



## Does Distance Blockade to Trade Interactions in Kalimantan Tengah Province?

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### Article

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### Abstract

Previous study has clarified that distance is a deterrent to the communication of exchange relations among districts and a few others show the contrary outcomes. This examination expects to recognize the degree of gravity displaying in keeping up the suspicion that distance is a boundary to trade interactions between the growth poles and its hinterlands. This sort of examination is quantitative spellbinding and was done purposively in the Province of Kalimantan Tengah, considering the welfare's imbalance occurs. Optional information is acquired by documentation at BPS, in particular the Real GRDP and HDI for the 2014-2018 period by Regency/City, and their distances. Examination of the connection of exchange relations at the development community utilizes a correlation of 2 changed models of the estimation of the gravity list by including pointers of proportions of thriving, specifically GRDP and HDI. The consequences of this examination give another commitment which demonstrates that the HDI as a proportion of flourishing can more readily mirror the hypothesis of gravity than the GDRP. Accordingly, these outcomes affirm that expanding access and offices for wellbeing, instruction, exchange and transportation foundation administrations can be utilized as an answer in endeavors to productivity the collaboration of exchange relations.

## INTRODUCTION

The process of economic development requires economic growth while as yet focusing on decency in income sharing (Sukirno, 2015), the character of economic growth, specifically how to accomplish it, who partakes, and focused on areas, just as institutional plans (Todaro & Smith, 2011). This recommends that the issue of imbalance ought not be happens constantly in most regions amidst progress on indicators of welfare such as the one in the Province of Kalimantan Tengah.

Kalimantan Tengah as one of the areas which comprises of 14 regencies/urban communities in Indonesia, has encountered

imbalance of success in the majority of its locales over the most recent five years. In view of the distribution of BPS information (2018, 2019a), the nature of the 2014-2018 economic, social and wellbeing pointers through the Human Development Index (HDI) just as the 2014-2018 monetary marker amount information, to be specific Real GDRP, affirms that there are as yet nine regions that are less than ideal - arrived at the midpoint of yearly. This demonstrates that it is as yet important to zero in on dealing with improvement arranging contemplates dependent on spatial science.

**Table 1.** HDI by Regency/Municipality in Kalimantan Tengah Province 2014-2018.

| Regency            | 2014         | 2015         | 2016         | 2017         | 2018         |
|--------------------|--------------|--------------|--------------|--------------|--------------|
| Kotawaringin Barat | 70.14        | 70.60        | 71.13        | 72.11        | 72.46        |
| Kotawaringin Timur | 68.45        | 68.61        | 69.42        | 70.17        | 70.56        |
| Kapuas             | 65.29        | 66.07        | 66.98        | 68.04        | 68.68        |
| Barito Selatan     | 66.61        | 68.27        | 69.00        | 69.25        | 69.73        |
| Barito Utara       | 66.30        | 67.38        | 68.28        | 69.07        | 69.72        |
| Sukamara           | 64.44        | 65.80        | 66.40        | 66.98        | 67.52        |
| Lamandau           | 67.53        | 68.30        | 68.54        | 69.17        | 69.70        |
| Seruyan            | 63.49        | 64.77        | 65.40        | 66.14        | 67.04        |
| Katingan           | 65.79        | 66.81        | 67.41        | 67.56        | 67.91        |
| Pulang Pisau       | 65.00        | 65.76        | 66.49        | 67.00        | 67.54        |
| Gunung Mas         | 68.13        | 69.24        | 69.73        | 69.95        | 70.23        |
| Barito Timur       | 69.12        | 69.71        | 70.33        | 70.57        | 70.82        |
| Murung Raya        | 66.10        | 66.46        | 66.96        | 67.16        | 67.56        |
| Palangkaraya       | 78.50        | 78.62        | 79.21        | 79.69        | 80.34        |
| <b>Average</b>     | <b>67.77</b> | <b>68.53</b> | <b>69.13</b> | <b>69.79</b> | <b>70.42</b> |

Source: BPS data (processed)

It can be seen from the table 1, it can be concluded that the advancement of the number of HDI on every year (2014-2018) has not shown the equalization yet either the welfare on economy or social in some of the regencies in Kalimantan Tengah Province. Based on the data

above, it is found that 9 regencies that can be seen developed every year are still under HDI average; the regency of Kapuas, Barito Selatan, Barito Utara, Sukamara, Lamandau, Seruyan, Katingan, Pulang Pisau and Murung Raya.

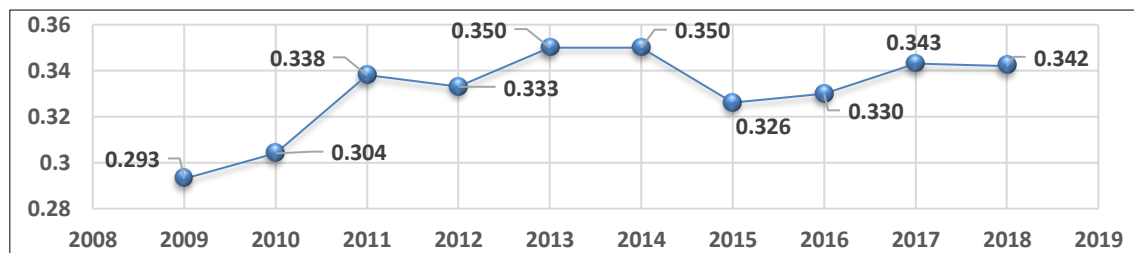
**Table 2.** Real GRDP by Regency/Municipality in Kalimantan Tengah-Indonesia 2014-2018

