

## Impact of unbalanced economic growth to dynamic trade specialization

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**Abstract.** *This paper aims to analyze the influence of Unbalanced Economic Growth on Dynamic Trade Specialization. We analyze the effects of unbalanced economic growth to the dynamic trade specialization with the econometric model. The countries of Argentina, Brazil, Paraguay and Uruguay are the units of analysis in this research. The results obtained the country Argentina and Brazil possesses positive relations and significantly affect dynamic trade specialization, but not for the country Paraguay and Uruguay. In addition, the world unbalanced economic growth has a relationship that does not significantly affect the Dynamic trade specialization of all countries selected in this research.*

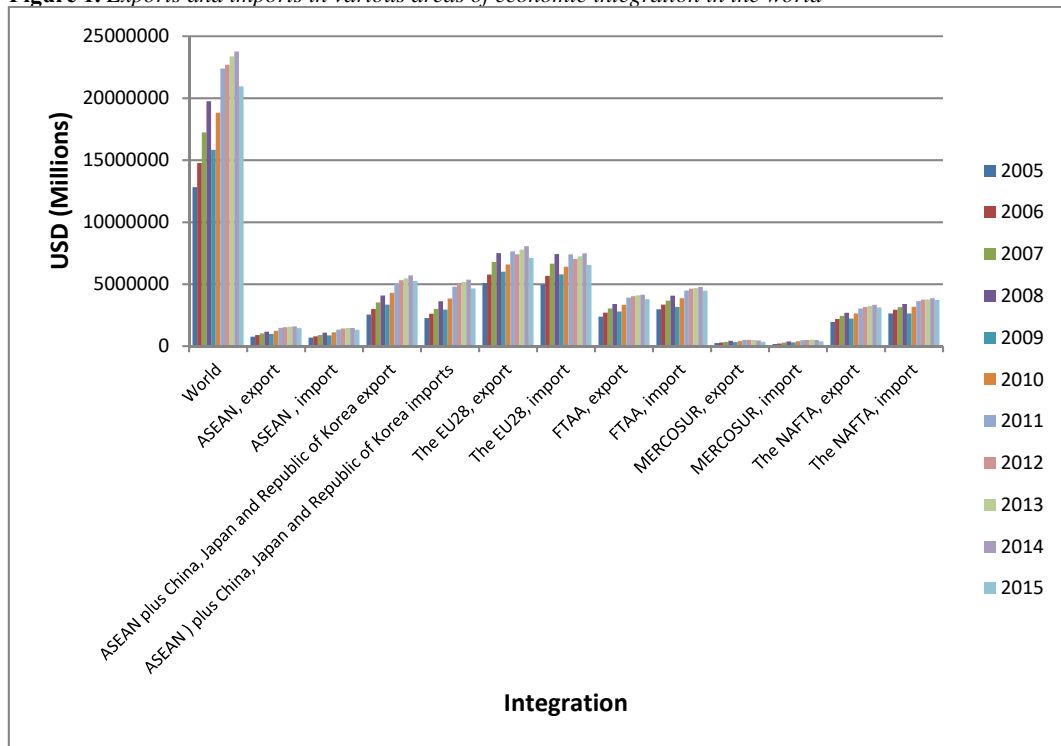
**Keywords:** unbalanced economic growth, dynamic trade specialization, RSCA, GDP.

**JEL Classification:** F10, F13, F19.

## A. Introduction

A searcher who consider a country's comparative advantage in the dynamic sense rather than static one where the big attention aimed at the change in the side of the supply or production. World prices and the common changes in technical efficiency which is reflected in the GDP share is the variables that affect the dynamics of comparative advantage (Redding, 2002). In addition, the dynamics comparative advantage influenced by the role of trade, the frictional input in international trade and investment flows substantially to geography, institutions, transports and information cost (Grossman and Helpman, 1991). Widodo and Shaleh (2010) also examine the impact of unbalanced economic growth upon dynamic trade specialization.

**Figure 1.** Exports and imports in various areas of economic integration in the world



**Source:** UNCTAD stat (2017), author's calculation.

Figure 1 shows openness of trade in various integration that occurred in the world, visible exports and imports *Común Mercado del Sur - Mercosur* (Southern Common Market) is smaller than the other integration like ASEAN, ASEAN+3, EU28, and the NAFTA. In average years 2005-2015 the distribution of exports and imports of Mercosur to the world is just 2.04% and 1.932%.

