison to -0.10% of the whole economy. Note that this happened when the capital productivity not only of the whole economy but also of manufacturing recorded negative average annual rate of change. Contrarily, the period 2011–2015 is marked by a rapid fall of manufacturing’s profitability at the pace of -7.70% amidst stagnant performance of both profit rate and capital productivity across industries. This can be well explained by the fact that manufacturing witnessed a solid profit share, 3.80% during 1996–2010, whereas it recorded the worst number for its profit share, -5.85% , during 2011–2015.

The empirical observations thus far point to the importance of the dynamics of class conflict reflected in the profit share. In particular, several differences documented above between manufacturing and the entire industries will provide crucial insights in understanding the structural change of the Korean economy.

3 Marxian value analysis: macro–level

To further pursue our discussion from the previous section on the class conflict on the distribution of national income, we study historical developments of Marxian ratios in the Korean economy, such as the value of labor power and the rate of exploitation at the macro–level from the perspective of the New Interpretation (NI) of Marxian value theory. In comparison to our discussion in the previous section, we add two extensions. First, the distinction between productive and unproductive labors is explicitly incorporated to the analysis.⁵ This distinction is specific to the Classical and Marxian theories of value. Even in the literature on Marxian value theory, some are skeptical about the logical consistency and the analytical usefulness of the distinction; see. e.g. Laibman (1999). However, as shown later, some characteristic pattern of the capital accumulation in Korea can be captured using the

⁵The productive industries include agriculture, forestry, and fishery; mining; manufacturing; utilities; construction; accommodation and food service; transportation and warehousing; information services; education service; arts and entertainment.

distinction. We adopt the conventional definition of productive labor as “wage labor that exchanges against capital and is employed in the productive phase of the circuit of capital rather than in the realization or financial phases” (Foley, 2013, p.261).

Second, considering the fact that the share of the self-employed, unincorporated sector is large in the Korean economy and that the social and economic conditions of the self-employed are quite weak, we decompose the income of this sector — which is officially categorized as profit — into capital income and labor income when measuring the income distribution. In doing this, we follow Joo and Jeon (2014) and decompose the mixed income, which is another name for the income of the self-employed sector, according to the ratio between capital income and labor income in the incorporated sector.⁶

To begin with, according to the NI, the value of labor power (VLP) and the rate of exploitation, denoted by e , are defined as follows, respectively.⁷

$$e = \frac{m}{w} - 1 \quad (2)$$

$$VLP = \frac{w}{m} \quad (3)$$

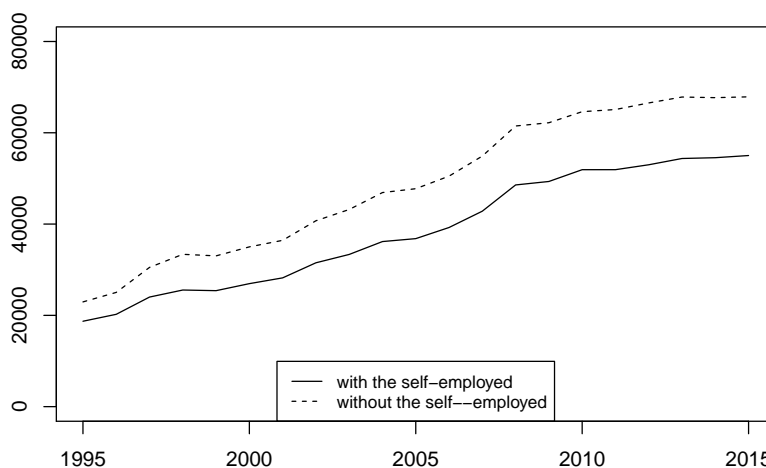
where w denotes a wage rate and m the monetary expression of labor time (MELT). When computing the exploitation rate and the value of labor power according to equations (2) and (3), we measure the two key parameters, w and m , by explicitly considering the productive–unproductive labor distinction along with the decomposition of the mixed income. In the case of w , on one hand, it is not the total wage of the whole economy that is counted but only of the productive sectors plus the labor share of the mixed income. Let us denote the latter by w_P , which then should replace w in equations (2) and (3).

Similarly, on the other hand, with the definition of the MELT being the ratio between aggregate value added and total labor time, there are two issues that can be considered related to the denominator of the MELT. First, one can count ① only productive labors as in Mohun (2006) and Cogliano (2017) or ② the entire labors, productive or unproductive. ① is a more standard approach in Marxian literature and it is consistent with Foley (1986).

⁶The underlying assumption is that the the labor share in income is identical between the incorporated and unincorporated sectors.

⁷See Mohun (2006) for a summary of the theoretical framework of the NI in the context of an empirical analysis.

Figure 5: The monetary expression of labor time (1995–2015)



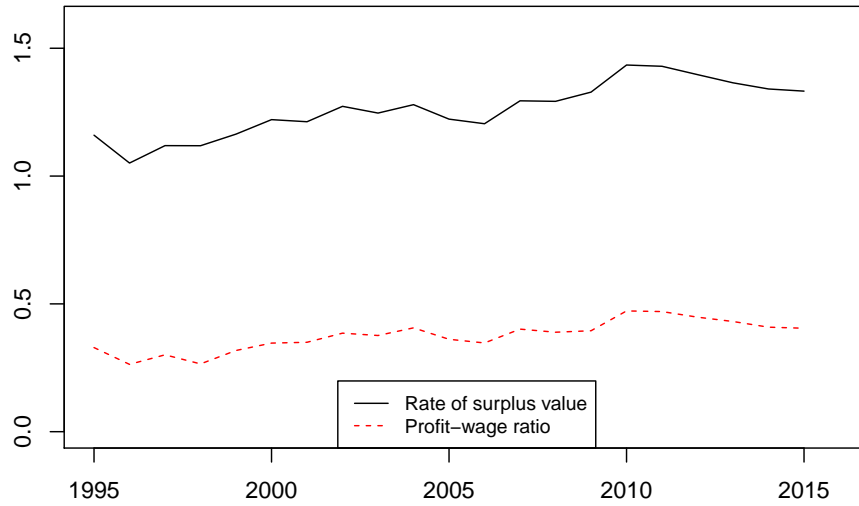
(We used net national income for the aggregate money value added in the numerator of the MELT and the total labor time of the productive industries is computed by ‘the annual number of employed and self-employed \times monthly average of working time \times 12’ for the productive industries as a whole.)

Second, one can \textcircled{A} take the productive–unproductive labor distinction as equivalent to the productive–unproductive industry distinction as in Cogliano (2017) or \textcircled{B} apply the class concept to the productive–unproductive labor distinction thereby categorizing a supervisory labor as unproductive as in Mohun (2006). In this article, we adopt the $\textcircled{1}$ – \textcircled{A} combination.⁸ In addition, we take the labor of self-employed as productive. In all, denoting the aggregate monetary value added by MVA and total labor time of the whole productive sectors and those of the whole unproductive sectors, respectively, by L_P and L_U , the MELT can be expressed as $\frac{MVA}{L-L_U}$ where $L = L_P + L_U$.

In order to visualize the consequence of counting the labor of self-employed in the denominator of the MELT as productive, we illustrate in figure 5 two different versions of the MELT, one that counts the labor of self-employed as productive and the other that does not. In either cases, the MELT constantly rises until 2011 after which it slows down and stagnates. Yet the gap between the two measures of the MELT tends to get widened after

⁸While \textcircled{B} could be a useful approach in separating out the supervisory labor from the productive labor as shown in Sung (2007) and Jeong (2015), it is difficult to apply without some restrictive assumptions since Survey Report on Labor Conditions by Employment Type published by Ministry of Employment and Labor is based on sample, but complete, inspection.