| Regency            | 2014           | 2015           | 2016           | 2017           | 2018           |
|--------------------|----------------|----------------|----------------|----------------|----------------|
| Kotawaringin Barat | 9423.20        | 10113.30       | 10704.70       | 11441.60       | 12180.90       |
| Kotawaringin Timur | 12851.00       | 13836.00       | 14932.80       | 16126.10       | 17255.80       |
| Kapuas             | 7682.90        | 8241.40        | 8842.10        | 9515.80        | 10182.80       |
| Barito Selatan     | 3367.50        | 3554.10        | 3754.10        | 3971.20        | 4195.10        |
| Barito Utara       | 5410.40        | 5696.50        | 6008.60        | 6369.60        | 6748.40        |
| Sukamara           | 2116.60        | 2243.50        | 2381.10        | 2531.30        | 2687.00        |
| Lamandau           | 2699.80        | 2882.20        | 3074.90        | 3280.80        | 3506.40        |
| Seruyan            | 4700.30        | 4943.20        | 5196.30        | 5467.50        | 5754.50        |
| Katingan           | 3746.30        | 3990.90        | 4252.00        | 4531.10        | 4829.60        |
| Pulang Pisau       | 2490.50        | 2682.60        | 2845.30        | 3012.00        | 3191.00        |
| Gunung Mas         | 2504.50        | 2678.70        | 2866.20        | 3064.80        | 3276.70        |
| Barito Timur       | 4065.20        | 4274.80        | 4510.00        | 4779.60        | 5054.20        |
| Murung Raya        | 4382.50        | 4684.20        | 4953.90        | 5244.70        | 5538.80        |
| Palangkaraya       | 7730.50        | 8286.00        | 8859.50        | 9476.50        | 10150.90       |
| <b>Average</b>     | <b>5226.51</b> | <b>5579.10</b> | <b>5941.54</b> | <b>6343.76</b> | <b>6753.72</b> |

Source: BPS data (processed)

Based on the Real GRDP data above (table 2), it is found that 9 regencies which develop consistently on every year were still under the average standard of GRDP of regency / city. Those regencies are the regency of Barito Selatan, Sukamara, Lamandau, Seruyan, Katingan, Pulang Pisau, Gunung Mas, Barito Timur, dan Murung Raya.

Based on Gini data index in Kalimantan Tengah in 2018 0.342 shows that there are still on Inequality in terms of welfare between regions (Central Statistic Agency, 2019a). In general, due to Gini trend index, the ratio would develop in the latest period of 9 years (2009-2018), with the the level of income inequality was 0.29 in 2009 to 0.34 in 2018.

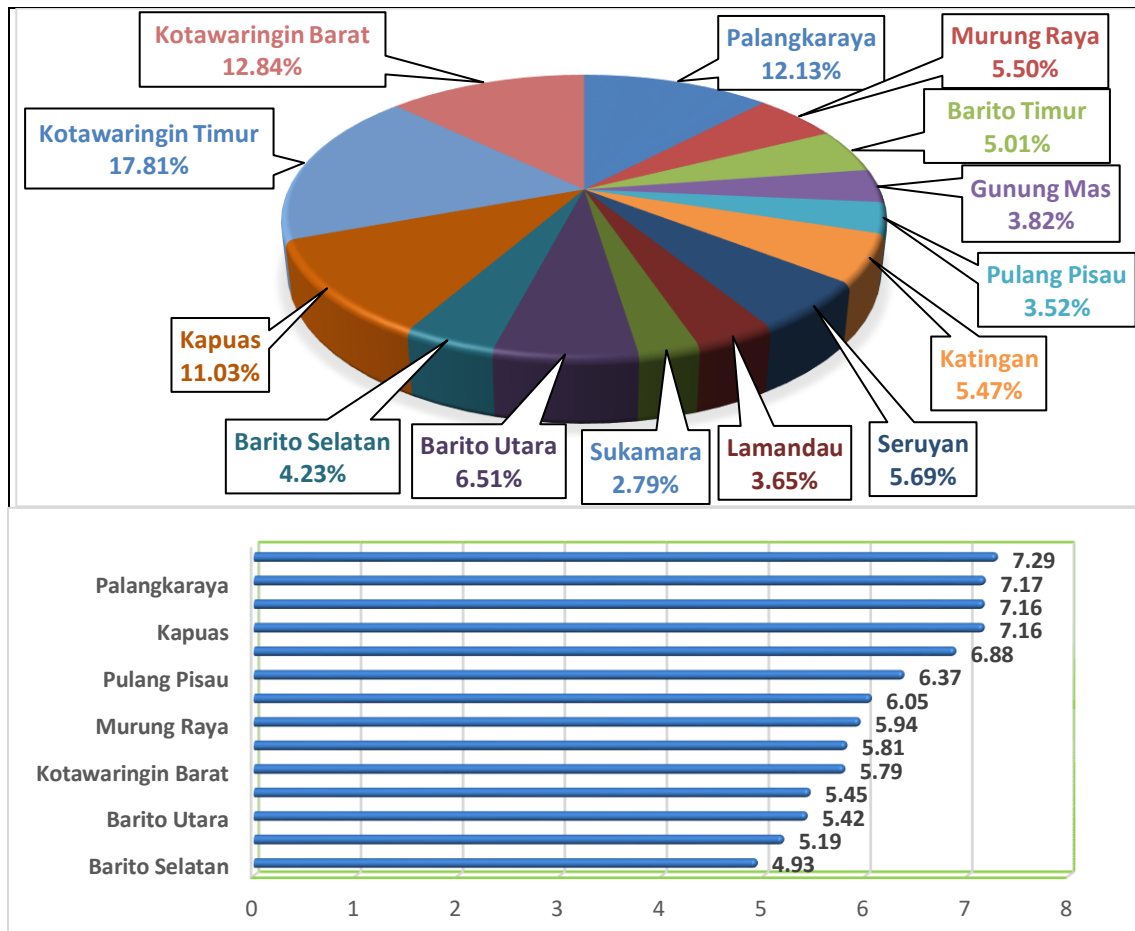
**Figure 1.** Gini Index in Kalimantan Tengah Province, 2009-2018

Source: BPS data (processed)

