Journal of Economics and Development, Vol.21, Special Issue, 2019, pp. 51-68 ISSN 1859 0020 | DOI: 10.33301/2019.JED.SPI.04

An Analysis of The Contribution of Economic Restructuring to Social Labor Productivity Growth: A Case Study of Vietnam

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Received: 30 September 2018 | Revised: 26 December 2018 | Accepted: 31 December 2018

Abstract

This study analyzes and proposes a method to examine the impacts of sectorial restructuring on social labor productivity (LP) growth when changing the proportion of each sector in the total output values and the value-added rates out of sector outputs. This method aims to supplement or replace the shift share analysis (SSA)[1], in which the central variable is the labor structure, with an application on the output. This new approach helps to avoid errors in calculation, and considers the aggregation of growth factors rather than labor mobility itself; hence, it provides a more comprehensive explanation of the origins of productivity growth and a meaningful assessment to improve the policies on restructuring economic sectors. The research uses methods of decomposing LP growth and explains the influence of factors contributing to productivity growth including: output restructuring, changing the quality of economic growth measured by the value-added to gross output ratio, combination of interactions between structural change and change in value-added, and correlation between production expansion and labor attraction. The research analyzes the LP in Vietnam during 2000-2017 based on data collected from the general statistics office (GSO). Results show that the LP growth rate of Vietnam in recent years has improved but slowly due to the inefficient economic restructuring. It sheds light on proposing recommendations to increase the social labor productivity in Vietnam.

Keywords: Decomposition; economic restructuring; social labor productivity; Vietnam.

JEL code: J24, O11, O47.

1. Introduction

Social labor productivity growth is influenced by many factors, among which economic restructuring is important. The two most popular types of economic structures are the output and the labor structures. In order to analyze the growth of labor productivity (LP), it is necessary to quantify the contribution of sectoral restructure, especially an increase in the number of sectors makes sectoral structure more complicated. There have been many methods to measure the contribution of economic structure to LP growth, and the most common one is shift share analysis (SSA). Over the past seventy years, many authors have used the SSA method to analyze labor productivity growth and to quantify the contribution of economic restructuring to the growth of LP and the productivity of economic sectors.

However, many studies have shown that this method has many limitations such as: low accuracy and the limited breaking-down contribution of labor restructuring; thus it makes it difficult to fully explain the source of productivity growth. This paper proposes a new way of measuring the contributions of economic structure to the LP growth without using the shift of labor structure but the output structure by economic sectors to explain better the impacts of economic structure on productivity growth. It also opens new research directions for economic restructuring and the forecasting of labor productivity growth.

This paper is organized as follows: After the introduction, section 2 provides a literature review, section 3 presents the model and data, section 4 presents empirical results and discussion, and section 5 concludes the paper and gives policy recommendations.

2. Literature review

In terms of quantity, economic restructuring is a change in the proportion of sectors that constitute an economy. Along with the economic activities, sectoral restructuring takes place regularly and continuously, which is the result of moving or allocating such resources as capital, labor, technology, etc. among sectors. The change in allocation of resources among sectors will change the output of sectors (production, labor productivity, etc. for example), leading to a change in the gross output (GO) of the economy and affecting the productivity of social labor simultaneously. The theory of the relationship between structural change and productivity growth has a long history of development. One of the first researchers in this field is Schumpeter (1912, 1934). In his study, Schumpeter shows that moving resources from one sector to another could boost productivity growth if resources are re-allocated with priority to the higher productivity sector. Under these conditions, enterprises either passively or actively vary in their production and technological innovation for growth and development. This requires state policies influencing behaviors of the enterprises and thereby affecting the economic restructuring. Lewis (1955) and Fei and Rainis (1964) also indicate that the movement of human resources from the traditional sector (agriculture) to modern ones (industry, service) increases labor productivity of the agricultural sector and the economy as a whole. Kuznets (1966, 1971) explores that the difference in the growth rates between sub-sectors is a cause of resource movement in the sector. Over time there would be a number of sectors

that lagged behind (e.g. agriculture) and some others would emerge (e.g. industry, services), leading to the reallocation of resources and motivating productivity growth. In Vietnam, there are many studies on economic restructuring, especially those of Do (1996) and Bui (1997, 2006). However, these studies only focused on the economic restructure trend analysis in the industrialization and modernization orientation and with a qualitative approach.

In the context of economic restructuring in accordance with the current "target" characteristics, state intervention through structural change policies is important. In order to have a sufficient basis for structural policymaking, a quantitative method measuring the impact of restructuring on the growth of social labor productivity is essential. In quantitative terms, Fabricant (1942) is credited with laying the foundations of a by-part method that measures the contribution of restructuring (SSA method) to the productivity growth of the United State (US) manufacturing industry during 1899-1939. Fabricant focuses more on the impacts of structural change on productivity growth as a result of labor mobility across economic sectors. This method was later largely exploited and used in assessing the contributions of structural change to the total productivity growth in the economy or sectors. Ark (1995) uses this method to analyze the labor productivity growth of eight Western European economies post-World War II, from 1950 to 1990 compared to the United States[2]. Ark (1995) decomposes the growth of labor productivity into three components that reflect the contribution of (i) the productivity growth of sectors; (ii) sectoral restructuring; and (iii) the comprehensive impact of sectoral restructuring on productivity growth. The research result shows that the productivity growth of the sectors contributes the most to labor productivity growth. But the contribution of structural change is still significant for countries with a high share of agricultural labor, such as Spain and Italy, over the 40-year period from 1950 to 1990. Ark and Timmer (2003) divided the economies of seven Asian countries[3] into 10 sectors and calculated for the four phases of 1963-1973, 1973- 1985, 1985-1996 and 1985-2001. The contribution of each sector to the overall labor productivity growth has changed over the studied periods. The general trend is that manufacturing and processing industries contributed the most to labor productivity growth in all countries, and it was the driving force for growth during the period of 1963-2001. Even for Japan and other newly industrialized countries (NICs) like South Korea and Taiwan, the contribution of the manufacturing sector is still huge, especially in South Korea. In the recent period, from 1985 to 2001, the manufacturing industry still contributes to 60% of overall labor productivity growth in Korea.

