



## Hofstede's cultural dimensions in the gravity model using mixed-effect model

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### ABSTRAK

Menurut model gravitasi, semakin dekat jarak antara dua negara, maka akan semakin besar aktivitas perdagangan antara kedua negara tersebut. Penelitian ini bertujuan untuk mengetahui apakah model gravitasi berlaku pada nilai ekspor Indonesia untuk periode tahun 2002-2019. Selain jarak, penelitian ini juga mempelajari pengaruh dari populasi, PDB PPP per kapita dan dimensi-dimensi budaya Hofstede. Penelitian ini dilakukan menggunakan mixed-effect model. Hasil dari penelitian ini menunjukkan secara bersama-sama populasi, PDB PPP per kapita, jarak dan dimensi-dimensi budaya Hofstede berpengaruh signifikan terhadap nilai ekspor Indonesia. Model gravitasi terbukti berlaku dalam studi ini karena jarak memiliki pengaruh signifikan negatif terhadap nilai ekspor. Secara individual, populasi, PDB PPP per kapita dan indeks long-term orientation berpengaruh signifikan positif, sedangkan indeks masculinity berpengaruh signifikan negatif terhadap nilai ekspor. Nilai ekspor Indonesia bersifat elastis terhadap PDB PPP per kapita, populasi dan jarak. Penelitian ini juga menemukan PDB PPP per kapita mempunyai efek acak atau efeknya berbeda antar negara mitra dagang.

### ABSTRACT

According to the gravity model, the closer the distance between two countries, the trade activity between those countries will be greater. This research aims to know whether the gravity model works on Indonesian export value in 2002-2019. Besides the distance, this research also studies the effects of population, per capita PPP GDP, and Hofstede cultural dimensions. The research

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was done using a mixed-effect model. This study shows that population, per capita PPP GDP, distance, and Hofstede cultural dimensions have significant effects on Indonesian export value. The gravity model is proven in this study because distance has a negative effect on export value. Individually, population, per capita PPP GDP, and long-term orientation index have significant positive effects while masculinity index has a significant negative effect on export value. Indonesian export values tend to be elastic toward per capita PPP GDP, population, and distance. This research also found that per capita PPP GDP has a random effect, or its effect is different among Indonesia's main trade partners.

## INTRODUCTION

A country with an open economic system cannot be independent of an international market. International trade becomes an area to build relationships both bilateral and multilateral with other countries. Through export and import, not only does it enable relationships with other countries, but it could also carry out the flow of goods and services in a country to other countries and from other countries to that country. The export will be done if production in a country exceeds the demand in that country and satisfies the requirements to be sold abroad.

In international trade, there are some theories. One of them is the gravity model theory introduced by Tinbergen in 1962 (Head, 2006). The theory is developed from physics science about the earth's gravitational attraction to the objects above it. The Newton gravitation theory states that the gravity force among objects is directly affected by the mass of those objects. On the other hand, it is affected proportionately by the squared distance between those objects. In the economic environment, the gravity theory is adjusted by substituting the attraction force with the flow of the monetary values, replacing the object's mass with the GDP or the GNI, by changing the distance between two objects into the distance between two locations, and by altering the gravity coefficient with the remoteness of a location (Head, 2006). In the international trade model, Linnemann (1966) uses the trade flow between two countries to replace the flow of the monetary values, employs the GNP and the population as the mass, and utilizes the preference factor in the trade as the geographical distance between two countries. Meanwhile, Fitzsimons et al. (1999) substitute the mass with the per capita GDP and population.

According to the gravity model in international trade, the closer the distance between a country and other countries that have a bilateral relationship with that country, the bigger the export volume from that country. It is because of the logistic cost that tends to be cheaper because of the relatively closer distribution distance.

The gravity equation is utilized in many economic issues both at the

international and regional levels. Some studies use the gravity model to explain the trade between Indonesia and its other main trade partners from some countries and do not limit it with a certain region (Bato, 2014; Effendi, 2014; Hermawan, 2011; Lembang & Pratomo, 2013; Ridwannulloh & Sunaryati, 2018; Rizal, 2018). However, some studies utilize the gravity model to explain the trade between Indonesia and its main trade partners in a specific area, such as Asia Pacific, ASEAN, RCEP, and China ASEAN Free Trade Area (Ambarita & Sirait, 2020; Aryani et al., 2020; Mahendra & Solikin, 2019; Mardiah, 2020; Purnamasari et al., 2020; Supriana, 2011; Suryanta, 2012; Waristi, 2014).