Previous studies, stated that the center of economic growth in the Kalimantan Tengah region is Palangkaraya City and Kotawaringin Barat Regency (Pratiwi & Kuncoro, 2016). Over time, the center of growth was re-declared in Palangkaraya City, Kotawaringin Barat Regency and the birth of Kotawaringin Timur Regency as a new growth center (Pratiwi, 2017). Further research and the elaboration below will be based on Putra, et all's article (2020) states the potential of Palangkaraya City, Kotawaringin Barat

Regency, Kotawaringin Timur, and new additions to Gunung Mas Regency as a growth center in the Kalimantan Tengah region. This is in line considering that Kotawaringin Timur and Kotawaringin Barat Regencies dominate 17.81 and 12.84% in the formation of the total PDRB of districts / cities in Kalimantan Tengah, while Palangkaraya City and Gunung Mas Regency are the regions with the highest growth rate of 7.29% and 7.17% (Central Statistic Agency, 2020a).

**Figure.2** Contribution and Rate of Economic Growth in Districts/Cities of Kalimantan Tengah in 2019



Source: BPS data (processed)

As of recently, the difficulties of the issue of flourishing disparity in different districts in Indonesia have made this investigation broadly directed. The hypothesis of growth centers is accepted to invigorate the economy and produce a spread impact for the encompassing territory (Rossi, 2020; Rustiadi, 2018; Saragih, 2015; Tarigan, 2012) sounds natural in many territorial based examination articles. This likewise proposes that the investigation of the association of exchange relations Kalimantan Tengah Province is a need to be read considering the open door for the capacity to spreadeffect by every growth center to its encompassing territories can have great potential in battling the issue of disparity that happens.

In light of the economic base hypothesis suspicions, the similar preferred position of an area will open up open doors for expanded

exchange communications through inventory (send out) exercises to different locales, which thusly will build the development of the district of root. Besides, the expansion in the flourishing development of the districts of cause additionally opens open doors for expanded exchange relations through interest (imports) to different locales. This recommends that there is a collaboration of exchange relations between districts so the expected extent of provincial (spatial) reliance can't be overlooked being developed arranging displaying.

Unlike previous research (Inayah, Oktaviani, & Daryanto, 2016; Kassa, 2013; Khayat, 2019; Kuik, Branger, & Quirion, 2019; Mubarakah, 2020; Muharami & Novianti, 2018; Ridwannulloh & Sunaryati, 2018; Rindayati & Kristriana, 2018; Rizal, 2018; Sahat, Nuryartono, & Hutagaol, 2018; Salam &

Nugroho, 2016; Suryanta, 2012; Wahyudi & Anggita, 2015) which uses GDP and / or GDP per capita as a variable measure of mass economic potential in gravity modeling, this research also involves the Human Development Index (HDI) indicator as an update and comparison of the GDRP. Potential macroeconomic achievements that include economic and social elements (purchasing power, education and health) can also be reflected through the Human Development Index (HDI) indicator (Sjafrizal, 2014). The high HDI figure is a reflection of the demand for human capital investment (education, training and health) which leads to productivity opportunities (including purchasing power and income) and in turn will increase the interaction of trade relations between regions. An increase in the average length of schooling and life expectancy has a significant positive effect on labor productivity (Puspasari & Handayani, 2020). Therefore, the development of this study also includes the HDI variable as an indicator of the economic size in the original gravity modeling.

Based on previous studies using population and distance variables in their gravity analysis (Ardila, 2012; Emalia & Farida, 2018; Nainggolan, 2013; Panjiputri, 2013; Putra, Badjuri, & Anifatul, 2017; Soares, Rustiadi, & Mulatsih, 2017), this study also presents a modified update through a comparison of 2 original gravity models involving the Human Development Index (HDI) as an update on the coverage of the welfare indicators (i.e., economically and socially). In contrast to the previous study, this study also adds a suitability analysis between the ranking of trade relations interactions with the order of distance between regions. Thus, this is also a proof of the gravity assumption with a different perspective from the analysis that includes the distance variable using the regression method in previous studies (Inayah et al., 2016; Kassa, 2013; Khayat, 2019; Kuik et al., 2019; Mubarokah, 2020; Muharami & Novianti, 2018; Ridwannulloh & Sunaryati, 2018; Rindayati & Kristriana, 2018; Rizal, 2018;

Sahat et al., 2018; Salam & Nugroho, 2016; Suryanta, 2012; Wahyudi & Anggita, 2015).

The economic development pace of a locale is affected by determinants both from the district itself and different areas, just as the economic development of different districts (Aspiansyah & Damayanti, 2019). The part of fares and imports in PDRB regions/urban communities in Kalimantan Tengah contributes extraordinarily and an excess actually rely upon being met from different areas (Central Statistic Agency, 2020a). All in all, regions/urban communities in Kalimantan Tengah Province actually need different territories with an end goal to build the development of expectations for everyday comforts and success through the association of exchange relations. This foundation proposes that the investigation of exchange relations associations involves advantage to be examined and incorporates distance which is obviously firmly identified with the effectiveness of giving framework administrations, time and appropriation costs that should be borne by trade import exercises (Mubarokah, 2020). Moreover, this article has a research problem and the gap about the potential for cooperation between exchange relations between development focuses and different regions/urban communities (hinterland) in Kalimantan Tengah Province.

The gravity model is generally utilized in clarifying the cooperation of exchange relations between districts (counting development focuses and zones behind them) and further work is additionally utilized in deciphering exchange execution through the volume or worth made from fare and import exercises. The connection between exchange associations has a positive relationship with macroeconomic execution markers (economic aspects size) claimed by an area, for example, GDP, populace, offices, business fields, and is contrarily identified with distance (Kuik et al., 2019; Sjafrizal, 2014; Tarigan, 2012). Alluding to the hypothesis of gravity and a few examination results on exchange execution between nations, distance is a potential hindrance that clarifies the decrease in exchange association/execution/volume with

expanding distance (Host, Skender, & Zaninović, 2019; Inayah *et al.*, 2016; Kassa, 2013; Muharami & Novianti, 2018; Ridwannulloh & Sunaryati, 2018; Rindayati & Kristriana, 2018; Rizal, 2018; Sjafrizal, 2014; Tarigan, 2012).