In Vietnam, Nguyen (2007) uses the general SSA methodology and GSO data to quantify the contribution of the sectors and structural shifts to the total labor productivity growth in Vietnam during 1991-2006. The results confirm the positive contribution of shift effects to the total labor productivity growth during 1991-2006. Considering the three-time periods of the plan, an increase in labor productivity sectors themselves (the intra effect) creates a decrease in social labor productivity (SLP) growth, while the contribution of restructur-

ing to productivity growth increases. In 2006, this trend became more balanced and labor productivity growth contributed more to productivity. In the five-year plan (1991 to 1995), intra-sector labor productivity growth contributed 73.3% to the SLP growth, then the five-year plan from 2001 to 2005 contributed 67.1% to structural change, which became the engine of productivity growth.

Although the SSA method has been generally applied in the world, it still has limitations. Firstly, the SSA method assumes that labor mobility across sectors does not change the productivity of sectors. In fact, this is very difficult to hold because (i) labor included in the new model is only considered in terms of quantity but the difference in quality is not taken into account; (ii) the new model focus on labor restructure without considering other resources while the labor movement among sectors will change the ratio of labor to other resources such as capital, technology, etc. Secondly, the change in the industry and economy output prices will affect the calculation results, especially the accounting of labor productivity growth for a long period. This limitation prevents the SSA method from fully explaining the source of productivity growth.

In addition to the method of accounting for labor productivity growth by the SSA model, in order to assess the impacts of sectoral restructuring on the growth of social labor productivity, many studies have used econometrics methods, developing regression models in which independent variables are the shares of sectors as a proxy for structural changes. Phi (2014) uses the regression method for the Vietnamese economy during 1986-2012 to examine the relationship between sectoral restructure and social labor productivity. The study concludes that: (i) sectoral restructure towards the high proportion of the non-agricultural sector has a positive relationship with labor productivity growth; (ii) there is a one-way Granger causal relationship between output structure and sector structure. Mai (2014) also uses the regression method to analyze the impacts of sectoral restructuring on the economic growth of Ho Chi Minh city from 1993 to 2012. The study conducts a multivariate regression model in which only the share of agriculture reflects the sectoral restructure in the economy. The research results show that during the period 1993-2012, the sectoral restructure contributes 27.16% to the economic growth of Ho Chi Minh City and approximately 9% to labor productivity growth. Overall, the econometrics methods provide a solid mathematical foundation but require strict assumptions and data, especially in models that have many variables reflecting the sectoral proportions. Current studies only include in their research model an independent variable reflecting the share of the agricultural or non-agricultural sector in the economy. Therefore, the explanatory insight is limited.

In this study, a research model is proposed to measure impacts of sectoral restructure on social labor productivity, which does not come from the allocation of a particular resource such as labor among sectors but output restructures among sectors. This model is based on the principle of decomposing social labor productivity growth into constituent components but includes other factors. The study uses the value - added ratio[4] (VA/GO ratio) of sectors as an independent variable instead of sectoral labor pro-

ductivity and sectoral labor share from the SSA model. Including the VA/GO ratio of sectors in the model rather than any particular resources (for example labor, capital, technology) would allow the expansion of the analytical content and offer solutions for increasing effectiveness of economic growth by combining resources to boost social labor productivity growth. In other words, the model allows investigating the motivations and obstacles to productivity growth. The empirical results are expected to suggest resource allocation in attempts to restructure the economy to achieve the sustainable growth of social labor productivity.

3. Model development and data description

3.1. Model development

As defined by the Organisation for Economic Co-operation and Development - OECD (2002), labor productivity is the ratio between output and input with which, if the output is either Gross domestic product (GDP) or total value added (VA), the input can be reflected through the number of working hours, the labor force or the actual number of actively working people in the economy. In this study, the labor productivity of the economy (seen as the overall labor productivity hereafter) is calculated by the ratio of GDP to the total number of those working in the economy. Based on a sectoral perspective, because the economy includes all sectors in the economy combined, the overall labor productivity is determined by the average labor productivity of all sectors in the economy. Accordingly, the sectoral labor productivity is calculated by the ratio of the VA of each sector and the actual number of employees of that sector during the reference period within one year. In practice, to be consistent with the proposed model, the data in terms of the VA of the industries as well as GDP are extracted from the Input - Output (I-O) sheet (calculated according to the basic price to eliminate the production tax).

We continue to denote several variables as follows:

LP, GDP and L stand for overall labor productivity, gross domestic product and the number of laborers working in the year, respectively. LP is calculated through the equation below:

$$LP = \frac{GDP}{L} = \frac{\sum_{i=1}^{n} VA_i}{L} = \frac{\sum_{i=1}^{n} v_i X_i}{L} = \frac{X}{L}\sum_{i=1}^{n} v_i \frac{X_i}{X}$$

$$\Leftrightarrow \quad LP = \frac{X}{L}\sum_{i=1}^{n} v_i s_i \quad (1)$$

In which, $s_i = \frac{X_i}{X}$ represents the proportion of the output value of sector *i* in the total output value of the whole economy (X), I = (1; n); v_i is a proxy of the value added rate of sector *i:*

$$v_i = \frac{VA_i}{X_i}$$

in which VA_i means the value added of sector *i.*

Labor productivity growth at two different points in time is presented as follows:

$$G(LP) = \frac{LP^{(t+1)} - LP^{(t)}}{LP^{(t)}} = \frac{\frac{X^{(t+1)}}{L^{(t+1)}}\sum_{i=1}^{n} v_i^{(t+1)} s_i^{(t+1)} - \frac{X^{(t)}}{L^{(t)}}\sum_{i=1}^{n} v_i^{t} s_i^{t}}{\frac{X^{(t)}}{L^{(t)}}\sum_{i=1}^{n} v_i^{t} s_i^{(t)}} \quad (2)$$