Figure 6: Rate of surplus value and profit–wage ratio, 1995–2015



(The numerator of the profit–wage ratio is measured by operating surplus including income receipt on assets from the rest of the world minus the labor income of self–employed, while the denominator is measured by employment compensation including wage and salary receipt from rest of the world plus the labor income of self–employed.)

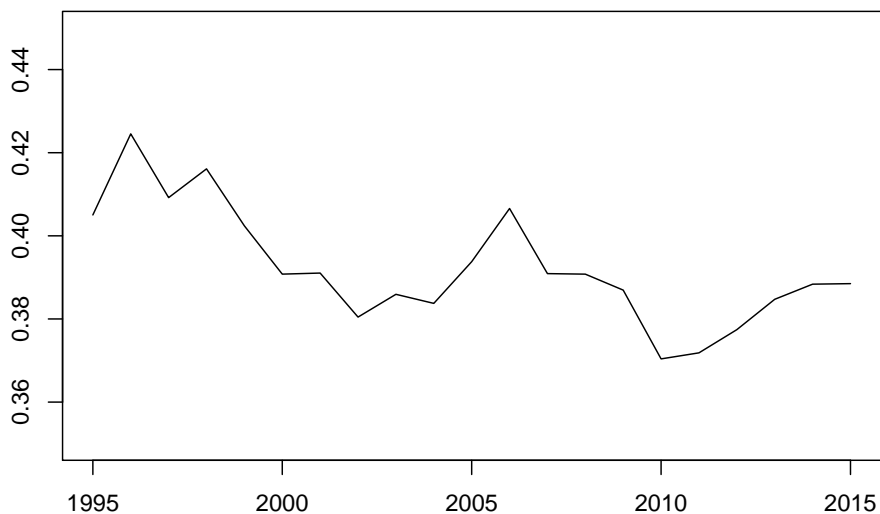
the 1997–8 crisis. This result partly reflects that the productivity of the self–employed sector has been sluggish.

Now we can plot the historical trajectories of the rate of exploitation and the value of labor power. On one hand, the exploitation rate expressed in equation (2) is now replaced by

$$e = \frac{m}{w_P} - 1 = \frac{MVA/L_P}{w_P} - 1 = \frac{MVA}{W_P} - 1 \quad (4)$$

where $W_P = w_P L_P$ is the total wage of the productive sectors. While the exploitation rate expressed in equation (2) is identical to the aggregate profit–wage ratio, the one in equation (4) is not, since the wage in the unproductive sectors is counted in the numerator of the exploitation rate and the labor share of the mixed income is added to the denominator. Therefore, the overall trends of the two ratios are usually different from each other in the case of the U.S. economy as shown in Shaikh and Tonak (1994). In the case of the Korean economy, figure 6 demonstrates that both the exploitation rate and the profit–wage ratio experienced an upward trend while the gap between the two has grown over time.

Figure 7: The value of labor power, 1995–2015



By the same logic, the value of labor power in equation (3) is now replaced by

$$VLP = \frac{w_P}{MELT} = \frac{w_P}{MVA/L_P} = \frac{W_P}{MVA} \quad (5)$$

The value of labor power measured accordingly is illustrated in figure 7. It underwent a precipitous fall during the two crisis episodes, in 1997–8 and 2008. While it seems to have been reversing the course in recent years since 2010, it hasn't recovered the pre-crisis level.

When the productive–unproductive labor is explicitly considered as in this article, a discrepancy between the value of labor power and the labor share of national income emerges, which is in contrast to the definition in equation (3), where there is no such discrepancy. As the value of labor power is computed in relation to the total wage of the productive labors only, instead of the total wage of the whole labors, the value of labor power is necessarily smaller than the labor share of income. To see this formally, let us denote the labor share by LS , which then can be expressed as, by definition,

$$LS = \frac{W_P + W_U}{MVA} \quad (6)$$

Combining equations (5) and (6) yields

$$VLP = \frac{W_P}{W_P + W_U} LS = \frac{1}{1 + \frac{W_U}{W_P}} LS \quad (7)$$

which conforms to that $VLP < LS$ holds and, moreover, that their difference depends on the relative volume of total wage between the productive and unproductive sectors, i.e. W_U/W_P .

Figure 8: The value of labor power and the labor share in income, 1995–2015 (1995=1)

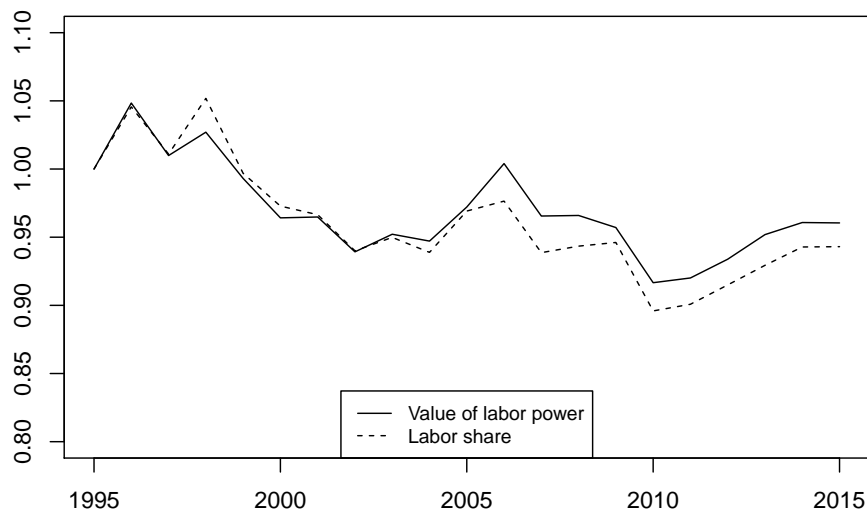


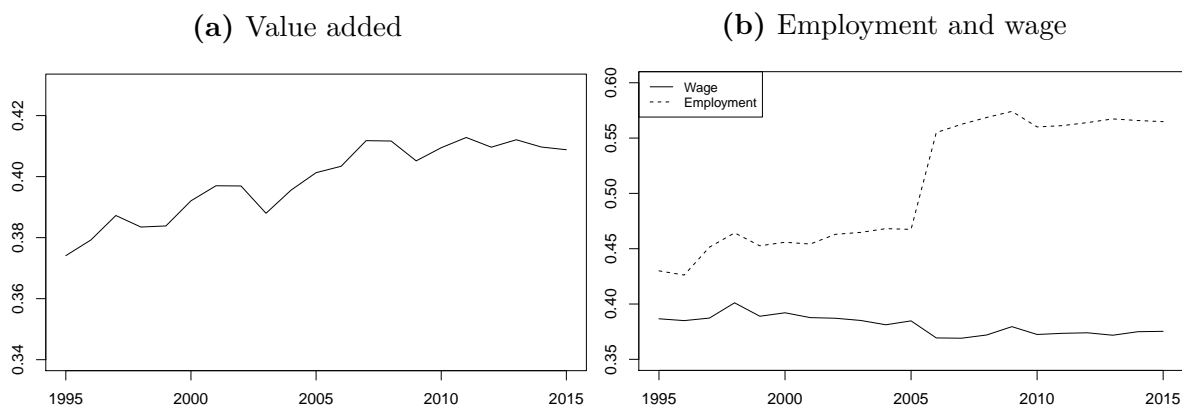
Figure 8 compares the developments of the value of labor power and the labor share in income.⁹ While their secular trends are similar to each other, the value of labor power declined at a faster rate than the labor share did in the aftermath of the 1997–8 crisis but, after early 2000s, the pace of the decline reversed, the labor share now falling more rapidly than the value of labor power. Interestingly, as shown in figure 9a, the share of value added of the unproductive sectors constantly increased until mid–2000s, but stabilized afterwards.