Yet on the other hand, the implementation of gravity modeling also shows the opposite that the distance is not significant in affecting the export and import trade performance of the Environmental Goods List (EGs) in Indonesia (Salam & Nugroho, 2016). Likewise, in Sahat's research (2018) it was found that economic distance did not show significant results on the performance of Indonesia's coffee export trade. Furthermore, still in Putra's article; it is explained that the interaction of trade relations in Kalimantan Tengah Province by including GRDP as an indicator of economic prosperity (economic size), there are results that still indicate trade relations in 4 growth centers are stronger to regions that are further away such as: (1) Palangkaraya City with Kapuas District (142 km) instead of Pulang Pisau Regency (98 km); Palangkaraya City with Kotawaringin Timur Regency (227 km) instead of Barito Selatan (183 km) and Gunung Mas (180 km); Palangkaraya City with Kotawaringin Barat District (449 km) rather than Murung Raya (411 km); (2) Kotawaringin Timur District with Kapuas (369 km) instead of Lamandau District (332 km) and Pulang Pisau (325 km); Kotawaringin Timur District with Barito Utara (583 km) instead of Gunung Mas Regency (407 km); Kotawaringin Timur Regency with Murung Raya (638 km) than Sukamara Regency (459 km); (3) Kotawaringin Barat Regency with Kotawaringin Timur (222 km) instead of Lamandau (110 km); Kotawaringin Barat District with Palangkaraya City (449 km) instead of Sukamara (237 km) and Katingan (361 km), Kotawaringin Barat Regency with Kapuas (591 km) rather than Seruyan (452 km); Kotawaringin Barat District with Barito Utara (805 km) instead of Barito Timur (725 km) and Gunung Mas (629 km); (4) Gunung Mas District to Kapuas (322km) rather than to Katingan District (268km).

In order to fill the gap above, this study aims to identify the extent to which gravity

modeling maintains the assumption that distance is a barrier to the interaction of trade relations between growth centers (growth poles) and hinterland areas in Kalimantan Tengah Province. First, the results of the study provide an overview of the strength of the interaction of trade relations between districts / cities as a reference for implementing regulations and cooperation in order to overcome the problem of wealth inequality. Second, the results of the study show that distance is a matter that must be considered by district / city governments in Kalimantan Tengah Province.

## RESEARCH METHODS

This examination is a quantitative expressive investigation which was led purposively dependent on the issue of disparity of thriving in the Kalimantan Tengah. Auxiliary information is gotten by documentation at the BPS, specifically the Gross Regional Domestic Product (GRDP) at 2010 Constants Market Prices for the 2014-2018 period, the Human Development Index (HDI) for the 2014-2018 period by Regency/City, and the distance between regions/urban areas in the Province of Kalimantan Tengah.

As referring to our previous research; determination of regions as growth centers is carried out by documentation referring to previous research publications; Palangkaraya City, Kotawaringin Barat Regency, Kotawaringin Timur and Gunung Mas Regency. The regency / city is declared a developed region (based on the 2014-2018 Klassen Typology) where the Human Development Index (HDI) and economic growth rate (GRDP rate) are above the average of Kalimantan Tengah Province; and (2) supported by relatively good potential for base sector advantages (Central Statistic Agency, 2017d, 2017b, 2017c, 2017a, 2019b). This is also reinforced by the publication of BPS data (2020a) that: (1) the wheels of the economy of Kalimantan Tengah Province 2019 are driven by Palangkaraya City, Kotawaringin Barat Regency, Kotawaringin Timur regency by 42.78%; (2) the priority order of the highest

growth rate in 2019 was achieved by Gunung Mas Regency at 7.29%, and Palangkaraya City (7.17%), and Kotawaringin Timur Regency (7.16%); (3) The highest priority ranking for the 2019 GRDP is achieved by Kotawaringin Timur Regency (26.8 trillion), Kotawaringin Barat Regency (19.3 trillion), and Palangkaraya City (18.3%). Furthermore, the area other than the four growth centers is referred to as the hinterland.

Referring to Tarigan (2012), there are several measures of mass or potential such as population, business fields, income, public facilities, distance, and so on which can affect the interaction or attractiveness between regions. Furthermore, in regional interactions, there are inhibiting variables including the geographical distance between the two regions (Almog, Bird, & Garlaschelli, 2019). This is in line with previous studies (Ardila, 2012; Emalia & Farida, 2018; Nainggolan, 2013; Putra et al., 2017), so that the formulation of the gravity model is as follows:

$$T_{ij} = k \frac{(P_i.P_j)}{(d_{ij})^b} \dots\dots\dots (1)$$

Where,  $T_{ij}$  is a regional interaction;  $k$  is a constant number;  $P_i$  and  $P_j$  are the population of the city of origin and city of destination;  $d_{ij}$  describes the distance between the city of origin and destination with the power  $b$ .

In order to measure the magnitude of trade relations between regions the formula can be modified slightly by using economic indicators where  $Y_i$  and  $Y_j$  are the GRDP between the two regions (Sjafrizal, 2014).

$$G = k \frac{(Y_i.Y_j)}{(d_{ij})^b} \dots\dots\dots (2)$$

Furthermore, the development of modification of regional interaction modeling was also found by multiplying the indicators of economic prosperity using the GDRP per capita by Panjiputri (2013), GDP by Tan (2016), and GRDP by Sugestiadi (2020) with the indicator of the population of a region. Based on these assumptions, the general formulation can be concluded as follows:

$$Spatial\ Interactions = k \frac{(G_i.G_j.Q_i.Q_j)}{(d_{ij})^b} \dots\dots\dots (3)$$

Where,  $k$  is a constant number;  $G_i$  and  $G_j$  are the GRDP or GDP between the two regions;  $Q_i$  and  $Q_j$  represent the population between the two regions;  $d_{ij}$  describes the distance between the two regions to the power of  $b$ .