In which, we denote $x^{(t+1)} = \frac{X^{(t+1)}}{L^{(t+1)}}; x^{(t)} = \frac{X^{(t)}}{L^{(t)}}$ as the average output value per worker at a given time of t+1 and t; then (2) is transformed

into (3):

$$G(LP) = \frac{LP^{(t+1)} - LP^{(t)}}{LP^{(t)}} =$$

$$\frac{x^{(t+1)} \sum_{i=1}^{n} v_i^{(t+1)} s_i^{(t+1)} - x^{(t)} \sum_{i=1}^{n} v_i^{t} s_i^{t}}{x^{(t)} \sum_{i=1}^{n} v_i^{t} s_i^{(t)}} \quad (3)$$

Splitting the equation (3) results in a new one as follows:

$$G(LP) = \frac{\sum_{i=1}^{n} x^{(t)} v_i^{(t)} (s_i^{(t+1)} - s_i^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (4.1) + \frac{\sum_{i=1}^{n} x^{(t)} s_i^{(t)} (v_i^{(t+1)} - v_i^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (4.2) +$$

$$+ \frac{\sum_{i=1}^{n} v_i^{(t)} s_i^{(t)} (x^{(t+1)} - x^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (4.3) + \frac{\sum_{i=1}^{n} x^{(t)} (s_i^{(t+1)} - s_i^{(t)}) (v_i^{(t+1)} - v_i^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} (4.4) + \quad (4)$$

$$+ \frac{\sum_{i=1}^{n} s_i^{(t)} (v_i^{(t+1)} - v_i^{(t)}) (x^{(t+1)} - x^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (4.5) + \frac{\sum_{i=1}^{n} v_i^{(t)} (s_i^{(t+1)} - s_i^{(t)}) (x^{(t+1)} - x^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} (4.6) +$$

$$+ \frac{\sum_{i=1}^{n} (v_i^{(t+1)} - v_i^{(t)}) (s_i^{(t+1)} - s_i^{(t)}) (x^{(t+1)} - x^{(t)})}{x^{(t)} \sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (4.7)$$

Equation (4) shows the way of categorizing LP into seven sub-fractions. More specifically:

Component (4.1) of the equation (4) stands for the combination of differences in the proportion of industries at two different points in time at t+1 and t in which the proportion of industries is based on the rate of value added of industries and the growth rate output value per worker at the given time. This fraction shows that increasing the proportion of industries with a high rate of value added along with reducing the proportion of those with a low rate of value added will cause improvement in LP. In other words, the value of this fraction is higher than 0, and vice versa. The value of this fraction shows the contribution of the shift in the output structure of industries to LP growth. Similar to SSA, this kind of impact is called the 'static-shift effect' meaning merely analyzing the impact when the change in sectoral structure of output is the only thing to occur.

Component (4.2) presents the combination of differences in the rate of value added at two different points in time between t+1 and t with the weights that are reflected through the proportion of industries and output value per worker at a given time. This fraction presents the LP that is expected to rise when the value added rate of industries is improved without a shift in both the sectoral structure and output value per worker. In this case, LP growth is considered as a result of advancement in economic growth quality through different ways such as reducing manufacturing activities, increasing processing activities along with the upgrading of the technology-led contribution and effectiveness of total factor productivity. In other words, the change of LP is, thus, named 'improvement of intra-sectoral economic growth quality'.

Component (4.3) represents the contribution to LP due to the increase in output value per worker at the time (t+1) with the condition in which there is no change in the sectoral structure and value-added rate of industries. The improvement of production output may come from the expansion of low-level processing activities hired by external parties or the increase of the gross output of the entire economy coupled with the high proportion of industries with a low value-added rate.

Not only does component (4.4) show the combination of changes in proportion, but also includes the changes in the value-added rate of industries. This fraction reflects the contribution resulting from the interaction between the change in proportion and the value-added of industries. Accordingly, the value of this frac-

tion is higher than 0 only when the shift in the sectoral structure occurs in a way in which the proportion of the high-value-added industries is boosted. This kind of impact is called the 'dynamic shift effect'.

Component (4.5) is the contribution of the increase in average output in the condition in which there exists an interaction with the change in the value-added rate of industries. Clearly, the improvement of the output value per worker only causes an increase in LP when the value-added rate of industries is higher.

The influence of the interaction between the increase in average output value and the change in the proportion of industries on LP is presented by the component (4.6). Accordingly, the contribution will be higher than 0 when the increase of output per worker is coupled with the expansion of high value-added-rate industries and a reduction of industries with a low level of value-added.

The component (4.7) stands for the contribution of three interactive factors including the shift in sectoral structure, the change in the rate of value-added among industries and the output per worker. Obviously, if the level of output per worker is higher, productivity growth will be higher than 0 when there is a shift in the sectoral structure towards expanding the industries with a high rate of value added. This effect is more exaggerated when industries with a higher rate of value-added prevail in the whole economy.