Despite that, in most of those researches, the gravity model is proved, that is, the distance affects the trade negatively (Ambarita & Sirait, 2020; Bato, 2014; Effendi, 2014; Mahendra & Solikin, 2019; Mardiah, 2020; Purnamasari et al., 2020; Ridwannulloh & Sunaryati, 2018; Rizal, 2018; Supriana, 2011; Suryanta, 2012). Nonetheless, some studies found that the distance affects the trade positively (Aryani et al., 2020; Lembang & Pratomo, 2013; Waristi, 2014), which might be due to the development of technology and communication so that the distance in the distribution process does not become the main resistance because the distribution becomes easier with the technology advances. Hermawan (2011) found that the commodity type and the trade country partner can cause whether the effect of distance is positive or negative. Thus, there is still inconsistency in the results of the existing research. Therefore, this research aims to prove that the gravity theory applies to Indonesia's export activity.

The previous studies employed various trade indicators. Aryani et al. (2020); Effendi (2014); Hermawan (2011); Mardiah (2020); Ridwannulloh & Sunaryati (2018) use export value, Lembang & Pratomo (2013) utilizes export volume while Purnamasari et al. (2020) make use of import value. Suryanta (2012) uses *net export* (export minus import), Ambarita & Sirait (2020); Mahendra & Solikin (2019) make use of export value, and import value, Supriana (2011) utilize export volume and import volume, whereas Waristi (2014) employs export value plus import value and Kristjánisdóttir et al. (2017) utilizes the ratio of the trade value to GDP. DiRienzo & Das (2020) used a different indicator, i.e., the Global Illicit Trade Environment (GITE) index.

**Table 1**  
**Indonesia's Export to 20 Main Trade Partners in 2019**

No	Trade Partner	Export Value (million US\$)	Market Share
1	China	27,961.9	16.68%
2	USA	17,844.6	10.64%
3	Japan	16,003.3	9.54%
4	Singapore	12,916.7	7.70%
5	Malaysia	8,801.8	5.25%
6	South Korea	7,234.4	4.31%
7	Phillippines	6,770.1	4.04%
8	Thailand	6,218.4	3.71%
9	Vietnam	5,153.4	3.07%
10	Taiwan	4,034.8	2.41%
11	Netherlands	3,205.0	1.91%
12	Hongkong	2,501.7	1.49%
13	Germany	2,405.8	1.43%
14	Australia	2,328.6	1.39%
15	Italy	1,749.3	1.04%
16	Spain	1,599.2	0.95%
17	United Kingdom	1,351.5	0.81%
18	Belgium	1,075.7	0.64%
19	France	1,013.3	0.60%
20	Mexico	939.3	0.56%

Source: Statistics Indonesia (2020)

This study does not limit Indonesia's main export trade partners in a definite zone to make the distance data more varied. It uses Indonesia's export data with all of its main trade partners. Other than that, as an indicator for Indonesia's export activity, this study also employs the export value because the data in Table 1 indicates that the gravity model applies for the export value.

Following DiRienzo & Das (2020), Kristjánsdóttir et al. (2017), and Waristi (2014), this research is also interested in studying the effect of cultural factors on trade. Culture and values within the society such as hard work factor, honesty, tolerance, etc. can affect the national economy (Guiso et al., 2006) because it might influence the economic activity such as saving, consumption, and production, so it could also affect the production process of export commodity and the export activity (Guiso et al., 2006). Because it affects how people think, culture may affect the science and technology mastering (Sasmojo, 2004). A country with good control over science and technology can be more competitive in the market because technology is one of the important factors in the production process. On the other hand, culture can deter trade. For example, it can detain the communication, cause misunderstanding and a clash in a negotiation, etc. (Head, 2006).

The difference between this research and the previous studies is that Waristi

(2014) only uses four of Hofstede's cultural dimensions (the power distance index, the uncertainty avoidance index, the individualism (versus collectivism) index, the masculinity (versus femininity) index), and Kristjánsdóttir et al. (2017) only utilizes five Hofstede's cultural dimensions (by adding the long-term orientation (versus short-term orientation) index), while this study, keeping up with the existing development, examines six Hofstede's cultural dimensions (by including the indulgence (versus restraint) index), as DiRienzo & Das (2020). Other differences are DiRienzo & Das (2020) inquire about the illicit trade of 62 countries in the world, Kristjánsdóttir et al. (2017) investigate the trade performance of the United States and 20 countries in Europe, and Waristi (2014) only examines the trade performance of Indonesia and ASEAN countries. The close location of countries in Europe and ASEAN makes those countries have cultural similarities. In this research, the trade partners being studied are not only from ASEAN but also include a broader area.