The results in figures 8 and 9a combined together indicate that exploitation in the unproductive sectors intensified after early 2000s.¹⁰ This is because when the nominal value added of the unproductive sectors increased and, later, stagnated — as shown in figure 9a — the fact that the labor share fell more than the value of labor power did after around early 2000s — as displayed in figure 8 — implies that, according to equation (7), W_U/W_P decreased during this period; it is a short step from the rise in the share of the value added

⁹In relation to the discussion in section 2, we can examine the behavior of the value composition of capital (VCC) using K/W_P as a proxy. From the estimation, the result of which is omitted in this article, we have observed that for both the whole economy and manufacturing the VCC increased during the two crisis episodes and then stagnated after 2010. In particular, the rising trend has been weaker in manufacturing than in the whole economy.

¹⁰Although value and surplus value are not produced in the unproductive industries, exploitation may take place therein, as Duncan Foley states that exploitation “through the wage labor relation occurs when a worker expends more labor hours than he or she receives an equivalent for in wages” (Foley, 1986, p. 122).

Figure 9: The share of unproductive sectors, 1995–2015



of the unproductive sectors and the decline in W_U/W_P to deriving a rise in the profit–wage ratio of the unproductive sectors.¹¹

In fact, our data demonstrate that exploitation in the unproductive sectors has intensified throughout the entire sample period. On one hand, figure 9b charts the share of unproductive activities in terms of employment and wage. It is readily observed that the share of total employment of the unproductive sectors is rising whereas the share of their total wage is falling albeit rather slowly. The combination of these two trajectories confirms that exploitation in the unproductive industries strengthened throughout the sample period. On the other hand, figure 10 more clearly and directly shows that the labor share of the unproductive industries went through a sharp decline in the immediate aftermath of the 1997–8 crisis and has continue the downward trend thereafter.

The increase in the share of unproductive activities in Korea — as evidenced in figures 9a, 9b, and 10 — corresponds to the experience of other developed capitalist economies; for the case of the U.S. economy, see, e.g., Paitaridis and Tsoulfidis (2012) and Basu and Foley (2013).¹² Notice that the expansion of unproductive activities is considered in Marxian

¹¹It should be noted, however, that this relation holds only under certain conditions.

¹²Paitaridis and Tsoulfidis (2012) document the rise in the share of the unproductive sectors in terms of employment and wage whereas Basu and Foley (2013) focus on employment and value added. It should be noted, however, that Basu and Foley (2013) adopted the distinction between service and non-service sector which is less controversial than productive vs. unproductive industry distinction.

Figure 10: Labor share in income of unproductive sectors, 1995–2015

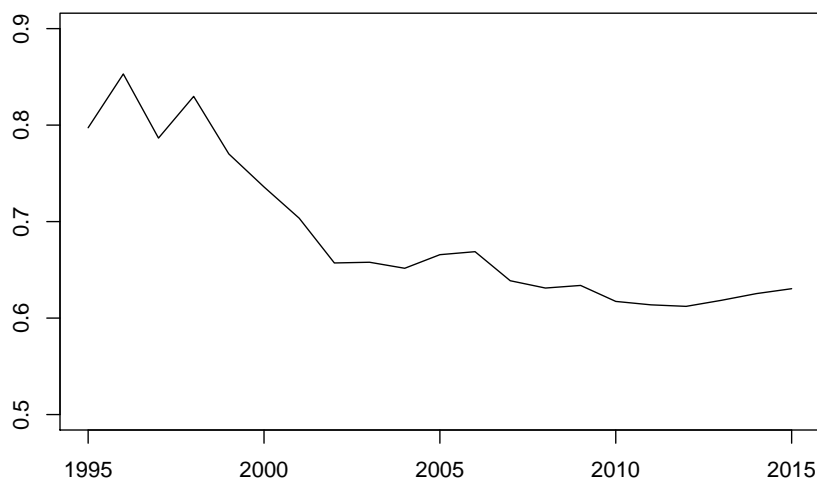


Table 2: The annual rate of change of the value of labor power and the rate of exploitation (%)

	Exploitation rate	Value of labor power	Labor share
1996–2010	1.53	−0.56	−0.68
2011–2015	−1.46	0.96	1.03

economic theory as a threat to capital accumulation (Shaikh and Tonak, 1994; Paitaridis and Tsoulfidis, 2012). In the case of Korean economy, however, the expansion of the unproductive activities doesn't seem to have undermined the conditions for capital accumulation in the Korean economy as it took place along with the strengthening of exploitation in the unproductive sectors, which might have offset the negative effects of the expansion of the unproductive activities.

Lastly, examining the dynamics of the three key variables reported thus far suggests that our sample period can be divided into two sub-periods in the same way as in table 1. The average annual rates of change of the value of labor power and the rate of exploitation during 1996–2010 and 2011–2015 are summarized in table 2. The period of 1996–2010 is characterized by a rise in the rate of exploitation and a decline in the value of labor power and the labor share, whereas these trends are all reversed during the period of 2011–2015. Tables 1 and 2 put together suggest that there is a structural break in our sample period before and after around 2010–2011.

4 Marxian value analysis: sectoral–level

Now let us plot the Marxian ratios at the industry level, aiming to gain more concrete understanding of how the performance of manufacturing has related to the overall condition of capital accumulation of the Korean economy. We will measure the MELT and the rate of exploitation at the industry level. They describe two different dimensions of class conflict. The former reveals the inter–industrial distribution of value whereas the latter describes capital–labor distribution of value in each industry.

Two methodological comments follow before proceeding. First, as the MELT is measured by national account data, our estimation of the industry–level MELTs reflect the end result of distribution of value among industries. That is, it illustrates realization, rather than production, of value in each industry. Therefore, an inverse transformation from price variables to value variables is required for estimating the sectoral rates of surplus value. Second, since it is only the productive sectors that produce value and surplus value while the source of income generated in unproductive sectors is the value transfer from the productive sectors, our measures of the MELT and the rate of surplus value at the industry level focus on the productive sectors only.

