

Incremental Labor Output Ratio (ILOR) and Output Growth in Indonesia

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ABSTRACT

This research specifically projecting output and predicting economic growth, investment needs, and additional labor by sector using labor and output data (GDP according to business fields at constant prices) during the 2001-2019 period. The analytical method used is a projection of labor based on the output approach, namely the Incremental Labor Output Ratio (ILOR). The results show that (1) an increase in output in the agricultural sector does not have an impact on expanding the absorption of labor in that sector, but the conditions are in contrast to an increase in output in the social services, mining and trade sectors which will have an impact on expanding the workforce (2) Additional employment in the agricultural sector does not provide optimal results or additional labor in the agricultural sector and results in a decrease in output in the future (3) Additional labor in the mining sector will produce high output in the future.

Keywords: Output, Economic Growth, Investment, Incremental Labor Output Ratio (ILOR)

1. INTRODUCTION

Dynamic economic changes have an impact on structural changes on the economy (Oreiro et al., 2020). This change in structure can be seen from the pattern of industrialization which plays an important role in the economy in Indonesia, considering that the context of workforce planning from the output side can be seen from the sectoral projection of labor. In terms of economic structure, it can be seen the distribution of each sector which is classified into three main sectors, namely Agriculture, Industry, and Services. In general, the economy in Indonesia during 2000-2019 was contributed by the industrial sector with an average of 52.04 percent. In terms of trends, there was a change in the pattern of the economic sector in Indonesia during 2015-2019, this condition can be seen from the decline in the share of the industrial and agricultural sectors, while the share in the service sector has increased as a whole during that period. This condition shows that there has been a structural economic transformation by forming an Agriculture-Industry-Service pattern.

This phenomenon is associated with a literature review that empirically shows differences with several

studies, namely Schlogl & Sumner (2020) & Mcmillan et al., (2011) which found that there are changes in economic patterns that will significantly increase economic growth due to the transformation of the workforce from the traditional sector to the modern sector, which has an impact on the movement of labor from sectors that have low productivity to high productivity. Empirically, the condition of the economic structure is in stark contrast to the state of labor absorption in Indonesia which is still concentrated in the traditional sector, namely the agricultural sector, this implication has been clear over the last 20 years.

The agricultural sector has played an important role in the absorption of labor in Indonesia during the last 20 years. It can be seen that on average, 58.3 percent of the workforce is absorbed in this sector. It is different from the industrial sector, although, in terms of the highest output contribution, the absorption of labor is the lowest on average, amounting to 20.2 percent. In terms of trend, a shift in labor has begun to appear even though employment is concentrated in the agricultural sector, but seeing the trend over the last 20 years there has been a slight shift in labor to the service sector with an average of 21.5 percent. This shift has been predicted by

Richter (1986), who explains that the projection of the workforce is inseparable from the uncertainty of future trends in economic growth due to changes in employment patterns and changes in technology.

Apart from the concentration of labor absorption in the agricultural sector, during the last few years, there has been a shift in the orientation of the agricultural market towards higher productivity, as revealed by (Ramaraio et al., 2014) which explains that the agricultural trend is leading to liberalization and globalization. Projections of skilled labor must also be considered in relation to changes in the pattern of economic structure (World Bank, 2014). Consistent with this, Taylor (2020) finds that there is a need to accelerate investment in the agricultural sector to increase productivity in agriculture for developing countries and that investment must go hand in hand with the movement of workers from the agricultural sector to the agricultural sector. Recommendations related to this issue Bertrand (2004) recommends addressing changes in a small number of sectors and skills with an emphasis on job structures that are described by the relationship between economic growth and employment types and job mobility.