The last difference is that the prior studies employ the stochastic frontier analysis (Effendi, 2014), the estimated generalized least square (EGLS) (Bato, 2014; Effendi, 2014; Hermawan, 2011; Lembang & Pratomo, 2013; Rizal, 2018), the multiple regression model (DiRienzo & Das, 2020), the pooled least square or the common effect model (Bato, 2014; Effendi, 2014; Hermawan, 2011; Lembang & Pratomo, 2013; Rizal, 2018; Suryanta, 2012; Waristi, 2014), the fixed effect model (FEM) (Aryani et al., 2020; Mahendra & Solikin, 2019; Purnamasari et al., 2020; Ridwannulloh & Sunaryati, 2018; Waristi, 2014) or the random effect model (REM) (Ambarita & Sirait, 2020; Lembang & Pratomo, 2013; Mahendra & Solikin, 2019; Ridwannulloh & Sunaryati, 2018; Rizal, 2018; Waristi, 2014), in which studies that use FEM and REM do not estimate the difference on the constant model and the random effect within countries being studied. Meanwhile, this study applies the mixed-effect model, which enables us to differentiate the constant model and the regression coefficients within the studied countries, both for variables with constant and various values within time.

Table 1 displays Indonesia's export value and market share to 20 destination countries in 2019. The table indicates that the gravity theory applies to the export value. Countries far from Indonesia, such as countries in Europe, tend to have a smaller export value than countries close to Indonesia, such as countries in Asia.

Based on the background presented above, then the objectives of this research are: (1) to test whether the gravity theory applies in Indonesia's export, (2) to analyze how population affects Indonesia's export value, (3) to study how per capita GDP affects Indonesia's export value and (4) to examine how the Hofstede's cultural dimensions affect Indonesia's export value. This research is expected to be an additional knowledge for this paper's researchers and readers and become a reference

for other researchers who have the same topic interested.

**LITERATURE REVIEW AND HYPOTHESIS FORMULATING**

**Gravity Model**

The gravity model is a physics theory discovered by Newton in 1687, later known as the law of universal gravitation or Newton's gravitation law. Further, the gravity model is applied to international trade for the first time by Jan Tinbergen in 1962 (Head, 2006):

$$F_{ij} = G \frac{Y_i^\alpha Y_j^\beta}{D_{ij}^\theta} \dots\dots\dots 1$$

where  $F_{ij}$  is the monetary flow from country  $i$  to country  $j$ ,  $Y_i$  is the national income (GDP or GNP) of country  $i$ ,  $Y_j$  is the national income of country  $j$ ,  $D_{ij}$  is the distance between country  $i$  and country  $j$ , and  $G$ ,  $\alpha$ ,  $\beta$ , and  $\theta$  are constants.

Since the national income can be determined by multiplying the per capita national income and population, then the gravity model in equation (1) can be modified into (Fitzsimons et al., 1999):

$$\log F_{ij} = \alpha \left( \log \left( \frac{Y_i}{P_i} \right) + \log \left( \frac{Y_j}{P_j} \right) \right) + \beta (\log P_i + \log P_j) + \gamma \log D_{ij} \dots\dots\dots 2$$

where  $F_{ij}$  is the international trade between country  $i$  and country  $j$ ,  $Y_i$  and  $Y_j$  successively are the national income of country  $i$  and  $j$ ,  $P_i$  and  $P_j$  consecutively are the population of country  $i$  and  $j$ .  $D_{ij}$  is the distance between country  $i$  and country  $j$ , and  $\alpha$ ,  $\beta$ , and  $\gamma$  are regression coefficients.

**Distance**

In a trading system, distance can become one factor that influences the demand for a product. The distance can be an obstacle because it causes a distribution cost or a logistic cost to distribute the product from a producer to a consumer (Linnemann, 1966). It is a resistance that appears naturally, especially in international trade. In the context of international trade, the farther a country is from its trade partner, the higher the logistic cost to make the trade flow between the two countries decrease. Nevertheless, the logistic cost is not only influenced by the distance, but the deepness of the relationship between the trade partners and type of commodity, export and import values, and the path taken in the distribution process also become factors that affect the flow of international trade among countries.

These are some factors why distance becomes one of the most influenced

variables in international trade (Head, 2003): (1) distance is a representation of the logistic cost, (2) distance describes the travel time in the distribution process, (3) distance affects the cost to make sure the availability of input on time in the production process (the synchronization cost), (4) distance reflects the communication cost between producer and consumer and among managers and labors and, (5) distance related to the transaction cost.