Analyzing economic growth through 7 components shows the contribution of the components rather than the contribution of each factor. To clarify the role of each factor, especially the sectoral restructuring, we use the concept of 'static' and 'dynamic' contribution. A 'static' contribution is understood as the contribution due to a change of one factor in the condition of ceteris paribus (with the fixed weight of reference period), while 'dynamic' contribution is created by the changes of one factor in the condition that the remaining factors change. The combination of 'static' and 'dynamic' contributions of each factor is called the 'net' contribution of that factor. Thus, it is possible to delineate the contribution of factors from the fraction (4) as follows:

- First, the net contribution of economic sector restructuring is the sum of the 'static' contribution (shown in the component 4.1) and the 'dynamic' contribution (including components 4.4, 4.6 and 4.7). In this case, the 'static' contribution is generated due to the economic restructuring towards increasing the proportion of sectors with a high VA/GO ratio and vice and versus. Whilst, a 'dynamic' contribution is generated by increasing the proportion of sectors with a higher VA/GO ratio, simultaneously reducing the lower VA/GO ratio. In other words, the 'dynamic' contribution is the 'multiplier' of the level of contribution of economic restructuring when a sector experiences a rapid growth not only of the VA/GO ratio, but also the increase of its proportion in the economy. Of course, in the opposite case, when the economic restructuring in the way of increasing the proportion of industries that have low value-added coefficients and a rapid decline of the value added coefficient, it will cause great disadvantages for labor productivity growth.

- The net contribution of the change in the VA/GO ratio includes two types: a 'static' contribution (the component 4.2) and a 'dynamic' contribution (the component 4.5). The impact

of changes in the VA/GO ratio in sectors on the increase or decrease in labor productivity shows the change in the effectiveness of the growth of sectors while the growth effectiveness of sectors is the result of improvements of growth quality.

- The net contribution of an increase in the average output per worker is expressed only in component 4.3 in the fraction (4). That means that the contribution of the increase in average output per worker to the growth of LP is exactly equal to the growth of output.

If output per worker remains unchanged, equation (4) may be shortened to (5) as follows:

$$G(LP) = \frac{\sum_{i=1}^{n} v_i^{(t)}(s_i^{(t+1)} - s_i^{(t)})}{\sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} + \frac{\sum_{i=1}^{n} s_i^{(t)}(v_i^{(t+1)} - v_i^{(t)})}{\sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} + \frac{\sum_{i=1}^{n} (s_i^{(t+1)} - s_i^{(t)})(v_i^{(t+1)} - v_i^{(t)})}{\sum_{i=1}^{n} v_i^{(t)} s_i^{(t)}} \quad (5)$$

In other words, an estimation of the contribution of the shift in the sectoral structure and the rate of value added of industries becomes succinct.

Further, equation (4) may provide a simulation-based estimation of LP at a future certain time given the conditions regarding the shift in the sectoral structure and the probability of improving multiplier coefficients of sectors. This method is advantageous because it does not require many data. Based on the data analysis in available I-O sheets (Bui et al., 2014), the calculation requirements are easily met.

Back to equation (2),

$x^{(t+1)} = \frac{X^{(t+1)}}{L^{(t+1)}}$ *and* $x^{(t)} = \frac{X^{(t)}}{L^{(t)}}$ stand for output per worker at different points in time t+1 and t, respectively. Of which, $X^{(t+1)}$ and $X^{(t)}$ are indicated by the I-O method.

$$X^{(t)} = \sum_{k=1}^{n}\sum_{i=1}^{n} b_{ki} Y_i^{d(t)} \text{ and } X^{(t+1)} = \sum_{k=1}^{n}\sum_{i=1}^{n} b_{ki} Y_i^{d(t+1)}$$

of which, $Y_i^{d(t)}$ is the final consumption of produced goods and services of sector i at time t.

$Y_i^{d(t+1)}$ is the final consumption of produced goods and services of sector i at time (t+1).

b_{ij} is defined as the complete distribution coefficient of Leontief matrix.

$\sum_{i=1}^{n} b_{ki} Y_i^{d(t)} = X_k$ is the output of sector k at time t;

$\sum_{i=1}^{n} b_{ki} Y_i^{d(t+1)} = X_k$ is the output of sector k at time (t+1).

As a result, I-O matrix analysis can offer a prediction of gross output (X) of the economy and the value of output of sector (X_k) based on the change in components of the final consumption of produced goods and services. After all, equation (4) provides a method for predicting the change of SLP at a future certain time.

3.2. Data description

Data used in this paper are collected from the General Statistics Office from 2000 to 2016, I-O sheets for 2000, 2007 and 2012 of GSO (2000, 2007, 2012) in which the updated I-O sheet for the year 2016 has been made by Bui (2016) based on the I-O sheet released in 2012. The term 'economic sector' employed in this paper covers the level-I sectors described in the system of economic sectors in Vietnam regulated in the Decision 10/2007 issued on January 23rd 2007 including 21 economic sectors (Appendix A, from August 2018, Vietnam introduced a new system of economic industries, however, the article used the calculation

data for the period 2000-2016, so the system of 2007 was applied). To calculate the VA/GO for the years 2000, 2007 and 2012, this paper attempts to synthesize and use the aggregated data of such sectors in I-O sheets.

For sectoral structure, the proportion of sectors is presented through the rate between outputs of each sector and GO; the rate of value-added of sectors is calculated by value-added and output value (production price applied). This type of data is collected from above-mentioned I-O matrix sheets. The real annual average number of workers is extracted from the statistical yearbooks.

Calculating and comparing indicators of LP and the value of output per worker require an application of a constant price. Due to the change of price in the gross output's components and the limited access to the database, we calculate these indicators based on the interbank exchange rate for the years 2000, 2007, 2012 and 2016, officially released by the State Bank of Vietnam.

4. Empirical results and discussion

To illustrate the method, the author performed the model calculation with the Vietnam data for the period 2000-2016. The I-O data and the actual number of laborers of the whole economy allow the creation a comparative table of indicators such as GO, GDP, output per worker and SLP. These indicators employ a current price and are measured in United States dollar (USD).

Table 1 shows that Vietnam's labor productivity during 2000-2016 witnessed a rapid increase from $794.5/worker (2000) to $3779.6/worker (2016). The average rate of LP growth per worker in the period 2000-2007 was 9.51% and 15.25% for the period 2007-2012 and 5.5% for the period 2012-2016. The labor productivity growth rates were calculated based on applying the interbank exchange rate method (data from I-O tables published by GSO), which is somewhat different from the results revealed in several previous studies. For example, Nguyen (2007) found that Vietnam's labor productivity growth was 4.25% in 2001, 6.04% in 2005 and the average growth rate was 4.9% in the period 2001-2005.