The transformation will be related to the supply side workforce planning process. The grand theory which is the basis of reference for seeing the relationship between sectors and the labor supply pattern uses the labor planning approach from the supply side, namely using the approach developed by Richter (1986) which explains the aspects of planning the workforce from the supply side of labor in terms of population, The school-age population and the labor participation rate cannot significantly predict the uncertainty of future economic growth trends due to changes in employment patterns and changes in technology. A more comprehensive model of labor planning from the coloring side involves the application of demographic calculations for population, migration, education and training. Specifically, manpower planning based on the relationship between output and quantity of labor is discussed by Psacharopoulos (1991), which explains that the projection of labor is inseparable from changes in output and labor quantity according to the level of skills/education required for the production of that output. In line with this, Ziderman & Horn (1993) stated that the workforce planning pattern must be supported by training as an alternative to fulfill the types of work provided.

2. LITERATURE REVIEW

More comprehensively studied by Adams et al., (1992) explains that labor planning must consider labor market signals, according to him, labor planning is intensified in monitoring job training, indirectly this planning provides information to guide training decisions and manage the system. training. This planning benefit can increase the efficiency of training

and also help improve labor market performance. Planning for this requires planning techniques that balance the social benefits and costs of training responsively to changing economic conditions. Meanwhile, in planning for strategic skills supply of the workforce with long waiting times to acquire skills, much of the workforce planning can focus on providing information about skills demand, which can be used by individuals, companies, and managers of training institutions in making training decisions.

An empirical discussion of the projected sectoral workforce through the elasticity approach was studied by Islam & Nazara (2000) who found that the highest employment opportunity elasticity in Indonesia occurred in the agricultural sector and was followed by trade, service, and industry sectors by sector. Consistent with this, Amjad (1981) substantially measures manpower planning using the additional capital method and incremental labor productivity and elasticity. According to him, there is a limited ability to absorb labor in Asian countries, in this case, the large-scale manufacturing sector accounts for a large part of the total development resources invested by these countries but does not provide high employment opportunities.

In addition, the capacity of the state to provide employment in the public sector has also diminished, particularly with the increasing emphasis on 'privatization' of the economy in recent years. The proportion of the labor force in these countries is concentrated in the agricultural sector and the growth of employment outside the agricultural sector is in many cases not high enough to absorb the increase in the workforce, resulting in high employment opportunities in the agricultural sector, the recommendation of this issue is how the country is increasing productive employment in the agricultural sector. A different approach is used by Matías, (2010), the incremental labor productivity approach is considered to produce a more realistic scenario. The recommendation for a new approach he proposes is to use a dynamic shift-share formulation, which allows time changes in both the sectoral structure and the level of the variables under consideration.

Regarding the availability of a sectoral workforce, Ismail et al., (2011) examined the need for labor in the service sector. This study categorizes workforce planning from two types of work, namely professional workers and technical workers. This estimate predicts that more than half of the workers in the period were professional and technical workers. Meanwhile, the findings of sectoral workforce planning show that in the future the wholesale and retail trade sector; and hotels and restaurants have high labor availability. In addition to the type of work, this study also found that the need for labor was also based on the level of education and labor market signals, as well as a reference for training providers regarding the needs of prospective students in tertiary institutions and related programs for future job

requirements, as well as helping institutions determine the number and the type of a number of students entering.

The projected workforce was carried out by Henderson (2015) using the output approach. His research finds that by 2024, the services sector will account for more than 81 percent of all jobs in the economy and will make up the majority of job growth projected from 2014 to 2024. The health care and social assistance sectors will account for more than a third of the jobs added during the projection period. The real output from the total service sector is projected to grow slightly faster than the economy as a whole and contribute to an increase in the proportion of total output in 2024. In contrast to L. Agarwal et al., (2013) modeling projections of the workforce in the construction and building sector, research results found that the construction sector requires a large number of unskilled, skilled, and technical workers for planning, monitoring, and implementing construction projects.

In addition to output conditions, workforce planning can be projected through the main occupation approach. Maier et al., (2017) predict that there will be a decrease in employment opportunities of nearly 5 million skilled workers in 9 of the 20 main occupations by 2030.

Consistent with this Wolf & Lockard (2012) overall job type is projected to increase by about 14 percent over the 2010-2020 period with more than half a million new jobs expected for each of the four occupations including registered nurse, retailer, family health assistant, and personal care assistant. ; jobs that typically require post-secondary education to enter are projected to grow faster than average, but jobs that typically require a high school diploma or less will continue to represent more than half of all jobs.