In line with the integration process in the world market, the critical issue is on a country's specialization and dynamic change in comparative advantage, this paper aims to examine the impact of unbalanced economic growth upon dynamic trade specialization. Argentina, Brazil, Paraguay, and Uruguay are chosen for case studies. In session 2, explains

about the framework of the theory and empirical studies related to this research. The session 3 discusses methodology and data used, the session 4 shows results and analysis, and last is the conclusion that will be discussed in the session 5.

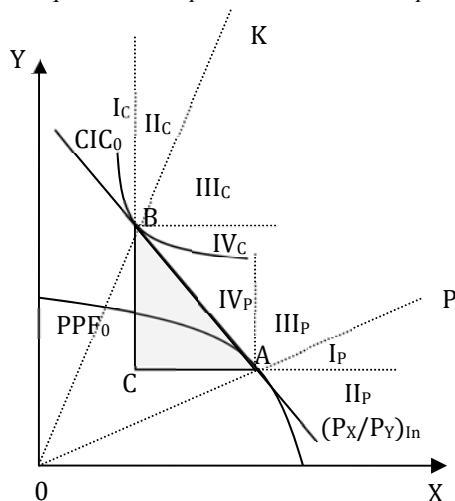
## B. Theoretical framework and empirical studies

### *Theoretical framework*

In the Bowen (1998) a small country, a country have PPF (production possibility frontier) and a community indifference curve (CIC). With the economic growth, The PPF shifts outward, allowing the country 0 choose different production combinations of X and Y. The various new possible equilibrium in production are located within the region fixed by the mini-axes drawn through the original production equilibrium at point A. The economic growth is product-neutral, when productions of the export good and the import competing good have increased in the same rate or if the new equilibrium in production lies on the straight in OP. If the new equilibrium lies in region  $I_p$ , it is *pro-trade-biased* (reflecting the relatively greater availability of export good). In region  $II_p$  is *ultra-protrade-biased*, in region  $III_p$  is *anti trade biased* (reflecting the relatively greater availability of import good), and in region  $IV_p$  is *ultra anti trade biased* (Widodo and Shaleh, 2010).

In addition, the consumption equilibrium impacts due to the economic growth (Widodo and Shaleh, 2010). The balance of the consumption is at the point of origin B. The straight line OB is a new equilibrium point, so consumption of both goods X and Y will increase proportionally and the consumption trade effect will be *neutral* (consumer have not changed their relative consumption pattern with growth). If the new consumption equilibrium in region  $II_c$ , it is call *Pro trade consumption effect* (reflecting the relatively greater availability of export good), *ultra protrade consumption effect* in region  $I_c$ , *anti protrade consumption effect* in region  $III_c$ , and *ultra anti protrade consumption effect* in region  $IV_c$ .

**Figure 2.** *Equilibriums in production and consumption*



**Source:** Widodo and Shaleh (2010).

Mankiw (2010) said that the changes in technology (i.e. factor neutral, labor saving or capital saving) or the courses of factors of production (i.e factor neutral growth, relatively higher growth in capital or relatively higher growth in labor) can affect economic growth. Todaro and Smith (2011), suggest that balanced and unbalanced growth is the type of economic growth. In Widodo and Shaleh (2010), the shift out of PPF can proportionally or not. A country becomes more or less specialized specialized after the economic growth depend upon the kids of growth (balance or unbalanced).

### ***Empirical studies***

Widodo and Shaleh (2010) analyze the impact of unbalanced economic growth upon countries' dynamic trade specialization in ASEAN. He found that the state of Indonesia and Malaysia are significant and positively affect the dynamic trade specialization. Meanwhile the country Korea and Singapore are not significant. Unbalance economic growth world did not significantly affect the dynamic trade specialization. This shows that the unbalanced in the world will not be able to affect the international trade in a country.

Redding (2002) analyzed the dynamics of specialization using disaggregated data on 20 manufacturing industries in seven OECD countries the 1970-1990. His results show how statistical models of distribution dynamics may be used to shed light on a variety of issues relating to specialization dynamics, bringing empirical work the closer to the focus on dynamic comparative advantage evident in range research on trade and growth. He finds substantial mobility in patterns of specialization. Then, over longer time horizons, country-specific changes in factor endowments become more important. But there is no evidence of an increase in countries' overall degree of specialization.