4.1 Sectoral monetary expression of labor time

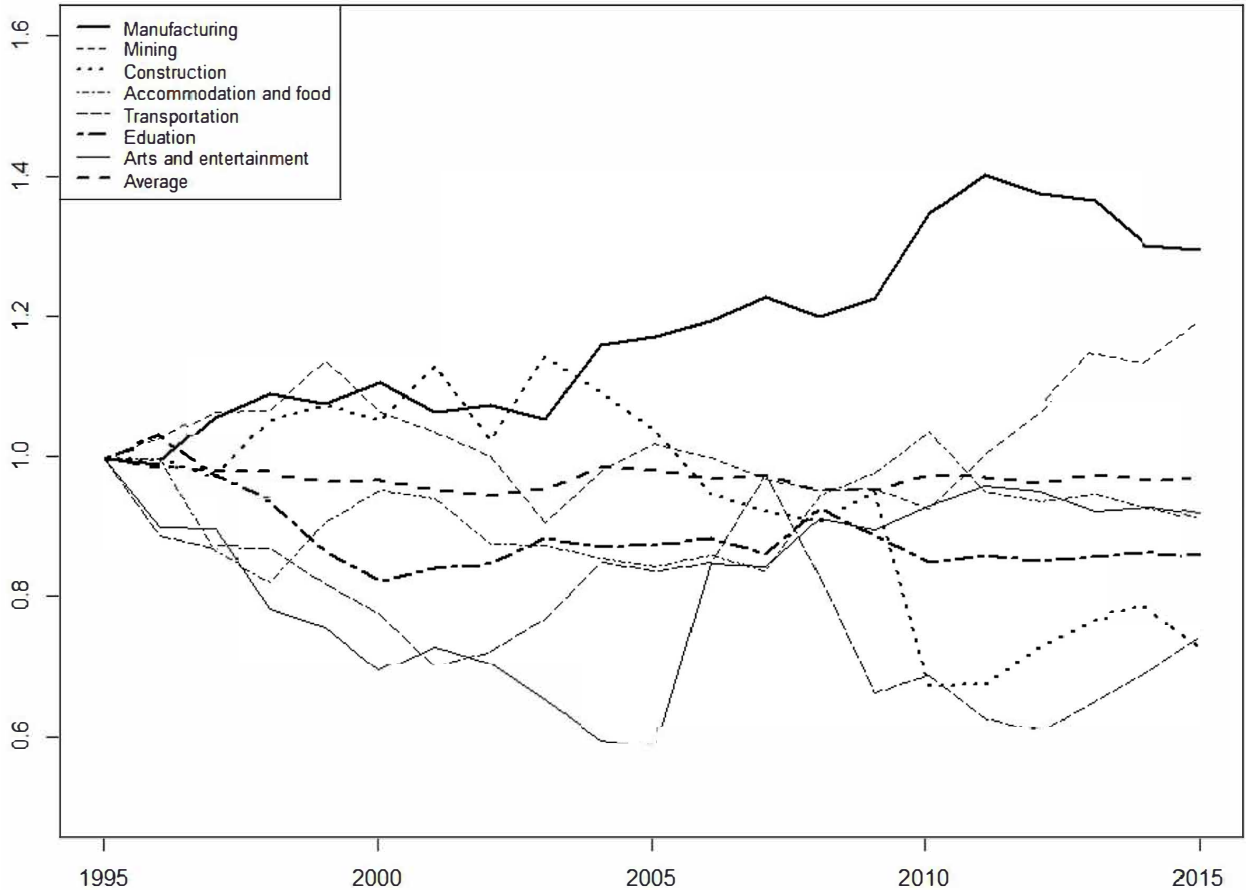
The MELT defined at the industrial level, denoted by m_i , is expressed as

$$m_i = \frac{MVA_i}{L_i} \quad (8)$$

where MVA_i and L_i are money value added and total labor time of productive industry i .

In interpreting the relation between m_i and m , we rely on Okishio (1956), where the concept of ‘rate of income’, defined as income per unit of direct labor, is introduced and used in analyzing the inter–industry value transfer; note that Okishio’s rate of income is conceptually identical to the MELT. To be more specific, Okishio took the ratio between, using our terminology, the MELT of the individual industry and the aggregate MELT, i.e. $\frac{m_i}{m}$, as an index of unequal exchange among industries and interpreted the ratio greater than one as implying gains from exchange while the ratio less than one as implying losses from exchange.

Figure 11: $\frac{m_i}{m}$ of productive industries (1995=1)



When the productive–unproductive labor distinction is taken into account as in this article, however, we need to consider that $\frac{m_i}{m} < 1$ is much more likely than not for most of the productive sectors since there is a systematic value transfer to the unproductive sectors, which do not produce value at all. In this sense, examining relative levels and overall trends of $\frac{m_i}{m}$ for the productive industries is more relevant when interpreting the relation between m_i and m , rather than asking whether the ratio is greater or less than one. Accordingly, we consider an increase (a decrease) in $\frac{m_i}{m}$ as implying that industry i 's position in the inter-industrial value transfer is enhancing (weakening) and the conditions for industry i 's capital accumulation in terms of both production and exchange are improving (deteriorating).

In this context, figure 11 compares the relative trends of $\frac{m_i}{m}$ for the productive industries. While the absolute levels are not reported here, most productive industries displayed $\frac{m_i}{m} < 1$

as expected. Exceptions are utilities and information services where the industry's MELT is larger than the average and hence $\frac{m_i}{m} > 1$. One possible explanation is that these industries are characterized by natural monopoly; such industries are protected by entry barrier from the competitive force of profit rate equalization through the process of surplus value distribution. They have a market power of price control, which enables them to achieve an higher-than-average level of MELT.¹³

On the other hand, the most interesting observation in figure 11 concerns manufacturing. It uniquely exhibited a clear upward trend since the 1997-8 crisis and a clear downward trend since 2011. That is, manufacturing was the only sector that experienced a persistent improvement in the conditions for capital accumulation during the long period stretching from the beginning of the sample period through around 2010; and, again, it is the only sector that has gone through a persistent deterioration of the conditions for capital accumulation from 2011 until the recent years.

In addition, the ratio $\frac{m_i}{m}$ can also be used to estimate the value transfer from the productive to unproductive sectors. To show this, let us first define the weighted average of m_i with the share of labor time of each industry as the weight and denote it by m^* . Then, we have

$$m^* = \sum_i \frac{L_i}{L_P} m_i \quad (9)$$

where $L_P = \sum_i L_i$, with i 's being productive industries. Next, note that there is a discrepancy between MVA_i and money value actually produced by industry i due to value transfer and unequal exchange vis-à-vis the other productive and unproductive industries. If we define $MVA_P = \sum_i MVA_i$, with i 's being productive industries, to denote the total money value added of the productive industries as a whole, $MVA - MVA_P > 0$ represents the magnitude of the value transfer.

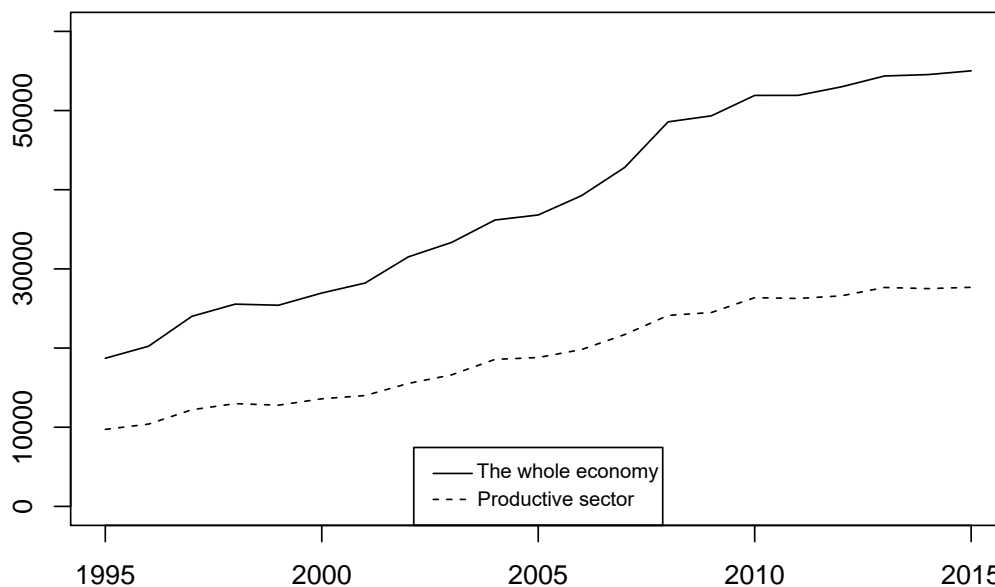
Furthermore, it can be easily verified that

$$m^* = \frac{MVA_P}{L_P} \quad (10)$$

holds. Then, the difference between the aggregate MELT, $m = \frac{MVA}{L_P}$, and the weighted average of the productive industries, $m^* = \frac{MVA_P}{L_P}$, estimates the value per labor time transferred

¹³For more discussions on the determinants of the sectoral MELTs, see Rieu et al. (2014).