In line with this, Cappelen et al., (2013), based on the workforce projection, show that the previous trend of increasing demand for workers with tertiary education and secondary and higher vocational education will continue until 2030. Meanwhile, there is a decline in the proportion of demand at the level of primary school education. , higher education and vocational education until 2030. Meanwhile, there has been an increase in growth for most of the detailed education fields, and especially for prospective workers in the fields of economics and administration, and nursing. According to Giesecke et al., (2011), this condition is related to the labor market, so there is a need for adjustments in terms of relative wage movements across qualifications and jobs.

A specific discussion related to the projections of labor in the agricultural sector was reviewed by Allen et al., (2018) who analyzed the structure of employment in the food economy in four major segments of activity: agriculture, processing, marketing, and food. The implication in this study is to explain the relationship between rural-urban employment structure and the diversification of rural employment, which is related to

the transformations that shape patterns in the agricultural sector, this study finds the need for projections related to employment strategies related to agricultural productivity, employment outside the agricultural sector and market conditions. work in rural-urban areas and this condition must be applied to productive workers and types of work based on gender.

Charlton, (2019) emphasizes productivity in the agricultural sector related to investment education, training, and innovation. If the agricultural industry does not consider the variables, there will be a tendency for agricultural sector workers to move to jobs with higher wages and skills in other sectors, conditions will have an impact on decreased agricultural production and labor-intensive crop production will shift to other countries where wages remain low. In line with this, Maoyong et al. (2015) stated that the causes of changes in the structure of employment in the agricultural sector are changes in the demographic composition, labor force, and structural changes in the economy.

3. METHOD

This research will discuss the estimated projections of the sectoral workforce in Indonesia using labor data and output (GDP by field of business at constant prices) during the 2001-2019 period. Data obtained from the Indonesian Central Bureau of Statistics. The analysis method used is the projection of the workforce based on the output approach, namely the Incremental Labor Output Ratio (ILOR) and the ICOR Labor Approach. Transition (1969) and Walters (1966) model this approach mathematically as follows:

$$ILOR = \frac{\Delta L_i}{\Delta Y_i} \quad (1)$$

Where ΔL_i = additional labor in sector i and ΔY_i = additional output (GDP at constant prices) sector i. Meanwhile, the investment approach uses the following equation model:

$$Labor\ Productivity = \frac{Y_i}{L_i} \quad (2)$$

Where Y_i = Output (GDP in sector i and L_i = Labor in sector i.

If the amount of ILOR is negative, it means that in the period a certain time there is an imbalance between the change in labor absorbed and the change in economic output. There are times when there has been a reduction in the absorption of labor but it is still able to produce a fairly high output value. Or a lot of labor is absorbed but there is a decrease in gross added value. both of these will have a negative impact on both the social and economic dimensions. For a country that is still developing, of course, it will prioritize the absorption of

labor and in the first place at a relatively good level of productivity.

4. RESULT AND DISCUSSION

The estimates in this paper will discuss the conditions of employment opportunities by sector during the 2001-2019 period in terms of labor

productivity, *Incremental Labor Output Ratio* (ILOR). The estimated projection of labor is inseparable from the condition of labor productivity, the average picture of labor productivity in all business sectors during the 2001-2019 period can be seen in Table 1:

Table 1. Labor Productivity by Business Field in Indonesia, 2001-2019

Field Business	Productivity					
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2019	2001-2019
Agriculture, Plantation, Forestry, Hunting, and Fisheries	0.006	0.007	0.008	0.009	0.011	0.008
Mining and Quarrying	0.207	0.174	0.140	0.142	0.151	0.163
Industry	0.037	0.043	0.044	0.050	0.048	0.044
Electricity, Gas, and Drinking Water	0.059	0.066	0.079	0.078	0.066	0.070
Construction	0.060	0.066	0.069	0.073	0.082	0.069
Trade, Restaurants, and Accommodation Services	0.014	0.017	0.019	0.021	0.021	0.018
Transportation, Warehousing, and Communication	0.017	0.023	0.043	0.062	0.070	0.042
Financial Institutions, Real Estate, Leasing, and Business Services	0.121	0.134	0.113	0.097	0.131	0.119
Services Community, Social, and Prior Figure	0.014	0.015	0.014	0.015	0.017	0.015