Table 1: The value of output and labor productivity per worker

Indicators	2000	2007	2012	2016
GO (billion Vietnamese dong - VND, Current price)	948,296	2,861,116	9,157,2445	16,081,158
GDP (billion VND, Current price)	424,296	1,094,242	3,267,536	4,502,724
VA/GO	0.4474	0.3825	0.3568	0.2800
The number of laborers (thousand)	37,609.6	45,208.0	51,422.4	53,302.8
Interbank exchange rate (VND/USD)*	14,200	16,132	20,828	22,350
The value of output/worker (USD)	1,776	3,923	8,550	13,499
Labor productivity (USD/worker)	794.5	1,500.4	3,050.9	3,779.6

*Note: * The average interbank exchange rate officially released by The State Bank of Vietnam for the years 2000, 2007, 2012 and 2016.*
Source: computed by the author based on data of I-O sheets and statistical yearbooks.

Table 2: The growth rate of output/worker and labor productivity

Periods	Growth rate of GO/worker measured in USD (%)		SLP growth rate measured in USD (%)	
	For the entire period	Annual average	For the entire period	Annual average
2000-2007	120.94	11.99	88.85	9.51
2007-2012	117.94	16.86	103.33	15.25
2012-2016	57.88	12.09	23.89	5.50

Source: Calculated by the author from the data of I-O tables and statistical yearbooks.

Results in Table 2 reveal that the growth rate of labor productivity of Vietnam has not been stable over time and has tended to decrease to the lowest level over the past 5 years with an increase rate of approximately 5.5% per year. The critical questions that need to be answered are: 'What causes this status? In the process of restructuring the economy, how have policies towards restructuring the economy influenced SLP growth in Vietnam?' By the method of accounting of SLP described above, results are expressed in Table 3.

Data in Table 3 shows that, in all 3 periods, the LP growth rate of Vietnam has increased at an average level that is much lower than the growth rate of output per worker. This result is the sum of the impact of 7 components and will be decomposed as follows:

- The contribution of sectoral restructuring in all 3 periods renders a negative result, meaning that sectoral restructuring hinders labor productivity growth and the impact also fluctuates. In terms of proportion, the impact level decreased from -10.64% in the period 2000-2007 to -1.48% in the period 2007-2012 but increased very rapidly to -6.19% in the period 2012-2016. This result shows that economic restructuring is negative and inactive.

- The contribution of change of the VA/GO ratio in all 3 periods is negative. That means

Table 3: Calculating and splitting the contribution of factors to labor productivity growth, 2000-2016

Indicators	2000 - 2007		2007 - 2012		2012 - 2016	
	Contribution (%)	Share (%)	Contribution (%)	Share (%)	Contribution (%)	Share (%)
SLP growth rate	88.84	100	103.36	100	23.89	100
The shift in sectoral structure	-9.45	-10.64	-1.53	-1.48	-1.46	-6.11
Change in VA/GO ratio	-7.66	-8.62	-4.12	-3.99	-20.46	-85.64
The growth of GO/worker	120.89	136.07	117.95	114.11	57.89	242.32
Structure and the proportion of VA in GO	2.60	2.93	-1.05	-1.01	0.38	1.59
Change in VA/worker and GO/worker	-9.25	-10.42	-4.86	-4.7	-11.83	-49.52
The shift in sectoral structure and GO/worker	-11.43	-12.86	-1.8	-1.74	-0.85	-3.56
Aggregated effect of 3 factors	3.14	3.54	-1.23	-1.19	0.22	0.92

Source: Calculated from the data of I-O tables and statistical yearbooks.

that the impact of reducing LP growth tends to increase with a high rate, from accounting for -7.66% (2000-2007) to -3.99% (2007-2012) but sharply increased in absolute value at -85.64% (2012-2016). That signals abnormal signs in the trend of sectoral growth effectiveness.

- The contribution of the expansion of output is reflected through the positive value of the average output per worker in all 3 periods and tends to have increased from accounting for 136.07% (2000-2007), decreased slightly to 114.11% in the period 2007-2012, but increased to 242.32% in the period 2012-2016.

- The combined impact of structural change and the change of the VA/GO ratio in 3 periods approaches the neutral level, accounting for 2.93% in the period 2000 -2007, decreasing to -1.01% of the period 2007-2012, and increased to 1.59% for 2012-2016. Although the contribution to LP growth of these two factors is not significant, it improves.

- The combined contribution of changes in the VA/GO ratio and GO tended to curb economic growth from the proportion of 10.42% (2000-2007) to -4.7% (2007-2012), then increased to -49.52% (2012-2016).

- The contribution of sectoral restructuring and the increase in the average output per worker receives a negative number in all 3 periods, reflecting an unexpected trend. The impact of these factors decreased from -12.86% in the period 2000-2007to -1.74% in the period 2007-2012, then increased to -3.56% in the period 2012-2016. This result is reasonable because under the negative impact of sectoral restructuring, the larger the scale of labor input, the more negative results LP growth receives.

- Finally, the contribution of 3 factors including sectoral restructuring, changes of the VA/GO ratio and the increase in average output per worker is not stable in spite of the positive impact in the first period with 3.54%. However, it challenged LP in the second period with a negative contribution of -1.19% before contributing positively at 0.92% in the period 2012-2016.