In this study, the analysis of the interaction of growth centers trade relations in Kalimantan Tengah Province uses a comparison of 2 modified models of gravity index calculations by including indicators of welfare measures both economically; GRDP and economically and socially, namely the Human Development Index (HDI). It stands to reason that HDI is a measure of prosperity that has accommodated economic and social elements (purchasing power, health and education). HDI is a key dimension of human development (healthy and long life; educated and having a decent standard of living) which is summarized on average (Central Statistic Agency, 2020b).

$$Gravity\ Index\ (IG) = k \frac{(H_i.H_j)}{(d_{ij})^b} \dots\dots\dots (Model\ 1)$$

$$Gravity\ Index\ (IG) = k \frac{(H_i.H_j.Y_i.Y_j)}{(d_{ij})^b} \dots\dots\dots (Model\ 2)$$

Where,  $k$  is the simplified constant = 1;  $H_i$  is the district / city HDI as the analyzed growth center;  $H_j$  is the HDI of the hinterland region / city analyzed;  $Y_i$  is ADHK's GRDP as the growth center analyzed;  $Y_j$  is the PDRB ADHK district / city of the hinterland region analyzed;  $(d_{ij})$  describes the distance between the two districts / cities by referring to gravity modeling; the distance as an obstacle to the interaction of trade relations; and  $b$  is the power of  $d_{ij} = 2$ .

This research attempts to contribute in resolving the issue of inequality of prosperity in Kalimantan Tengah Province. Therefore, nine districts affected by inequality in economic and social prosperity (having consistently below average HDI during the 2014-2018 period) are Kapuas, Barito Selatan, Barito Utara, Sukamara, Lamandau, Seruyan, Katingan, Pulang Pisau, and Murung Raya is used as a target reference for recommendations for the implementation of trade regulation and cooperation by the growth-

center based on the priority order of trade relationship interaction analysis.

## RESULTS AND DISCUSSION

The calculation of the gravity index explains the strength of attraction or trade

relationship interactions of each growth center to each district / city in Kalimantan Tengah Province. The following is the relationship of trade interactions and the order of priority based on the 2014-2018 period average.

**Table 3.** The Interaction of Trade Relations in Palangkaraya City vs. Distance

| Regency/municipality | Average of IG (model 1) | Ranking of IG (model 1) | Average of IG (model 2) | Ranking of IG (model 2) | Distance | closest distance |
|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|------------------|
| Kotawaringin Barat   | 0.0280                  | 10                      | 2,721,642.4514          | 9                       | 449      | 10               |
| Kotawaringin Timur   | 0.1068                  | 6                       | 14,466,365.9237         | 3                       | 227      | 6                |
| Kapuas               | 0.2635                  | 3                       | 21,166,647.6625         | 2                       | 142      | 3                |
| Barito Selatan       | 0.1623                  | 5                       | 5,507,511.9220          | 5                       | 183      | 5                |
| Barito Utara         | 0.0508                  | 8                       | 2,769,352.0508          | 8                       | 326      | 8                |
| Sukamara             | 0.0112                  | 13                      | 240,497.3108            | 13                      | 686      | 13               |
| Lamandau             | 0.0174                  | 12                      | 484,805.9433            | 12                      | 559      | 12               |
| Seruyan              | 0.0248                  | 11                      | 1,164,341.7209          | 11                      | 457      | 11               |
| Katingan             | 0.6869                  | 1                       | 26,421,990.2000         | 1                       | 88       | 1                |
| Pulang Pisau         | 0.5478                  | 2                       | 14,037,483.0755         | 4                       | 98       | 2                |
| Gunung Mas           | 0.1699                  | 4                       | 4,408,610.5985          | 6                       | 180      | 4                |
| Barito Timur         | 0.0730                  | 7                       | 2,976,951.2247          | 7                       | 276      | 7                |
| Murung Raya          | 0.0314                  | 9                       | 1,400,121.3373          | 10                      | 411      | 9                |
| <b>Average</b>       | <b>0.1672</b>           |                         | <b>7,520,486.2632</b>   |                         |          |                  |

Source: Research data processed, 2020

The results of the Gravity Index analysis using the HDI indicator (model 1) concludes that Palangkaraya City has a good chance of providing a spread effect on its hinterland districts with the following priority order: (1) Katingan; (2) Pulang Pisau; (3) Kapuas. This is evidenced by the fact that the three districts have a gravity index above the overall regional average (amounting to 0.1672). These results support the calculation of the gravity index which relies on the GRDP variable in our previous finding that Katingan, Pulang Pisau, and Kapuas are districts with strong trade relationship interactions above the overall regional average (although in order of priorities are not the same). However, through the formulation of model 1, new information was found that Palangkaraya City also has an above average trade relationship strength with other growth centers, namely Gunung Mas District. In an effort to combat the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, it is hoped that the recommendations for implementing regulations

and trade cooperation for Palangkaraya City are expected to lead to and be improved in order of priority to the following districts: (1) Katingan; (2) Pulang Pisau; (3) Kapuas; (4) Barito Selatan; (5) Barito Utara; (6) Murung Raya; (7) Seruyan; (8) Lamandau; (9) Sukamara.

The results of the analysis of model 2 in table 3 show that Palangkaraya City has the strength of trade relations above the average of the hinterland districts with the following priority order: (1) Katingan; (2) Kapuas; and (3) Pulang Pisau. This result is fully in line with previous study; where the gravity index calculation rests on the economics size variable referring to GRDP only. In addition, Palangkaraya City also has the potential for trade relations above average to other growth centers; Kotawaringin Timur Regency. More deeply, instead of fighting the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, the recommendations for implementing regulations and trade cooperation in Palangkaraya City are expected to lead to and be increased in order of



priority to the following districts: (1) Katingan; (2) Kapuas; (3) Pulang Pisau; (4) Barito Selatan; (5) Barito Utara; (6) Murung Raya; (7) Seruyan; (8) Lamandau; (9) Sukamara.