Figure 12: The monetary expression of labor time: the economy versus the aggregate productive sector, 1995–2015



from productive to unproductive sectors; that is,

$$m - m^* = \frac{MVA - MVA_P}{L_P} > 0 \quad (11)$$

Figure 12 charts historical evolutions of m and m^* together. It is not only confirmed that $m > m^*$ holds; it is also clearly observed that the magnitude of the value transfer per labor time, indicated by the gap between the two trajectories, has steadily increased throughout the entire sample period. This is another indication of the expansion of unproductive activities in Korea that corresponds to the observations reported in figure 9.

4.2 Sectoral rates of exploitation

4.2.1 Theoretical background

The conventional assumption in Marxian economics that the sectoral rates of exploitation converge to the average implies perfect competition in labor markets. While it can be useful for a theoretical purpose as in the case of transformation of value into price of production, it is unrealistic to adopt the assumption when dealing with data consisting of actual market

prices.¹⁴ Prevailing observations about huge differences on working conditions depending on workers' education, skills, etc. make it unrealistic to assume that the exploitation conditions tend to be equalized over time. For this reason, the central hypothesis in this section is that there is no tendency for the sectoral rates of exploitation to converge to a unique value.

In order to verify whether there is any empirical support to our hypothesis, we conducted panel unit root tests on the time series of the deviation of the sectoral rate of exploitation from the mean. We used two different Augmented Dickey–Fuller tests proposed by Im et al. (2003) and Maddala and Wu (1999), respectively. For both tests, the null hypothesis is that a unit root is present in all the time series, whereas the alternative hypothesis is that there is no unit root in some of the time series. The fact that the time series of the deviation do not have a unit root and hence are stationary implies that the deviations do not develop permanently but are corrected by reverting to the mean. In contrast, the presence of a unit root implies that the time series of the deviation are non-stationary and thus do not exhibit mean reversion. Therefore, if the null is not rejected, we can safely discard the assumption of the equalization of the sectoral rates of exploitation.

The test results are reported in table 3. It can be seen that the validity of our hypothesis depends on the model specifications. At the significance level of 5%, the p -value larger than 0.05 can be taken as implying the presence of unit roots. Except for the model with a time trend, the results suggest either moderately — in the case of the model without a time trend — or strongly — in the case of the model without a drift and a time trend — that our data do not display an equalization of the sectoral rates of exploitation. We conclude that imposing the equality of the sectoral rates of exploitation would not fit well, at least, to the case of the Korean economy during 1995–2015.¹⁵

The novel approach we propose here relies on the inverse transformation of a price variable to a value variable. That is, instead of directly computing the sectoral rates of exploitation,

¹⁴See Rieu (2008) for the related theoretical issues.

¹⁵To our knowledge, Vaono (2011) is the only paper that precedes ours to use panel unit root tests to examine the hypothesis of equalization of either the rate of profit or the rate of exploitation. As Vaono (2011) studies three European countries with a larger data set than ours, the Choi (2001) test, which is another available panel unit root test, is used in addition to the two tests we used; our data set is too small to employ the Choi (2001) test. The results reported in Vaono (2011) more strongly support the hypothesis that the sectoral rates of surplus value are not equalized.

Table 3: Panel unit root tests on the rate of exploitation at the industry level: p -values

	Im, Pearson, and Shin test	Maddala and Wu test
Model without a drift and a time trend	N/A	0.164
Model without a time trend	0.643	0.728
Model with a time trend	0.024	0.025

we first obtain the labor share at the industry level and from the latter derive the sectoral rates of exploitation. Similarly to the case of measuring the labor share of the whole economy, we decompose the income of self-employed of each industry into capital income and labor income according to the profit–wage ratio of the industry in question.¹⁶ One of the problems is that the income data of self-employed are available only at the aggregate level but not at the industry level. In addressing this issue, we follow Jeon and Joo (2015)’s method to distribute the total income of self-employed sector to each individual industry by taking the wage differentials among the industries into consideration. Thus-distributed income of self-employed in each industry is then decomposed into capital income and labor income according to the profit–wage ratio of the industry.

Next we present the theoretical relation of the inverse transformation between the exploitation rate and the labor share in income at the industry level. Let us denote the labor share in income of industry i by LS_i and its value equivalent by LS_i^{VALUE} . On the one hand, LS_i^{VALUE} is, by definition,

$$LS_i^{VALUE} = \frac{V_i}{V_i + S_i} = \frac{1}{1 + \frac{S_i}{V_i}} = \frac{1}{1 + e_i} \quad (12)$$

where V_i , S_i , and e_i are variable capital, surplus value, and exploitation rate in industry i , respectively. According to the NI, the exploitation rate of industry i can be computed as follows.

$$e_i = \frac{m}{w_i} - 1 \quad (13)$$

where w_i denotes the wage rate in industry i ; see Rieu (2008) for the derivation. Equation (13) holds under the assumption that the value-creating capacity of the aggregate labor in

¹⁶See footnote 6.

each industry is the same.¹⁷ Combining equations (12) and (13) yields

$$LS_i^{VALUE} = \frac{w_i}{m} \quad (14)$$

On the other hand, LS_i can be expressed as

$$LS_i = \frac{w_i}{m_i} \quad (15)$$

where m_i is the MELT in industry i , i.e. the ratio between value added and labor time defined in industry i . From equations (14) and (15), we obtain

$$LS_i^{VALUE} = \frac{m_i}{m} LS_i \quad (16)$$

which, when combined with equation (12), generates

$$e_i = \frac{1}{LS_i^{VALUE}} - 1 = \frac{m}{m_i LS_i} - 1 \quad (17)$$

Equation (17) demonstrates the relation of inverse transformation and accordingly enables deriving e_i when LS_i is given along with m and m_i .

Furthermore, note that the profit–wage ratio in industry i corresponds to its exploitation rate in price term; when the ratio is denoted by e_i^p , it can be expressed as

$$e_i^p = \frac{1}{LS_i} - 1 \quad (18)$$

From equations (17) and (18), the following relations can be obtained.

$$m \gtrless m_i \iff e_i \gtrless e_i^p \quad (19)$$

It states that the deviation between m and m_i , which reflects inter–industrial value transfer and unequal exchange, is related to the deviation between the sectoral exploitation rate and profit–wage ratio, which reflects the capital–labor distribution of value. In particular, $m > m_i$ ($m < m_i$) indicates that the exploitation is more (less) intense than when it is measured by the labor share of income.

¹⁷The assumption of an equalized value–creating capacity of each industry’s aggregate labor is necessary in measuring the sectoral rates of exploitation from the real–world data. Duménil et al. (2009) state that “[in] order to recover a measure of this value productivity from real–world price and wage data by sector, some additional assumption about relative rates of exploitation (which Marx often explicitly assumes to be equal) is required”. Hahn and Rieu (2017) presents simulations that examine the consequence of the assumption that the value–creating capacity of the aggregate labor in each industry is *not* the same.