A further analysis offers an unpromising prospect for the LP growth of Vietnam's economy. Over the three studied periods, the contribution of an increase in output per worker to LP decreased slightly from 136.07% in 2000 to 114.11% in 2012, and then increased to 242.32% in 2016. This result shows that the contribution of economic restructuring and value-added has experienced a declining trend over the past few years. This result is further strengthened by considering the general VA/GO ratio of the economy (shown in Table 1): the VA/GO ratio of the economy has continually declined from 44.74% in 2000 to 38.25% in 2007, 35.68% in 2012 and only 28% in 2016. Regarding the economic restructuring, using the "Vector Factor" method, United Nations Industrial Development Organization - UNIDO (2009) demonstrates that the shift in the economic sectoral structure of Vietnam is slow. More clearly, it was 11% during 2000-2007, 6.53% for 2007-2012, and 3.47% for the period 2012-2016. More noticeably, it appears that there exists a reduction of the VA coefficient of industries, combined with the slow restructuring that has not aimed at increasing the proportion of industries with a high level of value-added. Therefore, it hindered the improvement of LP.

The change of VA coefficients among sectors has witnessed a downward trend of the

Table 4: Analysis of 'static' and 'dynamic' impacts on labor productivity
(Unit: %)

Periods	Growth rate of SLP	Contribution to SLP through 'static' and 'dynamic' impacts						
		Change in VA/GO ratio			Increase in output/worker	The shift of economic structure		
		Net contribution	'static' contribution	'dynamic' contribution		Net contribution	'static' contribution	'dynamic' contribution
2000-2007	88.84	-16.91	-7.66	-9.25	120.89	-15.14	-9.45	-5.69
2007-2012	103.36	-8.98	-4.12	-4.86	117.95	-5.61	-1.53	-4.08
2012-2016	23.89	-32.29	-20.46	-11.83	57.89	-1.71	-1.46	-0.25

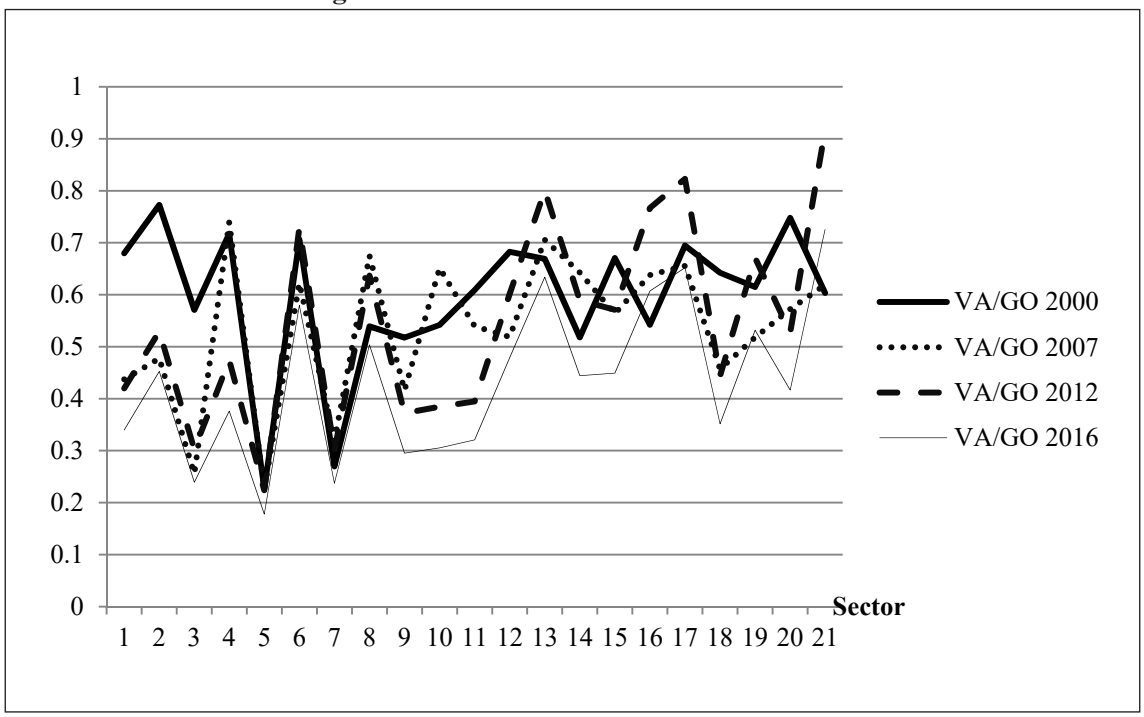
Source: Calculated by the author from the data of I-O tables and statistical yearbooks.

VA/GO ratio in many industries. Particularly in the 2012-2016 period, this declining trend occurred in all sectors (Appendix B).

Using equation (4), we calculate the LP and present it in Table 3. However, on the one hand, Table 3 only sheds light on the aggregated contribution of the components. On the other hand, it does not provide the specific effect of each component on LP or the correlation among them. To highlight the contribution of economic restructuring to LP, it is critical to divide the impacts into "static" and "dynamic" impacts. Static impact is defined because of a shift in the economic structure towards increasing the proportion of the sector with high value-added along with reducing the share of the sectors with a low level of value-added. A 'dynamic' impact is driven by the increase in the share of the industry, which has a higher growth rate in the VA/GO ratio while at the same time reducing the share of the industry with a low growth rate of the VA/GO ratio. In other words, the "dynamic" impact is created when a sector has both increased its VA/GO ratio and advanced its share in the overall economy. The Table 4 decomposes the aggregated impacts into two separate impacts.

Table 4 shows the net contribution of the factors, as well as the "static" and "dynamic" effects. For example during 2000-2007, the net impacts of the economic structure on labor productivity were -15.14%, of which the "static" impact was -9.45% and the "dynamic" effect was -5.69%. That means that the change in economic structure reduced labor productivity growth by 15.14%, of which the independent effect decreased by 9.45% and the integrated effect between the growth of sectors and pro-

Figure 1: Value added coefficient of sectors



Source: Calculated from I-O tables for the years 2000, 2007, 2012 and 2016.