In general, model 1 fully shows the correspondence between the gravity index

ranking with the order of the distance. By comparing the two models, model 1 further supports the assumption that the farther the distance results in the further trade relationship interactions.

**Table 4.** The Interaction of Trade Relations in Kotawaringin Timur Regency vs. Distance

| Regency/municipality | Average of IG (model 1) | Ranking of IG (model 1) | Average of IG (model 2) | Ranking of IG (model 2) | Distance | closest distance |
|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|------------------|
| Kotawaringin Barat   | 0.10                    | 3                       | 16,462,850.58           | 1                       | 222      | 2                |
| Kapuas               | 0.03                    | 7                       | 4,636,036.38            | 5                       | 369      | 7                |
| Barito Selatan       | 0.03                    | 9                       | 1,622,280.00            | 8                       | 410      | 9                |
| Barito Utara         | 0.01                    | 12                      | 1,280,357.93            | 10                      | 583      | 12               |
| Sukamara             | 0.02                    | 10                      | 794,342.71              | 13                      | 459      | 10               |
| Lamandau             | 0.04                    | 6                       | 2,032,372.32            | 6                       | 332      | 6                |
| Seruyan              | 0.09                    | 4                       | 6,796,385.44            | 4                       | 230      | 4                |
| Katingan             | 0.24                    | 1                       | 15,659,420.56           | 2                       | 139      | 1                |
| Pulang Pisau         | 0.04                    | 5                       | 1,887,322.80            | 7                       | 325      | 5                |
| Gunung Mas           | 0.03                    | 8                       | 1,275,135.63            | 11                      | 407      | 8                |
| Barito Timur         | 0.02                    | 11                      | 1,325,132.08            | 9                       | 503      | 11               |
| Murung Raya          | 0.01                    | 13                      | 859,073.33              | 12                      | 638      | 13               |
| Palangkaraya         | 0.11                    | 2                       | 14,466,365.92           | 3                       | 227      | 3                |
| <b>Average</b>       | <b>0.06</b>             |                         | <b>5,315,159.67</b>     |                         |          |                  |

Source: Research data processed, 2020

The results of the Gravity Index analysis using the HDI indicator (model 1) concludes that Kotawaringin Timur Regency has a good chance of providing a spread effect to the hinterland districts in the following priority order: (1) Katingan; and (2) Seruyan. This is evidenced by the fact that the two districts have a gravity index above the overall regional average (0.06). These results support the calculation of the gravity index which relies on the GRDP variable in the previous study that Katingan and Seruyan are districts with strong trade relations interactions above the overall regional average. In line with the previous study; this research also shows that Kotawaringin Timur Regency has the strength of the interaction of trade relations above average with other growth centers; Kotawaringin Barat Regency and Palangkaraya (although the priority order is not the same). In an effort to combat the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, it is hoped that the recommendations for implementing regulations and trade cooperation

for Palangkaraya City are expected to lead to and be improved in order of priority to the following districts: (1) Katingan; (2) Seruyan; (3) Pulang Pisau; (4) Lamandau; (5) Kapuas; (6) Barito Selatan; (7) Sukamara; (8) Barito Utara; (9) Murung Raya.

The results of the analysis of model 2 in table 4 show that Kotawaringin Timur Regency has the strength of trade relations above the average of the hinterland districts with the following priority order: (1) Katingan; and (2) Seruyan. In essence, Kotawaringin Timur Regency also has the potential for trade relations above average to other growth centers in the following order, namely (1) Kotawaringin Barat Regency; and (2) Palangkaraya City. This result shows that gravity index calculation relies on the economics size variable referring to GRDP only. Slightly different from previous research (Putra et al., 2020), this result shows that the strength of the trade relationship between Kotawaringin Timur Regency and Kotawaringin Barat Regency is greater than that of Katingan

Regency. However, in general it is supported by our previous study that Kotawaringin Timur Regency has the potential for trade relations above the average in the four districts / cities. More deeply, instead of fighting the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, the recommendations for implementing regulations and trade cooperation in Palangkaraya City are expected to lead to and be increased in order of priority to the following districts: (1) Katingan; (2) Seruyan; (3) Kapuas; (4) Lamandau; (5) Pulang Pisau; (6) Barito Selatan; (7) Barito Utara, (8) Murung Raya; (9) Sukamara.

Model 1 shows that the gap in the theory of gravity is only found in the inverse position between the interaction relationship between Kotawaringin Timur Regency and Palangkaraya City (227 km) which is stronger than Kotawaringin Barat Regency which has a closer distance (222 km). But apart from that, generally model 1 shows the suitability of the gravity index ranking with its distance order relationship. By comparing the two models, model 1 further supports the assumption that the farther the distance results in the further trade relationship interactions.