4.2.2 Estimation

In relation to the inequalities in (19), we report the rate of exploitation e_i and the profit–wage ratio e_i^p at the industry level in figure 13. As expected, it is clearly noticeable that manufacturing has uniquely experienced the gap between the exploitation rate and the profit–wage ratio getting shrunk until 2011, which implies a steady rise of $\frac{m_i}{m}$ according to the relation in equation (19); it is also observable that the gap has started to increase thereafter, implying a decline of $\frac{m_i}{m}$. This result exactly corresponds to the dynamics of $\frac{m_i}{m}$ of manufacturing as displayed in figure 11. In all, the figure demonstrates that while manufacturing has exhibited an upward secular trend of profit–wage ratio and a downward secular trend of exploitation rate, its position in relation to the other productive and unproductive industries steadily improved until 2011, after which it has started to get undermined.

We have also estimated the exploitation rates and the profit–wage ratios for manufacturing at two–digit industry level and reported in figure 14 the results for three major manufacturing industries — electrical and electronic products; petroleum, coal, and chemical manufacturing; transportation equipment. Note that the share of these three major manufacturing industries in total manufacturing is, at an annual average, 65.6%, which rises to 83% when metals is included.

The overall trend of electrics and electronics and that of coal, mining, and chemicals seem to be the driver of the behavior of the entire manufacturing sector as they exhibit similar shapes. In the case of transportation, however, it is somehow different. These three manufacturing industries have the largest MELT among the entire manufacturing and are marked by a declining trend in recent years after 2011. Six out of eleven manufacturing industries with the MELT larger than the average, m^* , of the productive industries are collected in figure 15.

One of the important results that emerge from the estimates of sectoral exploitation rates in figures 13 and 14 in relation to our analyses in the previous sections has to do with the performance of manufacturing; it witnessed a long stretch of improvement in its conditions for capital accumulation amid the expansion of unproductive sectors and the consequent rise in value transfer to the latter; this continued until 2011, after which the course has reversed.

We may relate these observations with the fact that for about a decade following the

Figure 13: The exploitation rate and the profit–wage ratio at the industry level, 1995–2015

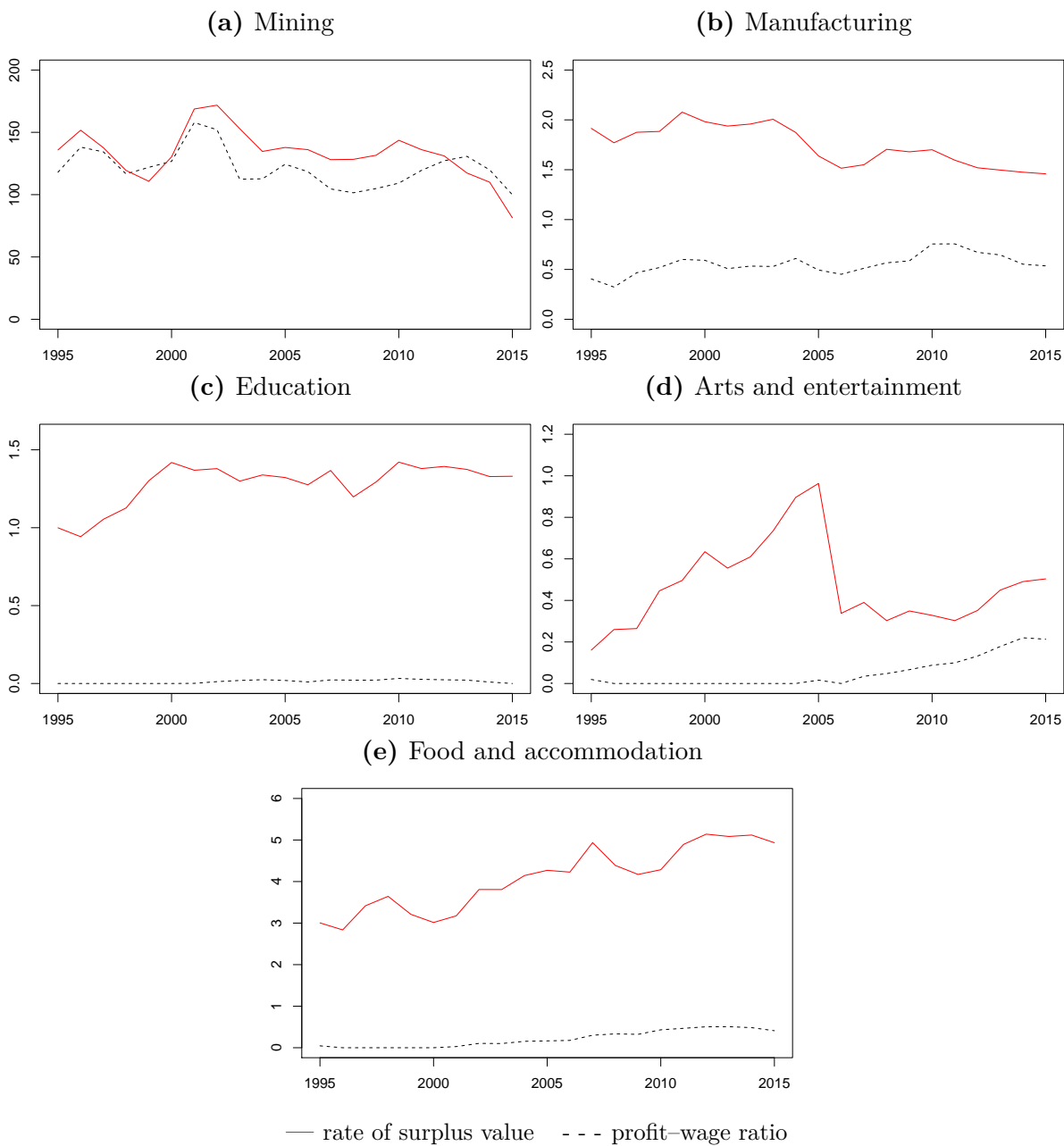


Figure 14: The exploitation rates and the profit–wage ratios of manufacturing at two–digit industry level, 1995–2015