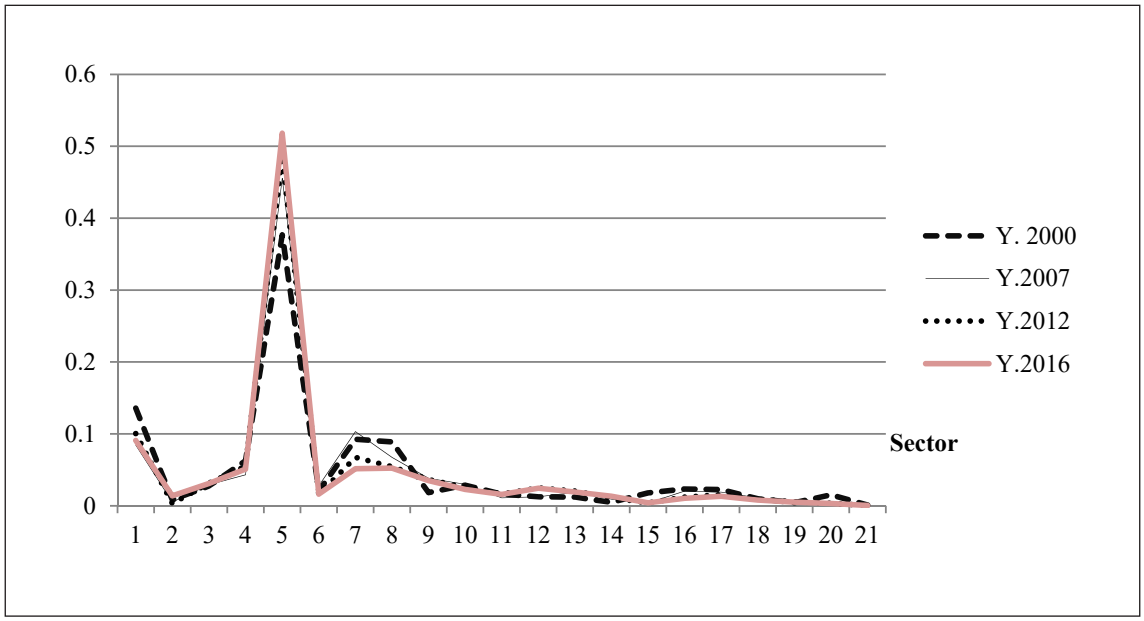
ductivity declined by 5.69%. Obviously, the decrease of the VA/GO ratio coupled with the increase in the value of output per worker leads to a more negative net contribution of economic structural changes. A similar analysis is for VA/GO ratios of industries in two other periods. The declining trend of the VA/GO ratio and economic restructuring are visualized in Figure 1 and Figure 2.

From the analysis of labor productivity growth in Vietnam in the period 2000-2016 according to the equation (4), the following conclusions can be drawn:

Firstly, although the changes in economic structure have negative effects on LP growth, this effect tends to decrease over the 3 analyzed periods. The negative but declining trend of 'static' contribution to LP growth reveals that the shift in economic structures has been moving slowly on the right track. That means that there are no major changes in the shares of low-level VA industries.

Secondly, the "dynamic" contribution was negative, indicating a negative impact on LP growth. Nonetheless, the negative impacts experienced a decrease from -6.4% (2000-2007) to -3.95% (2007-2012) and then to -1.05% (2012-2016). This results from the impacts of two processes: it does not sufficiently reduce the shares of low VA industries, and the low VA industries account for significant shares and slowly reduce. Especially as mentioned above, during the studied periods, the VA/GO ratio has significantly declined in most sectors.

Figure 2: The proportion of sectors in investigated periods



Source: Computed from the I-O data.

Thirdly, the net contribution to LP growth is negative, and it implies an adverse effect on LP growth. It is worth noting that the negative contribution increased during 2012-2016 by 135.16%. Of which, the contribution of "static" and "dynamic" impacts were -85.63% and -49.53%, respectively. Thus, the large adverse impacts on LP resulted from sectoral VA/GO ratios, especially during 2012-2016. It indicates that the growth quality is low, mainly based on increases of input mobility without making good use of the contribution of total factor productivity (TFP).

Finally, the growth of LP was primarily a result of an increase in output per worker. Ironically, the growth rate of output per worker is much higher than that of LP. For instance, the growth rate of output per worker is 121%, 118% for the period 2007-2012, and 58% for 2012-2016 along with relatively lower growth rates of LP in the same reference periods, which are 88.84%, 103.36%, 23.89%, respectively. The increase in the growth rate of output per worker without corresponding increases in LP growth can be explained by the increases in the size of the economy, increases in the intermediate costs, a minimal change in the economic structure, changes in export markets, and other external factors, of which the economic structural changes play a critical role.

5. Conclusion and recommendations

The study has proposed a decomposition equation of the growth of LP into 7 components, thereby allowing separating the contribution of sectoral restructuring to LP growth into two forms (a 'static' contribution and a 'dynamic' contribution. Compared to the SSA model, the proposed model does not consider

sectoral restructuring due to labor but to output. The new contribution of this study is that it has established a decomposition equation for the overall LP growth that contains three factors, including the proportion of sectors according to output value; the value-added coefficient of economic sectors; and average output per worker. Although it does not incorporate any specific resource, through the proportion of sectors as variables, it opens up a lot of possibilities to select a combination of resources to form a reasonable sectoral structure in order to motivate the growth of LP towards efficiency and sustainability. It is also a requirement for the economic restructuring process and for transforming the growth model towards improving efficiency and sustainability in Vietnam in the current context. In practice, the authors have applied a decomposition model with the data of Vietnam's economy in the period of 2000-2016 and made some remarkable conclusions:

- During the period 2000-2016, Vietnam's overall labor productivity increased at an average rate without breakthrough and inconsistent with the advantages of the economy's resources.