**Table 5.** The Interaction of Trade Relations in Kotawaringin Barat Regency vs. Distance

| Regency/municipality | Average of IG (model 1) | Ranking of IG (model 1) | Average of IG (model 2) | Ranking of IG (model 2) | Distance | closest distance |
|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|------------------|
| Kotawaringin Timur   | 0.10                    | 2                       | 16,462,850.58           | 1                       | 222      | 2                |
| Kapuas               | 0.01                    | 8                       | 1,330,003.00            | 6                       | 591      | 8                |
| Barito Selatan       | 0.01                    | 10                      | 502,632.78              | 8                       | 632      | 10               |
| Barito Utara         | 0.01                    | 12                      | 494,358.99              | 9                       | 805      | 12               |
| Sukamara             | 0.08                    | 3                       | 2,193,212.23            | 4                       | 237      | 3                |
| Lamandau             | 0.40                    | 1                       | 13,627,621.83           | 2                       | 110      | 1                |
| Seruyan              | 0.02                    | 6                       | 1,295,580.27            | 7                       | 452      | 6                |
| Katingan             | 0.04                    | 4                       | 1,708,967.00            | 5                       | 361      | 4                |
| Pulang Pisau         | 0.02                    | 7                       | 490,441.71              | 10                      | 547      | 7                |
| Gunung Mas           | 0.01                    | 9                       | 392,969.39              | 12                      | 629      | 9                |
| Barito Timur         | 0.01                    | 11                      | 469,617.93              | 11                      | 725      | 11               |
| Murung Raya          | 0.01                    | 13                      | 348,082.20              | 13                      | 860      | 13               |
| Palangkaraya         | 0.03                    | 5                       | 2,721,642.45            | 3                       | 449      | 5                |
| <b>Average</b>       | <b>0.06</b>             |                         | <b>3,233,690.80</b>     |                         |          |                  |

Source: Research data processed, 2020

The consequences of the Gravity Index examination utilizing the HDI marker (model 1) reasons that Kotawaringin Barat has a decent possibility of giving a spread impact to the hinterland regions in the accompanying need request: (1) Lamandau; and (2) Sukamara. This is confirmed by the way that the two areas have a gravity list over the in general territorial normal (0.06). These outcomes uphold the count of the gravity list which depends on the GRDP variable in the past investigation (Putra et al., 2020) that Lamandau is a region with the strength of exchange relations connections over the generally speaking provincial normal. Moreover, the aftereffects of this examination affirm the new

discoveries that Kotawaringin Barat likewise has great potential in exchanging relations with Sukamara Regency. In accordance with past investigations (Putra et al., 2020), this investigation additionally shows that Kotawaringin Barat Regency has a better-than-expected exchange relationship cooperation strength with other development places, specifically Kotawaringin Timur Regency. With an end goal to battle the issue of economic and social success imbalance that has happened in 9 locales over the most recent 5 years, the proposals for executing guidelines and exchange participation Kotawaringin Barat Regency are relied upon to lead and be improved arranged by

need to the accompanying regions: (1) Lamandau; (2) Sukamara; (3) Katingan; (4) Seruyan; (5) Pulang Pisau; (6) Kapuas; (7) Barito Selatan; (8) Barito Utara; (9) Murung Raya.

Kotawaringin Barat Regency has the strength of exchange relations over the normal towards its hinterland, which is just to Lamandau Regency. Likewise, Kotawaringin Barat Regency additionally has the potential for exchange relations better than expected to other development habitats, to be specific just to Kotawaringin Timur Regency. This outcome is completely in accordance with past investigations (Putra *et al.*, 2020), where the gravity record estimation lays on the economic aspects size variable alluding to GRDP as it were.

All the more profoundly, rather than battling the issue of economic and social imbalance that has happened in 9 areas over the most recent 5 years, the proposals for actualizing guidelines and exchange participation Kotawaringin Barat Regency are required to lead and be improved arranged by need to the accompanying regions: (1) Lamandau; (2) Sukamara; (3) Katingan; (4) Kapuas; (5) Seruyan; (6) Barito Selatan; (7) Barito Utara; (8) Pulang Pisau; (9) Murung Raya.

Model 1 fully shows the suitability between the gravity index ranking with its distance order relationship. By comparing the two models, model 1 further supports the assumption that the farther the distance results in the further trade relationship interactions.

**Table 6.** The Interaction of Trade Relations in Gunung Mas Regency vs. Distance

| Regency/municipality | Average of IG (model 1) | Ranking of IG (model 1) | Average of IG (model 2) | Ranking of IG (model 2) | Distance | closest distance |
|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|------------------|
| Kotawaringin Barat   | 0.0125                  | 10                      | 392,969.3914            | 9                       | 629      | 10               |
| Kotawaringin Timur   | 0.0291                  | 7                       | 1,275,135.6333          | 2                       | 407      | 7                |
| Kapuas               | 0.0449                  | 5                       | 1,166,409.4386          | 3                       | 322      | 5                |
| Barito Selatan       | 0.0540                  | 4                       | 592,502.8654            | 5                       | 297      | 4                |
| Barito Utara         | 0.0245                  | 8                       | 430,767.6708            | 7                       | 440      | 8                |
| Sukamara             | 0.0061                  | 13                      | 42,762.5280             | 13                      | 866      | 13               |
| Lamandau             | 0.0088                  | 12                      | 79,244.8683             | 12                      | 736      | 12               |
| Seruyan              | 0.0112                  | 11                      | 169,813.7283            | 11                      | 637      | 11               |
| Katingan             | 0.0649                  | 2                       | 807,240.3614            | 4                       | 268      | 2                |
| Pulang Pisau         | 0.0596                  | 3                       | 494,308.9901            | 6                       | 278      | 3                |
| Barito Timur         | 0.0320                  | 6                       | 422,470.8469            | 8                       | 390      | 6                |
| Murung Raya          | 0.0168                  | 9                       | 243,149.5441            | 10                      | 525      | 9                |
| Palangkaraya         | 0.1699                  | 1                       | 4,408,610.5985          | 1                       | 180      | 1                |
| <b>Average</b>       | <b>0.0411</b>           |                         | <b>809,645.1127</b>     |                         |          |                  |

Source: Research data processed, 2020

The results of the Gravity Index analysis using the HDI indicator (model 1) concludes that Gunung Mas Regency has a good chance of providing a spread effect on the hinterland districts in the following priority order: (1) Katingan; (2) Pulang Pisau; (3) Barito Selatan; (4) Kapuas. This is evidenced by the fact that the four districts have a gravity index above the overall regional average (amounting to 0.0411). These results support the gravity index which relies on the GRDP variable in the previous study that Kapuas and Katingan are districts with strong trade relationship interactions above the

overall regional average. Furthermore, the results of this study confirm the new findings that Gunung Mas District also has good potential in trade relations with Pulang Pisau and Barito Selatan Districts. Moreover, this study also shows that Gunung Mas Regency has an above average trade relationship interaction strength with other growth centers, namely Palangkaraya City. In an effort to combat the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, it is hoped that the recommendation for the implementation of regulations and trade cooperation for Gunung

Mas Regency is expected to lead to and be increased in order of priority to the following districts: (1) Katingan; (2) Pulang Pisau; (3) Barito Selatan; (4) Kapuas; (5) Barito Utara; (6) Murung Raya; (7) Seruyan; (8) Lamandau; (9) Sukamara.