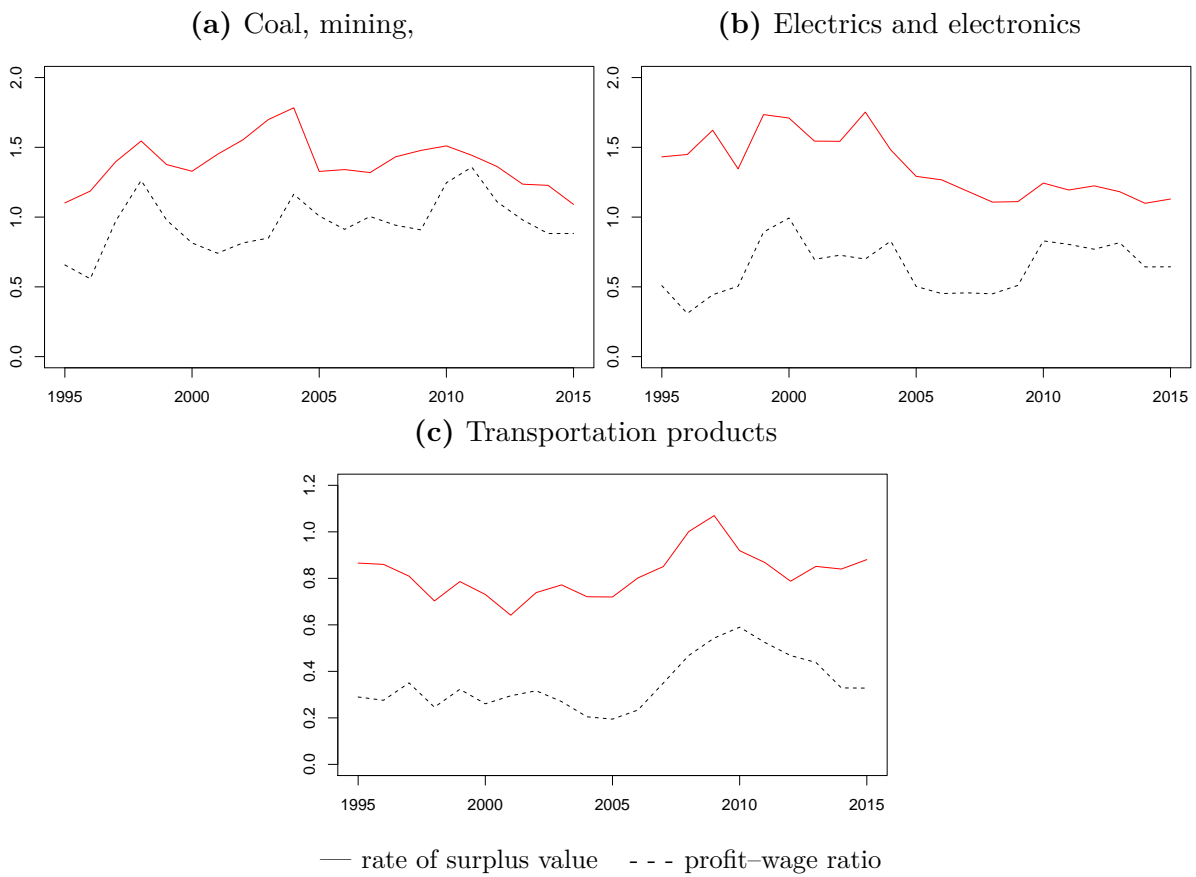


Figure 15: The monetary expression of labor time: manufacturing at two-digit industry level, 1995–2015

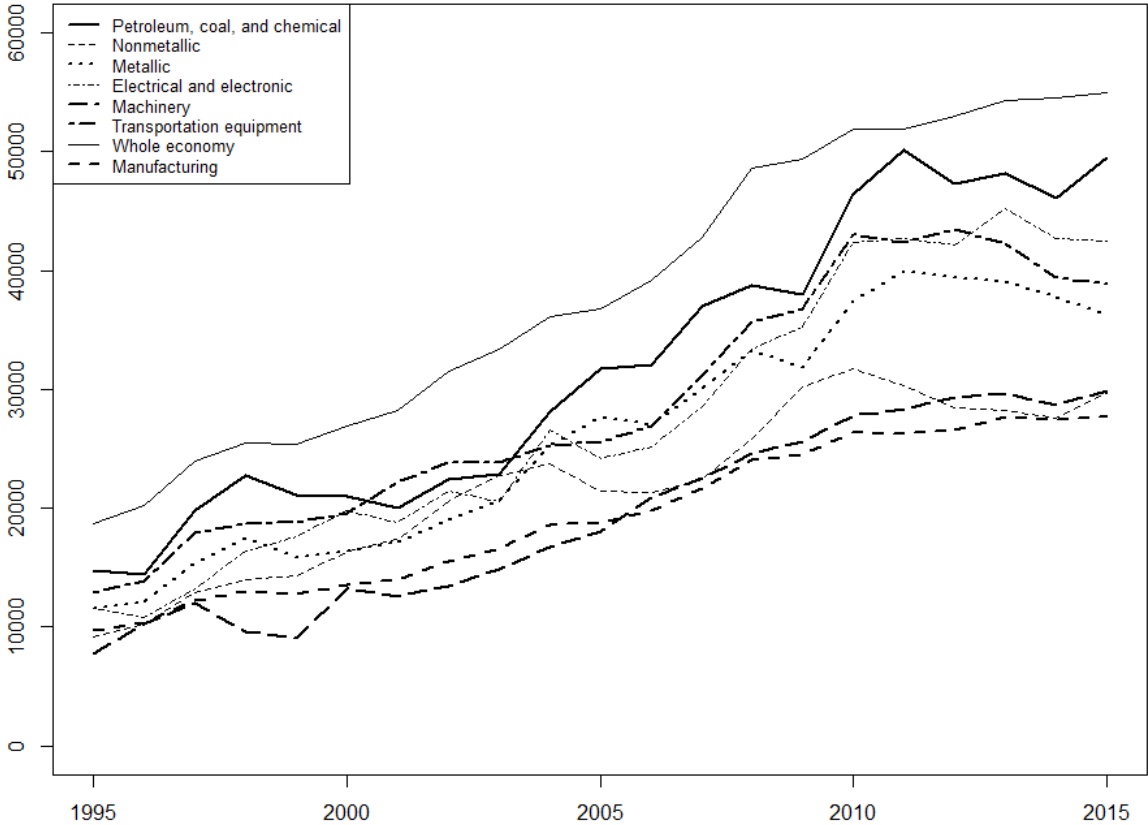
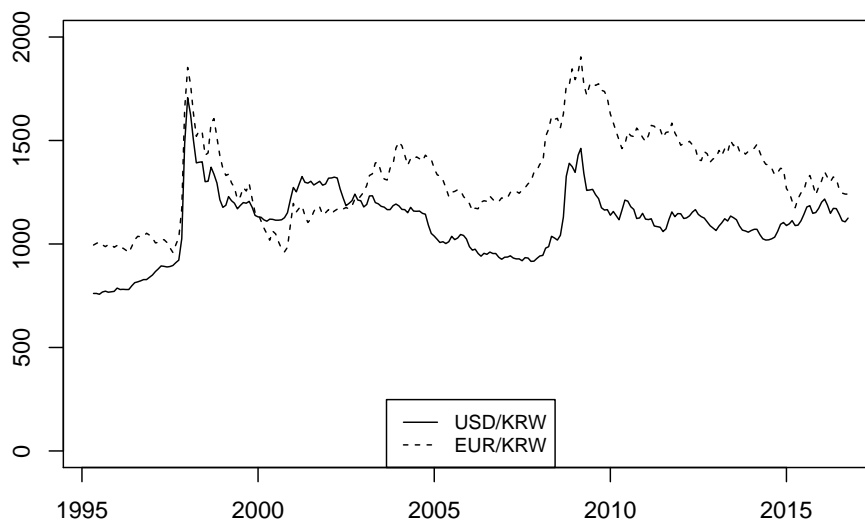


Figure 16: Foreign exchange rates, 1995–2015



1997–8 crisis, export of manufacturing maintained a stable rise with the help of favorable conditions in the global economy. For example, the manufacturing industry recorded 10.38% sales growth rate during this ten year period, which however was lowered to -0.07% after around 2010 due to the recessions in the global economy. Whether this structural change can be explained by the fact that export-led growth regime has been dismantled as Uni (2017) and Palley (2011) suggest is a question that requires further investigation. See, for instance, figure 16 which displays exchange rates, one of the crucial conditions for export-led growth regime. The Korean Won, after the sharp spike during the 1997–8 crisis episode, underwent a long period of gradual appreciation against the US Dollar.