- Through 3 periods, the growth rate of LP is much lower than the average increase in output per worker. This proves that the effectiveness of growth is still low, mainly reliant on expanding the scale of resource use along with a low level of efficiency and improvement.

- The sectoral restructuring over the last years has not had a positive impact on LP growth, and is even a factor hindering productivity growth. Although the negative effect of sectoral restructuring on productivity growth has improved, it has been at a low level. This result shows that the policy of restructuring the industries is slow to take effect in practice. Further, the sectoral restructuring is still lacking initiative and is ineffective in terms of policy impacts and governance.

- The endogenous capacity of economic sectors has not been effectively exploited, leading to a low level of growth effectiveness. If this trend remains unchanged, the expansion of the economy will cause more waste of resources and the target of growth in labor productivity, which is expected to make sure LP is rapid, effective and sustainable, will be a tough task.

In the next period, to promote the driving force of the sectoral restructuring for LP growth towards effectiveness and sustainability, it is necessary to focus on the following major solutions:

Firstly, there is a need to continue to accelerate the process of economic sector restructuring, implementing reform of the economic model towards improving efficiency and sustainability. The policy of economic restructuring should be strategized and specified into planning, having specific plans for each sector, forming development programs for each product on the basis of the advantages of each region, and having specific policies and measures to make sure that restructuring the industries can take effect in practice, strengthening direction and administration in the implementation process.

Secondly, there is a need to promote the process of sectoral restructuring on the basis of implementing feasible and effective policy for reallocating resources. In particular, it is necessary to create a suitable and flexible legal framework to promote major shifting influxes

in the economy; firstly shifting agricultural labor to the industrial and service sectors, then making a significant shift from where there are less advantages and competitiveness to other places with more advantages and competitiveness − from the public sectors to private sectors. In order to implement such works, it is necessary to urgently improve such policies as: practical and effective business support policies and a policy to allow the gathering of large-scale domestic private investment projects in industrial production, agriculture, tourism, and construction of transport infrastructure, etc.

Thirdly, it is necessary to promote structural restructuring in the agricultural sector towards restructuring the supply chains, improving domestic value added, especially the supply chain of products with competitive advantages such as rice, coffee, rubber, pepper, cashew nuts, catfish, shrimp and other seafood, vegetables, and tropical fruits, etc. Further, there should be completion of land policy and the development of the market for land use rights to accumulate land, creating a premise to shift from closed and dispersed production to value chain linkage, from household-level production to new forms of agricultural production. There should be strengthening of the training of rural workers to facilitate the movement of agricultural workers to the industrial and service sectors.

Fourthly, in the industrial sector, the process of redistributing production structure in accordance with each region and each area should be accelerated. First of all, in the field of processing and manufacturing industries, it is necessary to review and classify to develop a selective development policy, to seriously restructure inefficient production and business sectors and to prioritize the development of products with competitive advantages; products that are capable of participating in production networks and global value chains of high technology, mechanical industry, information and communication, agricultural products and fisheries with a competitive advantage, etc., increasing the content of science and technology and improving the domestic proportion in products.

Fifthly, in the service sector, it is necessary to actively prioritize policies to develop potential service sectors with a high level of knowledge and technology such as finance − banking, maritime, logistics and petroleum services, aviation, commercial services, education and training services, medical services, health care, auditing, consulting, legal, and tourist services, etc.

Finally, in order to implement those solutions, it is necessary to overcome “bottlenecks” and “barriers” in institutional reforms and administrative procedures. Policies to support the restructuring of the industries need to be implemented in an effective way.

APPENDIX

Appendix A: List of economic sectors at level 1

	Sectors		Sectors		Sectors
1	Agriculture	8	Wholesale and retail trade; repair of motor vehicles and motorcycles	15	Administrative and support service activities
2	Forestry	9	Transportation and storage	16	Activities of Communist Party, socio-political organizations; Public administration and defense; compulsory security
3	Fishing	10	Accommodation and food service activities	17	Education and training
4	Mining and quarrying	11	Information and communication	18	Human health and social work activities
5	Manufacturing	12	Financial, banking and insurance activities	19	Arts, entertainment and recreation
6	Electricity, gas, steam and waste management	13	Real estate activities	20	Other service activities
7	Construction	14	Professional, scientific and technical activities	21	Paid domestic work in households

Source: Government of Vietnam (2007).

Appendix B: Changes in VA Coefficient of Sectors

(Unit: %)

Sectors	2000-2007	2007-2012	2012-2016	Sectors	2000-2007	2007-2012	2012-2016
1	-24.25	-1.74	-7.98	12	-16.4	8.33	-12.31
2	-29.54	5.22	-7.7	13	3.65	9.52	-16.69
3	-31.52	4.66	-6.31	14	12.48	-5.35	-14.5
4	2.16	-26.52	-9.77	15	-10.69	0.75	-12.2
5	-0.05	-0.2	-4.59	16	9.56	12.89	-15.98
6	-8.41	10.6	-14.85	17	-3.92	16.77	-17.1
7	4.91	-1.86	-6.3	18	-18.52	-1.32	-9.23
8	13.61	-3.86	-13.29	19	-9.7	15.33	-13.94
9	-10.18	-4.37	-7.7	20	-17.55	-4.53	-11.05
10	10.98	-26.7	-7.91	21	1.53	29.79	-19.1
11	-6.96	-14.48	-7.38				

Source: Calculated from I-O data for all sectors listed in the Appendix A.

Notes:

1. The SSA method was introduced by the Fabricant (1942) in the employment in manufacturing study, 1899-1939. This method was detailed by Ark (1995).

2. Eight Western European economies includes: Denmark, Western Germany, Italy, Netherlands, Sweden, Spain, England and French.
3. Seven economies of Asian countries includes: Japan, South Korea, Taiwan, India, Malaysia, Indonesia and Thailand.
4. Value – added ratio is determined by the ratio of total value added (VA) to gross output (GO).

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