The results of the analysis of model 2 in table 6 confirm that Gunung Mas Regency has a strength of trade relations above the average towards its hinterland, which is only to Kapuas Regency. In other words, these results confirm the decision that Gunung Mas District has the potential for relatively good spread of prosperity to the rear areas of Kapuas District. Apart from Kapuas District, Katingan Regency was also stated above average. This proves that the inclusion of the HDI variable in the calculation of the gravity index creates a tighter selection so that it has the potential to add to or eliminate from previous results. This is in line with the concept that the HDI indicators include economic and social variables. In addition, Gunung Mas Regency also has the potential for trade relations above the average to other growth centers in the following order; (1) Palangkaraya City; and (2) Kotawaringin Timur Regency. In depth, instead of fighting the issue of economic and social inequality that has occurred in 9 districts in the last 5 years, the recommendation for the implementation of regulations and trade cooperation in Gunung Mas Regency is expected to lead and be improved in order of priority to the following districts: (1) Kapuas; (2) Katingan; (3) Barito Selatan; (4) Pulang Pisau; (5) Barito Utara; (6) Murung Raya; (7) Seruyan; (8) Lamandau; (9) Sukamara.

Overall, model 1 fully shows the suitability between the gravity index ranking and its distance order relationship. By comparing the two models, model 1 further supports the assumption that the farther the distance results in the further trade relationship interactions.

These results give new commitments while simultaneously noting the holes in past research (Putra *et al.*, 2020) which actually demonstrate the potential for more grounded exchange relations to areas that are further away. In other words, HDI's thriving apparatus is

expressed to have the option to all the more likely mirror the positioning of exchange relations between locales than GRDP through gravity demonstrating. This is in accordance with the way that HDI is significantly more delegate in reflecting proportions of thriving than economic markers from the material side (Hariwan & Swaningrum, 2015) and the size of the broadest sosio-economic examination of advancement depends on three last goals (Todaro & Smith, 2011), to be specific long and healthy life, being knowledgeable, and have decent standard of living (Central Statistic Agency, 2020b). Human development in a broad sense is not just high income (Todaro & Smith, 2011).

Henceforth, this examination likewise contains affirmation that exchange relations collaborations are additionally assembled through intermediaries of the accomplishment of human advancement limit (wellbeing, instruction, and a decent way of life). This is in line that the core concept of high spatial interaction also requires that one of them is to have a concentration of geographical aspects of several facility sectors (Tarigan, 2012), including the availability of life facilities such as health, education, economic, industrial, and religious which are reflected in the Sub-District. Development Index (SDI) (Wulandono, Rustiadi, & Ardiansyah, 2021).

## CONCLUSION

By relying on the consequences of the examination of model 1, Palangkaraya City has a better-than-expected exchange relationship connection with Katingan, Pulang Pisau, and Kapuas Districts. Kotawaringin Timut Regency has a better-than-expected exchange relationship cooperation with Katingan and Seruyan Regencies. Kotawaringin Barat Regency has the best potential in giving an equivalent dissemination impact in Lamandau and Sukamara Regencies. Gunung Mas District has the best potential in giving an equivalent appropriation impact in Katingan, Pulang Pisau, Barito Selatan, and Kapuas district.

The utilization of model 1 shows that the yield hole is just found in the converse situation between the collaboration connection between Kotawaringin Timur Regency and Palangkaraya City (227 km) which is more grounded than Kotawaringin Barat Regency which has a closer distance (222 km). Aside from that, the request for exchange connections the 4 development habitats in Kalimantan Tengah completely compares to the positioning request of distances between districts in Kalimantan Tengah. This is another commitment explanation which expresses that the HDI pointer can more readily mirror the hypothesis of gravity which expresses that the farther the distance will bring about lower provincial exchange relations associations. As such, the after effects of gravity demonstrating in this investigation demonstrate that distance is an inhibitor of the collaboration of exchange relations between development focuses (development shafts) and hinterlands in Kalimantan Tengah Province. In accordance with the hypothesis of gravity and some exploration results on exchange execution between nations, distance is a potential boundary that clarifies the decrease in exchange connection/execution/volume with expanding distance (Host et al., 2019; Inayah et al., 2016; Kassa, 2013; Muharami & Novianti, 2018; Ridwannulloh & Sunaryati, 2018; Rindayati & Kristriana, 2018; Rizal, 2018; Sjafrizal, 2014; Tarigan, 2012).

The estimation of the gravity file utilizing HDI as the monetary size (model 1) does not dismiss any of the consequences of the association between the development place and hinterland over the normal expressed in the past Putra (2020) study utilizing the GRDP marker. Moreover, model 1 shows that the aftereffects of the communication between areas are better than expected more than past examinations (Putra et al., 2020). This is in line that HDI is a marker of flourishing with a more extensive viewpoint than GRDP and incorporates economic and social perspectives.

With the information on the planning of exchange relations collaborations, it is trusted that neighborhood governments can give more

consideration to support nature of street framework with an end goal to expand the proficiency of fare import exercises for the dissemination of provincial predominant items. In depth, nearby governments can improve the quality and amount of admittance to wellbeing and schooling offices and strategies for more favorable exchange collaboration dependent on local comparative advantages.

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