### **Cultural Indicators**

Culture is the thinking pattern of someone or a group of people that makes a difference with other groups (Hofstede, 2011). Based on the research developed with other researchers, Geert Hofstede identifies national (country or regional) culture and culture in an organization according to some cultural dimensions measured on a scale of 0-100. Although each individual has different characters, those individuals may have a similar culture or behavior within a certain area. Thus, countries that are close and the geographic condition in a region usually are likely to have the same paradigm or culture. Hofstede Insights (2020) categorizes culture into these six dimensions.

### **Power Distance Index**

The power distance index reflects how far a member of a society with a lower power accepts and expects the power to be distributed unequally (Hofstede Insights, 2020). A high power distance index will be reflected from a hierarchical order (Hofstede Insights, 2020). In the leadership, the characteristic of a high power distance society will be represented on the society's desire to own a higher power to dominate weaker society (Robbins & Stylianou, 2009), so it could generate policies that will only give an advantage for the party with a higher power. Still, it might not benefit the party with weaker power (Waristi, 2014). Hence, a country with a high power distance index has a characteristic of a high level of corruption and inequality income (Hofstede, 2011).

### **Uncertainty Avoidance Index**

The uncertainty avoidance index describes the extension to which a society member feels uncomfortable due to uncertainty (Hofstede Insights, 2020). Countries with a high uncertainty avoidance index will be encouraged to ensure the fulfillment of society's needs in two ways: by self-producing or importing, hence it could affect Indonesia's export.

### **Individualism (versus Collectivism) Index**

A country with a high individualism level depicts that its residents are relatively less social (Hofstede Insights, 2020). With a high individualism level, a worker in a firm tends to need and want to have privacy (Robbins & Stylianou, 2009)

and likes to work individually rather than in a team (Sumantri & Suharnomo, 2011). Since they do not depend on social relationships, the residents of a country with high individualism are also likely to always self-learn (Hofstede, 2011).

### **Masculinity (versus Femininity) Index**

The characteristic of a society with high masculinity level is their desire to have high achievement, be a hero, and obtain awards for their success (Hofstede Insights, 2020). The society with high masculinity index tends to be ambitious and have a high work ethic because they put their work first over their family (Hofstede, 2011).

### **Long-Term Orientation (versus Short-Term Orientation) Index**

This index shows whether the mindsets of the people of a country are long-term or short-term (Hofstede Insights, 2020). A country with a long-term orientation will be better at preparing its future, especially in terms of its saving and investment (Hofstede, 2011). A country with a long-term orientation also intends to learn from other countries so that it tends to have rapid growth and high welfare society (Hofstede, 2011).

### **Indulgence (versus Restraint) Index**

This index reflects how far a society is prone to restraint itself from having the basic needs or the natural desire to enjoy life (Hofstede Insights, 2020). The people of a country with a high restraint value or low indulgence value tend to be more restrained by rules or norms in society and have a closed personality (Hofstede, 2011). On the other hand, people with a high indulgence value are likely to be happier and love freedom, especially the freedom to say their opinion (Hofstede, 2011).

### **Previous Studies**

As mentioned in the introduction, the trade indicator used in studies on the gravity model is various, and so do the test results for the gravity theory. Kristjánsdóttir et al. (2017) modified the gravity model by changing the distance between countries with Hofstede's cultural dimensions, whereas DiRienzo & Das (2020) do not apply the gravity model. The focus of some studies is not on a certain commodity (Aryani et al., 2020; Effendi, 2014; Supriana, 2011; Waristi, 2014), but some studies only inquire about a specific commodity (Bato, 2014; Lembang & Pratomo, 2013; Mardiah, 2020; Purnamasari et al., 2020; Rizal, 2018; Suryanta, 2012).

Most studies use GDP as an indicator for national income on trade (Ambarita & Sirait, 2020; Aryani et al., 2020; Effendi, 2014; Hermawan, 2011; Kristjánsdóttir et al., 2017; Lembang & Pratomo, 2013; Mahendra & Solikin, 2019; Ridwannulloh & Sunaryati, 2018; Rizal, 2018; Supriana, 2011; Waristi, 2014). Whilst DiRienzo & Das (2020); Hermawan (2011); Mardiah (2020); Purnamasari et al. (2020); Suryanta



(2012) utilize per capita GDP as Fitzsimons et al. (1999).