## **C. Methodology and data**

### ***Revealed symmetric comparative advantage***

Measurement tools in comparative advantage according to Laursen (1998) is Revealed Symmetric Comparative Advantage (RSCA). The RSCA index starting from the Revealed Comparative Advantage (RCA connectors) or Balassa index (Balassa 1965).

The RCA and RSCA indexes are formulated as follows:

$$RCA_{ij} = (x_{ij} / x_{in}) / (x_{rj} / x_{rn}) \quad (1)$$

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (2)$$

$RCA_{ij}$  represents revealed the comparative advantage of country  $i$  for the group of products (SITC)  $j$ ; and  $x_{ij}$  is total exports of country  $i$  in group of products (SITC)  $j$ . Subscript  $r$  represents all countries except country  $i$ , and subscript  $n$  stands for all groups of products (SITC) without group of product  $j$ . To avoid double counting, the country and group of products under consideration is excluded from the measurement so that the bilateral exchange is more exactly represented (Vollrath, 1991; Wörz, 2005; Widodo and Shaleh, 2010).

The RCA index range has a value ranges from zero to infinity  $0 \leq RCA_{ij} \leq \infty$ . Country  $i$  has a comparative advantage in the group of products  $j$  if  $RCA_{ij}$  greater than one means. On the other hand, a comparative disadvantage in product  $j$  if  $RCA_{ij}$  less than one implies that country  $i$  has. The Revealed Symmetric Comparative Advantage (RSCA) is the index created by Laursen (1998). The index will using when the  $RCA_{ij}$  turns out to have values that cannot be compared on both sides of one. The  $RSCA_{ij}$  index ranges from negative one to one or  $-1 \leq RSCA_{ij} \leq 1$ .  $RSCA_{ij}$  greater than zero implies that country  $i$  has a comparative advantage in product  $j$ . In contrast,  $RSCA_{ij}$  less than zero implies that country  $i$  has a comparative disadvantage in product  $j$ .

### ***The dynamics of specialization***

#### ***Econometric Model***

An econometric model (3) is commonly used to examine the dynamics of comparative advantage (Laursen, 1998; Wörz, 2005; and Widodo, 2009):

$$ij_t = \beta_{i,0-T} + \epsilon_{i,0-T} + \epsilon_{ij,t} \quad (3)$$

where:

$RSCA_{ij,t}$  and  $RSCA_{ij,0}$  = the RSCA indexes of country  $i$  in product  $j$  for years  $T$  and  $0$ , respectively.

$\epsilon_{ij}$  denotes white noise error term.

The coefficient  $\beta_{i,0-T}$  = the existing comparative advantage or specialization patterns have been reinforced or not during the years of observation.

If  $\beta_{i,0-T}$  is not significantly different from one  $\beta = 1$ , there is no change in the overall degree of specialization.  $\beta > 1$  indicates increased specialization of the respective country. Finally,  $0 < \beta < 1$  indicates de-specialization; that is, a country has gained a comparative advantage in industries where it did not specialize and has lost competitiveness in those industries where it was initially heavily specialized (Wörz 2005). In the event of  $\beta \leq 0$ , no reliable conclusion can be drawn on purely statistical grounds; the specialization pattern is either random, or it has been reversed. This equation is conducted for regional or country analysis.

#### ***Unbalanced economic growth***

The output growth of a specific sectors for period 0-T in country  $i$  can be calculated (Widodo and Shaleh, 2010):

$$g_{is,0-T} = (GDP_{is,T} - GDP_{is,0}) / GDP_{is,0} \quad (4)$$

where:

$GDP_{is,T}$  and  $GDP_{is,0}$  are the country  $i$ 's growth rate of sector  $s$  in years  $T$  and  $0$ , respectively. The output growth of a specific sector might differ from that other sector. So, the dispersion of output growth of sectors shows the unbalanced economic growth in a country (Widodo and Shaleh, 2010).