5 Conclusion

The neoliberal structuration since the 1997–8 crisis has made the globalization context influential in Korean economy. In this article, we examined Korean economy through the perspective of Marxian value theory. In order to understand the structural change of the conditions for capital accumulation, we focused on class analysis and inter-sectoral value transfer by estimating the sectoral rates of exploitation along with the sectoral MELTs. One of the novelties of this article, in particular, is to explicitly consider the self-employed sector, which is uniquely high in the Korean economy, and decompose its income into capital income

and labor income when measuring the sectoral rates of exploitation. Some of the key results of this article are summarized as follows.

First, the value transfer from the productive industries to the unproductive industries steadily increased after the 1997–8 crisis up until mid 2000s. At the same time, however, exploitation in the unproductive industries markedly intensified, particularly so in the immediate aftermath of the 1997–8 crisis. The combination of these two opposing tendencies concerning capital accumulation may explain the fact that the conditions for capital accumulation were not significantly undermined in Korea during 1995–2015 when the unproductive activities steadily expanded.

The second result has to do with the uniqueness of manufacturing in the capital accumulation of Korean capitalist economy. Manufacturing maintained a consistently high level of the rate of exploitation during most of the period, but experienced a decreasing trend at around mid 2000s. Its MELT was on a steady rise until 2011, after which it started to fall. More importantly, manufacturing was the only productive industry that witnessed a fall in the value transfer to the other industries until around 2010; then afterwards, again, it was the only productive industry where the value transfer increased. It can be concluded that the condition for manufacturing's capital accumulation steadily improved since the 1997–8 crisis, but started to deteriorate after 2011.

Globalization factors such as moving factories overseas might have been crucial for the improvement of the conditions for capital accumulation of manufacturing achieved amidst the steady rise in the unproductive sectors. However, the conditions for export-led growth has started to collapse since 2010, and the Korean economy has thereafter entered a conjuncture that requires a regime change towards domestic demand-led growth. Our value-theoretic analysis provides a foundation for understanding the context of the regime change, which may plausibly characterize the Korean economy last couple of decades.

Appendix Data

The sources of the data used in this article are as follows:

- Assets, value added, and income used for computing Piketty's β , income distribution, profit rates, capital productivity, and the MELT come from National Accounts by Bank of Korea available at <https://ecos.bok.or.kr>.
- Employment data used for computing income distribution and the MELT are obtained from Korean Statistical Information Service by Korea National Statistical Office available at <https://kosis.kr>.
- Working hours data used for computing income distribution and the MELT are obtained from Survey Report on Labor Conditions by Employment Type published by Ministry of Employment and Labor available at <http://laborstat.molab.go.kr>.

References

- Basu, D. and Foley, D. K. (2013). Dynamics of output and employment in the US economy. *Cambridge Journal of Economics*, 37(5):1077–1106.
- Choi, I. (2001). Unit Root Tests for Panel Data. *Journal of International Money and Finance*, 20(2):249–272.
- Cogliano, J. F. (2017). Surplus Value Production and Realization in Marxian Theory—Applications to the U.S., 1987–2015. Working Paper No. 2017–01, Department of Economics, Dickinson College.
- Duménil, G. (1980). *De la valeur aux prix de production*. Paris, 1 edition.
- Duménil, G., Foley, D., and Lévy, D. (2009). A Note on the Formal Treatment of Exploitation in a Model With Heterogenous Labor. *Metroeconomica*, 60(3):560–567.
- Foley, D. K. (1982). The Value of Money the Value of Labor Power and the Marxian Transformation Problem. *Review of Radical Political Economics*, 14(2):37–47.
- Foley, D. K. (1986). *Understanding Capital: Marx’s Economic Theory*. Harvard University Press.
- Foley, D. K. (2013). Rethinking Financial Capitalism and the “Information”. *Review of Radical Political Economics*, 45(3):257–268.
- Hahn, S. B. and Rieu, D.-M. (2017). Generalizing the New Interpretation of the Marxian Value Theory: A Simulation Analysis with Stochastic Profit Rate and Labor Heterogeneity. *Review of Political Economy*, 29(4):597–612.
- Hong, J. P. (2013). The Rate of Profit of Korean Manufacturing (In Korean). *Marxism 21*, 10(4):10–44.
- Im, K., Pesaran, M., and Yongcheol, S. (2003). Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 115(1):53–74.

- Jeon, S. M. and Joo, S. (2015). Measuring Labor Income Shares at the Industry Level for Korea (In Korean). *Journal of Korea Development Economics Association*, 21(4):35–76.
- Jeong, G. (2015). The Rate of Surplus Value in South Korea, 1980–2011: Improving the Weakness of Calculation Method Using ‘Monetary Expression of Labor Time’ (In Korean). *Review of Social and Economic Studies*, (50):25–58.
- Joo, S. and Jeon, S. M. (2014). Measuring Labor Income Share: Alternative Measure for Korea (In Korean). *Korean Journal of Political Economy*, (43):31–65.
- Laibman, D. (1999). Productive and Unproductive Labor: A Comment. *Review of Radical Political Economics*, 31(2):61–73.
- Maddala, G. and Wu, S. (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. *Oxford Bulletin of Economics and Statistics*, 61(S1):631–652.
- Mohun, S. (2006). Distributive Shares in the US Economy, 1964–2001. *Cambridge Journal of Economics*, 30(3):347–370.
- Okishio, N. (1956). National Income and Labor (In Japanese). *Kokumin Keizai Zasshi*, 94(4):48–64.
- Oostveen, A., Biletta, I., Parent-Thirion, A., and Vermeylen, G. (2013). Self-Employed or Not Self-Employed? Working Conditions of ‘Economically Dependent Workers’. European Foundation for the Improvement of Living and Working Conditions.
- Paitaridis, D. and Tsoulfidis, L. (2012). The Growth of Unproductive Activities, the Rate of Profit, and the Phase-Change of the U.S. Economy. *Review of Radical Political Economics*, 44(2):213–233.
- Palley, T. I. (2011). The Rise and Fall of Export-led Growth. Working Paper No.675, Levy Economics Institute of Bard College.
- Piketty, T. (2014). *Capital in the Twenty-First Century*. Cambridge Massachusetts: The Belknap Press of Harvard University Press.

- Rieu, D. M. (2008). Estimating Sectoral Rates of Surplus Value: Methodological Issues. *Metroeconomica*, 59(4):557–573.
- Rieu, D. M. and Joo, S. (2014). Marxian Ratios after Piketty (In Korean). *Review of Social and Economic Studies*, (45):161–183.
- Rieu, D. M., Lee, K., and Ahn, H. H. (2014). The Determination of the Monetary Expression of Concrete Labor Time under the Inconvertible Credit Money System. *Review of Radical Political Economics*, 46(2):190–198.
- Semieniuk, G. (2017). Piketty’s Elasticity of Substitution: A Critique. *Review of Political Economy*, 29(1):64–79.
- Shaikh, A. and Tonak, E. A. (1994). *Measuring the Wealth of Nations: The Political Economy of National Income*. Cambridge University Press.
- Sung, N. (2007). Marx, Rate of Surplus-Value and the Technological Progress in Korea (In Korean). *The Korean Journal of Economic Studies*, 55(1):69–101.
- Uni, H. (2017). The Transformation of Export-led Growth in East Asian Countries. Paper presented at the 14th International Karl Polanyi Conference, Seoul: Korea.
- Vaono, A. (2011). Profit Rate Dynamics, Income Distribution, Structural and Technical Change in Denmark, Finland and Italy. *Structural Change and Economic Dynamics*, 22:247–268.