Furthermore, DiRienzo & Das (2020); Mardiah (2020) successively found per capita GDP of the trade partner country has a positive effect on Indonesia's export value and the GITE. Ambarita & Sirait (2020) (2020); Mahendra & Solikin (2019); Ridwannulloh & Sunaryati (2018) found that the GDP of the trade partner country influence Indonesia's export value while Purnamasari et al. (2020) found that per capita GDP of the trade partner country has an impact on Indonesia's import value of corn. Next, Aryani et al. (2020), Hermawan (2011), Ridwannulloh & Sunaryati (2018) consecutively found that GDP or per capita GDP of Indonesia, while Ambarita & Sirait (2019) found that Indonesia's GDP has a positive effect on Indonesia's import value. However, Mahendra & Solikin (2019); Purnamasari et al. (2020) found that the influence of Indonesia's GDP and per capita GDP on Indonesia's import value is insignificant, respectively. Suryanta (2012) found varied results for various commodities and Indonesia's trade partner countries. Moreover, Kristjánsdóttir et al. (2017) found that the GDP has a negative effect on the trade of the United States and 20 European countries, and DiRienzo & Das (2020) found that per capita GDP has a negative impact on the GITE index within 62 countries being studied.

Some studies found that the population of the destination country or Indonesia's trade partner country has a positive effect (Hermawan, 2011; Mardiah, 2020; Supriana, 2011), while Effendi (2014) found that the relative population of the trade partner country on Indonesia's population has a negative effect on export value. Aryani et al. (2020) found that Indonesia's market share in ASEAN has a positive influence. In contrast, Purnamasari et al. (2020) found that the population of Indonesia's trade partner country has a negative influence, but Indonesia's population has no influence on Indonesia's imports.

Studies that investigate Hofstede's cultural dimensions are limited. DiRienzo & Das (2020); Kristjánsdóttir et al. (2017); Waristi (2014) found that culture affects trade. Waristi (2014) found that the power distance index and the uncertainty avoidance index have a positive effect. The individualism index has a negative effect, but the masculinity index does not affect Indonesia's trade and other ASEAN countries. Besides that four dimensions, Kristjánsdóttir et al. (2017) added one of Hofstede's cultural dimensions, that is, the long-term orientation index and for the trade of the United States and 19 countries in Europe, they found that the masculinity index has a positive influence on trade while other Hofstede's cultural dimensions do not influence trade. Further, DiRienzo & Das (2020) added one other of Hofstede's cultural dimensions, i.e. the indulgence index. They found that the individualism index, the uncertainty avoidance index, and the long-term orientation index have a positive impact on illegal trade.

## Research Hypothesis

Based on the gravity model (3), the greater the population size in Indonesia's trade partner country, the bigger Indonesia's export value to that country, specifically if that country has a high dependence on Indonesia's import value. This finding is supported by Hermawan (2011), Mardiah (2020), Supriana (2011) who found that the population of Indonesia's partner trade has influence Indonesia's export value positively. Therefore, this research proposes this hypothesis:

**H1:** Population of the trade partner countries has a positive effect on Indonesia's export value.

Per capita GDP represents the welfare of a country so that countries with high per capita GDP incline to have high investment probability and have high import ability. Thus, based on the gravity model (2), the higher per capita GDP in Indonesia's trade partner country, Indonesia's export value could also increase. The results of studies strengthen Hermawan (2011) and Mardiah (2020). Hence, this research proposes this hypothesis:

**H2:** Per capita income by Indonesia's trade partner countries has a positive effect on Indonesia's export value.

According to the gravity theory, the farther the distance of a country from its trade partners, the less the export value of that country will be. The findings by Ambarita & Sirait (2020); Bato (2014); Effendi (2014); Mahendra & Solikin (2019); Mardiah (2020); Ridwannulloh & Sunaryati (2018); Rizal (2018); Supriana (2011); Suryanta (2012) reinforce that. Hence this research suggests this hypothesis:

**H3:** The distance between Indonesia and its trade partner countries has a negative effect on Indonesia's export value.