To indicate the dispersion of output growth sectors (unbalanced economic growth) Widodo and Shaleh (2010) use the coefficient of variation (CV). Formulation of the Coefficient of variation of the sector output growth for period 0-T as follows:

$$CVG_{0-T} = \frac{\sqrt{(\sum_{s=1}^n (g_{is,0-T} - \bar{g}_{i,0-T})^2)/n}}{\bar{g}_{i,0-T}} \quad (5)$$

where:

$\bar{g}_{i,0-T}$  is the country i's average growth rate for the period 0-T. If all sector have the same growth of output (balanced economic growth), the coefficient of variation will equal zero.

Based on model Widodo and Shaleh (2010), estimation regression model to investigate the impact of unbalanced economic growth on the dynamic trade specialization as follows:

$$DS_{0-T} = \mu_0 + \mu_1 CVGD_{0-T} + \mu_2 CVGW_{0-T} + \varepsilon_T \quad (6).$$

$DS_{0-T}$  = Degree of dynamic specialization ( $\hat{\beta}_{0-T}$ ) in period 0-T obtained from the estimation of equation (3);

$CVGD_{0-T}$  = Coefficients of variation of domestic economic growth for the period 0-T;

$CVGW_{0-T}$  = Coefficients of variation of world economic growth;

$\mu_0$  = constant;

$\mu_1, \mu_2$  = coefficient;

$\varepsilon_T$  = white noise error term.

If a country (i) and world have a balanced economic growth ( $CVGD_{0-T} = 0$  and  $CVGW_{0-T} = 0$ ), the degree of dynamic trade-specialization will be constant and equal to  $\mu_0$ .

When a country (i) and world have an unbalanced economic growth ( $CVGD_{0-T} \neq 0$  and  $CVGW_{0-T} \neq 0$ ), the impact of unbalanced economic growth depends on the estimated coefficients  $\mu_1$  and  $\mu_2$ . The unbalanced economic growth of domestic and the world contribute to decreasing specialization (de-specialization) occurs when  $\mu_1$  and  $\mu_2$  are negative, and the unbalanced economic growth of domestic and the world contribute to increasing specialization occurs when  $\mu_1$  and  $\mu_2$  are positive.

The analysis used is the analysis of OLS in form of multiple analysis with the classical assumption must be fulfilled.

### Data

Data on export by the 3-digit Standard International Trade Classification (SITC) Revision 3 is data used in this research. the data come from the United Nations Commodity Trade Statistics Database (UN-COMTRADE) that using as indicator to calculate RSCA and data on Gross Domestic Products (value added) by economic activities (sector) taken from the United Nations Statistics Division (UNSD) for period 2000-2015. GDP is divided into seven following sectors: 1) Agriculture, hunting, forestry and fishing, 2) Mining, manufacturing and utilities, 3) Manufacturing, 4) Construction, 5) Wholesale, retail trade, restaurants, and hotels, 6) Transport, storage and communication, 7) other activities.

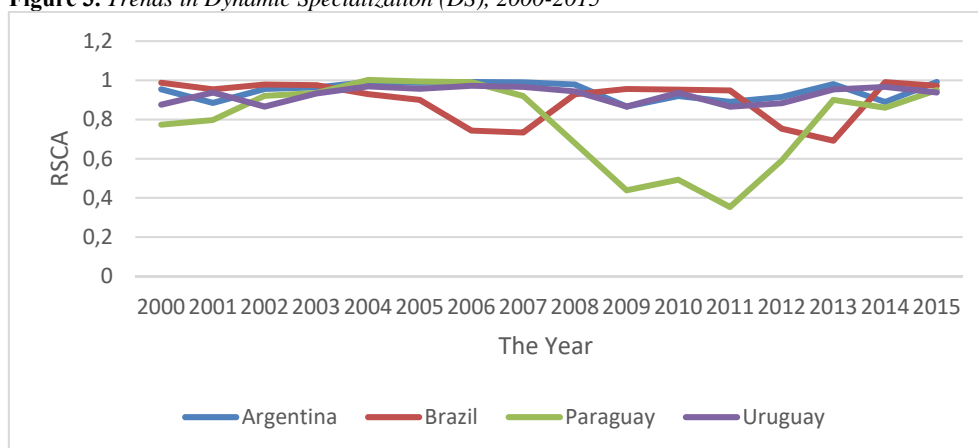
### D. Result and analysis

In the picture 4. Show the value of coefficient Dynamic Specialization (DS) for country Argentina, Brazil, Paraguay and Uruguay. This value obtained by similarities (3) in this research. DS is the value of ( $\hat{\beta}_{0-T}$ ) the period 2000-2015. Gained the ( $\hat{\beta}_{0-T}$ ) obtained with