Source: (Indonesian Central Bureau of Statistics, 2019), *processed*

Sectorally, the productivity of the agricultural sector is the lowest compared to other sectors. In terms of the highest average productivity value period occurred in the 2017-2019 period, amounting to 10.1 million / worker. Meanwhile, the lowest average period occurred in 2001-2004, which was 6 million / worker. Meanwhile, the sector with the highest productivity was the mining sector with an average of 163 million per

worker during the 2001-2019 period. On average, the productivity trend in the mining sector fluctuated, in the 2001-2014 period the highest average mining productivity was 207 million / worker. The amount of ILOR can be used as a parameter in determining some optimal workforce to be used in business sectors. By sector for a specific 4-year period can be seen in Table

Table 2. ILOR Value by Business Field in Indonesia, 2001-2019

Business Field	ILOR					
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2019	2001-2019
Agriculture, Plantation, Forestry, Hunting, and Fisheries	-0.025	0.023	-0.046	-0.032	0.008	-0.016
Mining and Quarrying	0.158	0.016	0.035	-0.005	-0.026	0.039
Industry	-0.002	0.017	0.027	0.000	0.028	0.013
Electricity, Gas, and Drinking Water	0.060	-0.007	0.009	0.022	0.036	0.024
Construction	0.025	0.009	0.012	0.013	-0.003	0.012
Trade, Restaurants, and Accommodation Services	0.001	0.023	0.051	0.033	0.074	0.034
Transportation, Warehousing, and Communication	0.024	0.010	-0.012	0.005	0.005	0.007
Financial Institutions, Real Estate, Leasing Business, and Corporate Services	0.008	0.008	0.022	0.010	-0.008	0.009

Community, Social, and Individual Services	0.053	0.059	0.086	0.041	0.018	0.053
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Source: (Indonesian Central Bureau of Statistics, 2019), *processed*

based on Table 2. way average over 2001-2019. The ILOR value in the agricultural sector is negative with an average which indicates that the increase in GDP in the agricultural sector is due to an increase in labor productivity which is not accompanied by an increase in labor absorption, meaning that the performance of the agricultural sector has not been able to increase the absorption of labor in that sector so that the output produced every time. agricultural sector workers are low. If you look at the sectoral comparison, the ILOR value of all economic sectors is positive, which means that every increase in output is able to expand labor absorption. The findings show that there are several sectors that have ILOR values below the average during the 2001-2019 period, namely the industrial sector, the construction sector, the financial sector, and the communication sector which ranges between 0.007-0.013.

The highest ILOR values occurred in the Social Services (0.053), Mining (0.039), and Trade (0.034)

sectors. The impact of the high ILOR value in these three sectors will have an impact on labor conditions in the future, where the increase in output that occurs will have a significant impact on the expansion of labor absorption, especially in the social services sector, this shift proves that there has been a structural transformation of employment, the agricultural sector which has The highest share of the labor market has a negative trend, which means there is a change in employment opportunities due to an increase in output, slowly the labor pattern changes, seeing the lowest ILOR value and this change has an impact on labor migration which was previously concentrated in the agricultural sector now Expansion of the workforce is predicted to occupy other sectors such as the service sector, mining, and trade. Based on these two approaches, the analysis of labor growth trends in the agricultural sector during the last 20 years is to prove the trend of labor growth during that period. Trends in employment growth presented in Table 3:

Table 3. Growth by Industrial Workers in

Indonesia's Business Sector	Employment Growth (%)					
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2019	2001-2019
agriculture, horticulture, Forestry, Hunting, and Fisheries	-0.1	0.4	-1.1	-4.8	0.2	-0.4
Mining and Quarrying	11.2	0.5	9.6	-9.9	-2.5	3.6
Industry	-1.3	3.0	5.3	-0.6	5.1	2.2
Electricity, Gas, and Drinking Water	21.9	-5.3	5.3	32.2	5.0	7.1
Construction	6.1	4.3	5.5	13.3	-1.6	3.8
Trade, Restaurants, and Accommodation Services	0.7	2.4	2.5	12.5	7.1	2.9
Transportation, Warehousing, and Communication	4.4	2.9	-5.3	10.0	2.9	1.4
Financial Institutions, Real Estate, Rental Business, and Corporate Services	4.0	6.2	13.3	26.1	- 5.5	5.4
Community, Social and Individual Services	2.0	5.3	6.7	11.0	0.7	3.6

Source: (Indonesian Central Bureau of Statistics, 2019), *processed*

The trend presented in Table 3 shows that the average growth of labor in the agricultural sector shows a strong growth trend. g was negative by an average of -0.4 percent over the period. In general, all economic sectors during the 2001-2019 period experienced a positive trend except for the agricultural sector, the trend of the highest labor growth during that period on average, namely the electricity, gas and drinking water sector at 7.1 percent, the mining and community services sector, namely by 3.6 percent and the financial institutions, real

estate, leasing business, and corporate services sector by 5.4 percent.

While on an average of 4 years, it can be seen that the agricultural sector experienced a negative growth trend in the 2001-2004 (-0.1 percent), 2009-2012 (-1.1 percent) and (-4.8 percent) periods. Meanwhile, mining occurred in the 2013-2016 (-9.9 percent) and 2017-2019 (-2.5 percent) periods. Meanwhile, the trade sector occurred in the 2017-2019 period (1.6 percent). This result proves empirically that labor growth in the

agricultural sector has a negative trend. This condition is in line with the ILOR calculation results which prove

that the growth trend is negative. Meanwhile, the output growth trend is shown in Table 4;

Table 4. GDP Growth by Business Field in Indonesia

Business Field	Output Growth (%)					
	2001- 2004	2005- 2008	2009- 2012	2013- 2016	2017- 2019	2001- 2019
Agriculture, Plantation, Forestry, Hunting, and Fisheries	3.2	3.5	3.5	3.6	3.7	3.5
Mining and Quarrying	-1.2	1.9	2.8	1.7	1.3	1.3
Industry	4.8	4.2	4.5	4.4	3.7	4.4
Electricity, Gas, and Drinking Water	6.3	7.7	7.0	5.1	3.7	6.0
Construction	4.6	7.1	6.3	4.9	5.8	5.7
Trade, Restaurants, and Accommodation Services	5.6	7.4	6.4	6.3	5.8	6.3
Transportation, Warehousing, and Communication	9.5	12.6	11.1	7.4	7.5	9.7
Financial Institutions, Real Estate, Leasing Business, and Corporate Services	6.5	6.6	5.9	9.6	5.4	6.9
Community, Social and Individual Services	4.0	5.7	5.8	4.9	5.7	5.2

Source: (Indonesian Central Bureau of Statistics, 2019), *processed*.

Based on the GDP growth trend by sector, it shows that on average all economic sectors experienced a positive GDP growth trend, meaning that during the 2001-2019 period, the Gross Domestic Product increased per year. herbs on average. For the economic sector that had the highest growth trend during the 2001-2019 period, namely the transportation sector at 9.7 percent, the trade sector at 6.3 percent, and electricity, gas, and drinking water (6.0 percent).

Meanwhile, the sectors with the lowest growth trend were the mining sector at 1.3 percent and the agricultural sector by 3.5 percent. When compared with the labor growth trend, it shows that the agricultural sector is less than optimal, as seen from the labor growth trend. and the lowest growth trend on average over the past 19 years.

5. CONCLUSION

This research focuses on projecting a workforce based on output using the Incremental Labor Output

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