The high power distance index reflects high power disparity and can be viewed in a hierarchical order (Hofstede Insights, 2020). Waristi (2014) found that the power distance index has a positive effect on trade value. In international trade, if the disparity or the power hierarchy happens in Indonesia's trade partner countries, it could create a complicated bureaucracy and a long procedure of import license that could cause high import cost to decrease the import of that country. Nonetheless, if the import is controlled by parties that have high power, it could motivate them to get a profit through import activity to increase the import of that country. Therefore, the power

distance characteristic of Indonesia's trade partner countries could have a negative or a positive effect on Indonesia's export, so this study suggests this hypothesis:

**H4a:** The power distance of trade partner countries affects Indonesia's export value.

The uncertainty avoidance index reflects a high uncomfortable caused by uncertainty (Hofstede Insights, 2020). DiRienzo & Das (2020); Waristi (2014) found that the uncertainty avoidance index positively affects the GITE index and trade value successively. Countries with a high uncertainty avoidance index will try to reduce the uncertainty in the compliance of their society needs. If Indonesia's trade partner countries tend to avoid uncertainty and fulfill that needs and the dependency of the trade partner country on Indonesia's products is low, then it could decrease their import. On the other hand, if their dependence on Indonesia's products is high, it could increase their import. So, the uncertainty avoidance characteristic of Indonesia's trade partner countries could have a negative or a positive effect on Indonesia's export. Hence, this study submits this hypothesis:

**H4b:** The uncertainty avoidance characteristic of trade partner countries affects Indonesia's export value.

DiRienzo & Das (2020) found that the individualism index has a positive effect on trade, but Waristi (2014) found that the individualism index negatively affects trade. Countries whose societies have an individualism characteristic have a higher eagerness to learn (Hofstede, 2011). It is also reflected in the production process and could drive the productivity increase of goods and services. Therefore, if the society of Indonesia's trade partner countries tends to have an individualism culture, they probably will be urged to learn, including in developing the production technology, to be able to fulfill the society's needs with own production and it will make import from that country to decrease. On the other hand, Indonesia's trade partner countries that are likely to have a collectivism culture might try to keep a good relationship with their relations to keep Indonesia's export to that country. Hence, the individualism characteristic of Indonesia's trade partner countries could have a negative or a positive effect on Indonesia's export, so the hypothesis proposed by this study is:

**H4c:** The individualism characteristic of the society of the trade partner countries affects Indonesia's export value.

Waristi (2014) found that the regression coefficient of the masculinity index is

negative. Still, its influence on trade value is insignificant, while Kristjánsdóttir et al. (2017) found that the masculinity index positively influences trade. The desire to achieve success will drive a country with high masculinity index to have high productivity on goods and services production. If Indonesia's trade partner countries have a high masculinity index and the in the production process there are components from raw material import, then the desire might increase the raw material import. Nevertheless, if the dependency on the raw material import is low, then the desire could motivate them to reduce the dependency on the raw material. Thus, the masculinity characteristic of Indonesia's trade partner countries might have a positive or a negative effect on Indonesia's export so the hypothesis proposed in this study is:

**H4d:** The masculinity characteristic of the trade partner countries influences Indonesia's export value.

DiRienzo & Das (2020) found that the long-term orientation index has a positive effect, while Kristjánsdóttir et al. (2017) found that the long-term orientation does not affect the trade value. However, if the society of Indonesia's trade partner countries tends to have a long-term orientation, then they might have a higher competitive spirit, and it will encourage them to comply with their needs with their production in the long-term to reduce its dependency on other countries. It definitely will decrease the import. So, the long-term orientation characteristic of Indonesia's trade partner countries could influence Indonesia's export negatively and the hypothesis suggested in this study is:

**H4e:** The long-term orientation of the trade partner countries influences Indonesia's export value.

The indulgence index is not investigated by Kristjánsdóttir et al. (2017); Waristi (2014), whereas DiRienzo & Das (2020) who examine that index found its influence on the illegal trade is insignificant. People with high indulgence values are likely to want more freedoms and more time to enjoy life (Hofstede Insights, 2020). One way for people to enjoy their life is by consuming. If Indonesia's trade partner countries have a high indulgence characteristic, it can drive them to consume not only for the fulfillment of primary and secondary needs but also for the tertiary needs; not only from domestic products but also from import goods. Thus, the indulgence characteristic of Indonesia's trade partner countries could have a positive on Indonesia's export value and the hypothesis suggested by this study is:

**H4f:** The indulgence characteristic of the trade partner countries has a positive

effect on Indonesia's export value.

## RESEARCH METHOD

### Research Data

This research employs secondary data. The first secondary data is Indonesia's export value to the main export destination country ( $X$ ), a dependent variable obtained from BPS (Badan Pusat Statistik, 2020). The export value choice as an indicator for export and not export volume is also because the cultural index in the Hofstede Insights (2020) is not available for several countries among 20 countries with the greatest export volume.