simple regression with using SITC Rev 3,3 digits with 237 commodities. It is apparent that all countries have the value ( $\hat{\beta}$ ) smaller than 1 and larger than 0 ( $0 < \hat{\beta} < 1$ ) indicates de-specialization; that is, a country has gained a comparative advantage in industries where it did not specialize and has lost competitiveness in an industry where it was initially heavily specialized. This implies that all countries show de-specialization process over time. The countries may have the trade-off between specialization in their existing products (with high comparative advantage but facial level low in technology) and specialization in the other products with many potentiality for comparative advantage in the future as the result of high productivity growth.

The global financial crisis that occurred in 2008-2009 was the worst in 80 years. The supreme mortgage crisis in United State eventually manifested into a world-wide financial crisis. No single country is free from the effects, including the countries in Mercosur. This crisis not only affects the financial sector but also real sector. This crisis makes Paraguay more smitten than 3 countries. This shows a more dramatically in the coefficient dynamic specialization on 2008-2014. The decrease means that Paraguay has de-specialized enormously her comparative advantage during that period.

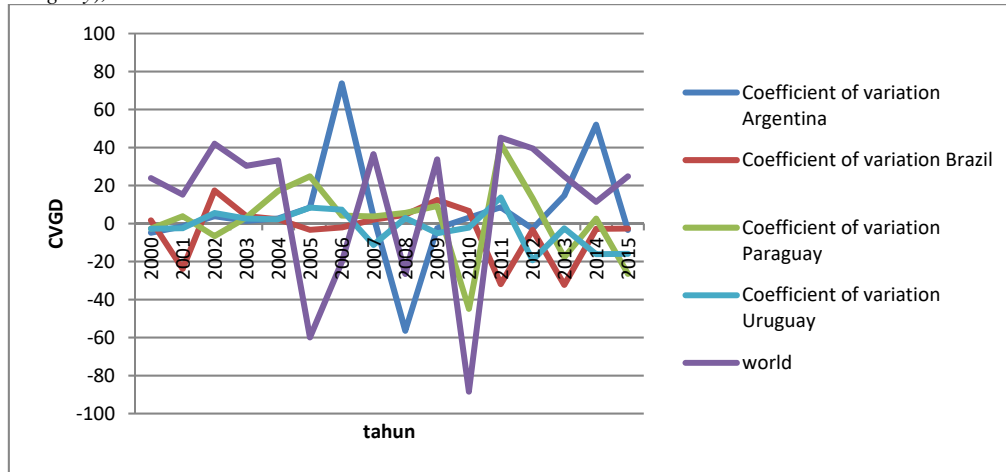
**Figure 3.** Trends in Dynamic Specialization (DS), 2000-2015



**Source:** UN\_COMTRADE (2017), the author's calculation.

Figure 4 shows the unbalanced value of domestic economic growth (CVGD) obtained from the value of the coefficient of variation of Value-added GDP of each country in 7 sectors. The results show that neither Argentina, Brazil, Paraguay nor Uruguay from 2000-2015 has values that are not equal to 0. This means that based on Widodo and Shaleh (2010) and Todaro and Smith (2011), it shows unbalanced economic growth. In addition to domestic Unbalanced Economic growth, the world's economic growth also, unbalanced. Where the coefficient value of world variation is not equal to zero.

**Figure 4.** Domestic Unbalanced Economic Growth (CVGD) in Mercosur (Argentina, Brazil, Paraguay, and Uruguay), 2000-2015



Source: UNSD (2017), the author's calculation.

Based on Bowen (1998) economic growth in a country does not balanced can be caused by the change of the  $k$  input (capital) or  $l$  (labor) or changes in the technology used in each sector. According to Todaro and Smith (2011) "structural change" from agricultural sector basis toward manufacturing and services cause unbalanced economic growth is because of non-homothetic preference. The consequences of the law Engel, where aggregate consumption of agricultural commodities increases less that proportionally with the growth of per capita income because The relative change in the contribution of each sector to total output Extensive industrialization in Mercosur has also been the main reason for unbalanced economic growth. The innovation (Romer, 1990), the role of technology (Edwards, 1992) and accumulation of human capital (Lucas, 1993) are causing of unbalance economic growth.