Other secondary data are the independent variables, i.e., per capita GDP PPP (*constant US\$*) ( $GDP$ ) and population ( $Pop$ ), which are taken from the *World Development Indicators* (World Bank, 2020), and Hofstede's cultural dimensions from Indonesia's trade partner countries that include the power distance index ( $Pow$ ), uncertainty avoidance index ( $Unc$ ), the individualism index ( $Indi$ ), the Masculinity index ( $Mas$ ), the Long-term Orientation index ( $LTO$ ), and the Indulgence index ( $Indu$ ) that are taken from the Hofstede Insight (2020). The distance ( $Dis$ ) between Indonesia and its trade partner countries ( $D$ ) is estimated using Google Maps. All data are collected from 2002 to 2019, adjusting to the availability of export data from BPS. Since data for Taiwan is not available in the World Bank. This study ends with 19 from 20 main trade partner countries displayed in Table 1 in the introduction section.

### Analysis Technique

This research uses the regression method for panel data combined with the cross-section data because distance and cultural data are fixed in time, viz., the mixed-effect regression model estimated by the maximum likelihood (ML) method (Field, 2017). The Linear Mixed Model (LMM) is known as the Hierarchical Linear Model or the Multilevel Model (Garson, 2014). This model is used so that the regression coefficient of the variables that are fixed in time, that is, the distance and the cultural index, can be estimated because the mixed-model is a model with the fixed and the random effects (Garson, 2014). In the modeling process, first, this study considers the possibility of the fixed-effect model (FEM) and the random effect model (REM). The least-square estimated method cannot estimate the fixed effect in the FEM that comes from the distance and the cultural index, which have fixed values in time, but the mixed-model can overcome that weakness. In the ordinary least square (OLS) method and the Generalized Least Model (GLM), the model's errors are assumed to be independent and have the same variance. Meanwhile, in the classified data, the

individual observations within the same group are not independent but have similarities because they have the same factors within groups.

Before the appropriate model is chosen, the stationarity tests are carried for the panel data (export value, per capita GDP, and population) using the Levin, Lin, and Chu (LLC) test (STATA, 2015). Table 2 shows that the export value, population, and per capita GDP that have been transformed into the natural logarithm are already stationary.

**Table 2**  
**LLC Stasionarity Tes for Variables Changing in Time**

	Adjusted t*	p-value	
<i>LnX</i>	-5.775	0.000	***
<i>LnPop</i>	-8.758	0.000	***
<i>LnGDP</i>	-2.567	0.005	***

Next, using the mixed-effect regression model, we estimated the random effects of constant and variables that change in time, i.e., population and per capita GDP. We think that the model is not good enough because although the random effects and the constant, population and per capita GDP can be estimated, the results do not display the robust standard error and the confidence interval for the random effect for the significant level ( $\alpha$ ) of 1 percent, 5 percent, and 10 percent. Therefore, we estimated the models in the next step by only considering the random effects of population and per capita GDP separately. The results point that both the *LnPop* and the *LnPDB* have a random effect. Still, the model with the random effect of the *LnPDB* has a smaller (absolute) log pseudolikelihood value than the model with the random effect of the *LnPop*, which indicates that the first model is better than the second model. Therefore, the regression model in this study is:

$$LnX_{ij} = b_{0j} + b_1LnPop_{ij} + b_2LnGDP_{ij} + b_3LnDis_{ij} + b_4Pow_{ij} + b_5Unc_{ij} + b_6Indi_{ij} + b_7Mas_{ij} + b_8LTO_{ij} + b_9Indu_{ij} + \epsilon_{ij} \dots \dots \dots 3$$

where *Ln* is the natural logarithm transformation,  $b_{0j}$  is constant for country -*j*;  $b_{2j} = b_2 + u_{12}$ , with  $b_2$  is the fixed regression coefficient of *LnGDP* and  $u_{1j}$  is the variance of the regression coefficient of *LnGDP* for country-*j*;  $b_1, b_3$  until  $b_9$  is the regression coefficient of other independent variables besides *LnGDP* and  $\epsilon$  is the model’s error.

Model (3) is estimated using the robust standard error so that the homoscedasticity assumption (the variance of the error is constant) is satisfied. The model is also free from the multicollinearity problem because there are no strong correlations among the independent variables or all correlation coefficients among independent variables < 0,9 (see Table 3), and the overall error is normally distributed

at  $\alpha = 1$  percent (see Table 4).