**Table 1.** Estimation results

Coefficient	Argentina	Brazil	Paraguay	Uruguay
Unbalanced domestic economic growth (cvdg)	0.0001936*** (0.0005262)	0.0006814** (0.0003032)	-0.0012179 (0.0029154)	-0.0005557 (0.0011969)
Unbalanced world economic growth (cvdw)	-0.0000187 (0.0000209)	1.6100E-06 (0.0000359)	0.0000262 (0.0000853)	-0.0000111 (0.0000165)
Constant	0.9423431** (0.0132893)	0.9145472** (0.0256002)	0.7945173** (0.0587888)	0.9235985** (0.0115728)

Notes: \*, \*\*, \*\*\* mean statistically significant at the level of significance 1%, 5%, and 10% respectively. Figures in parenthesis () represent standard error

In Table 1 shows the results of the estimation of the econometric model (6) for country Argentina, Brazil, Paraguay, and Uruguay. The value of Constant ( $\mu_0$ ) shows the coefficient dynamic specialization when the domestic economic growth and world economic growth are balanced. Visible all countries have a value smaller than one, this implies that Argentina, Brazil, Paraguay, and Uruguay will have de-specialization if the domestic economic growth and the world economic growth are the simultaneously balanced type. When conditions are balanced, Paraguay would have faster de specialization than Brazil,



Argentina, and Uruguay. Seen from the value of the constant is much smaller than the 3 other countries ( $0.7945173 < 0.9145472 < 0.9423431 < 0.9235985$ ).

The value of the coefficient  $\mu_1$  is the value of domestic Unbalanced Economic Growth (CVGD). It is apparent that the coefficient  $\mu_1$  countries Argentina and Brazil worth positive and significant impact on the alpha 1 % to Argentina and 5 % for Brazil. This shows that for the case of countries Argentina and Brazil, their domestic unbalanced sectoral-growth has caused the increase in specialization. The higher unbalanced domestic economic growth, the higher specialized is the exports. This results in line with the research Widodo and Shaleh (2010) who find that Korea, Malaysia, and Indonesia have positive relations between the unbalanced economic growth of trade specialization.

Different countries with Paraguay and Uruguay which is also the one area of economic integration (Mercosur). Domestic unbalanced economic growth in Paraguay and Uruguay have a negative impact and not significant for trade specialization. The higher unbalanced is the domestic economic growth, the less specialized is exports. This results in line with the research Widodo (2010) who find that Singapore has a positive relation between the unbalanced economic growth of trade specialization. According to Edwards (1992) in Widodo and Shaleh (2010) suggest that the incentive for research and in turn long-run growth will reduce because of trade. So that this is possible causes unbalanced economic growth related negative trade specialization.

The coefficient  $\mu_2$ , shows the effects of unbalanced economic growth globally. The result shows that the World unbalanced economic growth and all countries, both in the equation Argentina, Brazil, Paraguay and Uruguay did not significantly affect the countries dynamic specialization. This implies that the countries' dynamic specialization is a domestic issue rather than an international competition one.

Widodo and Shaleh (2010) stated that this can happen because the countries are considered as small countries in the world competition and they behave as 'price taker of'. Hence, the world economic growth is as a given thing and the countries only adjust their trade specialization based on domestic supports such as technologies, infrastructures, human resources, capital, labor, etc.

#### D. Conclusion

This paper aims to analyze how the impact from unbalanced economic sectoral-growth on dynamic trade specialization. Now the results obtained the country Argentina and Brazil possesses positive relations and significantly affect the dynamic trade specialization, but not for the case of the country Paraguay and Uruguay. In addition, the world unbalanced economic growth has a relationship that did not significantly affect the Dynamic trade specialization all countries selected in this research.

### Acknowledgements

The author wishes to thank Lembaga Pengelola Dana Pendidikan (LPDP) Ministry of Finance Republic Indonesia who has funded this research and *Theoretical and Applied Economics* (TAE) that the authors follow. As well as for the Master of Science and Doctorate, Faculty of Economics and Business, Universitas Gadjah Mada who helped support the research. Without the help of all parties above, the research that the authors do will be difficult to happen.

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