**Table 3**  
**Pearson Correlation Coefficient Among Independent Variables in the Model**

	<i>LnPop</i>	<i>LnGDP</i>	<i>LnDis</i>	<i>Pow</i>	<i>Unc</i>	<i>Indi</i>	<i>Mas</i>	<i>LTO</i>	<i>Indu</i>
<i>LnPop</i>	1.000								
<i>LnGDP</i>	-0.504	1.000							
<i>LnDis</i>	0.246	0.410	1.000						
<i>Pow</i>	0.030	-0.574	-0.573	1.000					
<i>Unc</i>	0.102	0.182	0.602	-0.192	1.000				
<i>Indi</i>	-0.039	0.548	0.690	-0.745	0.250	1.000			
<i>Mas</i>	0.376	0.007	0.111	-0.010	0.116	0.107	1.000		
<i>LTO</i>	-0.038	0.212	0.050	-0.113	0.188	-0.160	0.032	1.000	
<i>Indu</i>	-0.036	0.178	0.402	-0.167	0.136	0.440	-0.004	-0.559	1.000

**Table 4**  
**Normality Test for Panel Data**

	<i>Observed Coef.</i>	<i>Bootstrap Std. Err.</i>	<i>z</i>	<i>P &gt;  z </i>	<i>Normal-based [95% Conf. Interval]</i>	
<i>Skewness_e</i>	-0.005	0.002	-2.31	0.021	-0.01	-0.001
<i>Kurtosis_e</i>	-0.001	0.001	-0.94	0.348	-0.004	0.001
<i>Skewness_u</i>	0.000	3.52E-07	52.97	0.000	0.000	0.000
<i>Kurtosis_u</i>	0.000	6.24E-08	1,506.18	0.000	0.000	0.000
<i>Joint test for Normality on e:</i>			<i>chi<sup>2</sup>(2)</i>	6.23	<i>Prob &gt; chi<sup>2</sup></i>	0.045
<i>Joint test for Normality on u:</i>			<i>chi<sup>2</sup>(2)</i>	2.3E+06	<i>Prob &gt; chi<sup>2</sup></i>	0.000

Notes: e = the overall error and u = the error within groups.

## ANALYSIS AND DISCUSSION

**Table 5**  
**Estimation of Mixed-Effect Regression Model**

		<b>Dependent Variable: LnX</b>			
<b>Independent Variable</b>	<b>Coefficient</b>	<b>Robust St. Error</b>	<b>Z</b>	<b>p-value</b>	
<i>LnPop</i>	1.231	0.139	8.83	0.000	***
<i>LnGDP</i>	1.818	0.190	9.58	0.000	***
<i>LnDis</i>	-1.822	0.207	-8.79	0.000	***
<i>Pow</i>	0.004	0.013	0.32	0.750	
<i>Unc</i>	0.006	0.005	1.30	0.195	
<i>Indi</i>	0.005	0.010	0.57	0.570	
<i>Mas</i>	-0.015	0.009	-1.66	0.096	*
<i>LTO</i>	0.012	0.005	2.31	0.021	**
<i>Indu</i>	0.011	0.007	1.59	0.113	
Constant	-18.208	3.662	-4.97	0.000	***
<b>Random-Effect Parameter</b>	<b>Coefficient</b>	<b>Robust St. Error</b>	<b>95% Confidence Interval</b>		
sd( <i>LnGDP</i> )	0.045	0.012	0.027	0.075	
sd(Constant)	5.17e-09	.	.	.	
sd(Residual)	0.267	0.019	0.232	0.307	
R <sup>2</sup> Bryk/Raudenbush	Level 1	0.621	Wald chi <sup>2</sup>		305.87
	Level 2	0.782	<i>p-value</i>		0.000 ***

Notes: \*\*\*, \*\*, and \* represent significancy at  $\alpha = 1\%$ ,  $5\%$ , and  $10\%$ .

Table 5 presents the estimation results of the mixed regression effect with the random effect for  $\ln GDP$ . Table 5 shows that simultaneously, all of the independent variables in the model have a significant effect on the independent variable, viz. Indonesia's export value because the  $p$ -value of the statistic Wald  $\chi^2 = 0,000 < 1$  percent  $= \alpha$ . The  $R^2$  value is estimated using the  $R^2$  value for panel data, that is Bryk/Raudenbush  $R^2$  that can be differentiated within country groups (level 2) and overall (level 1). Within country groups, all of the independent variables can explain about 78.21 percent of Indonesia's export value variance. In contrast, overall, the independent variable can explain about 62.08 percent of the variance of Indonesia's export value. The remainder is explained by other factors outside of the model.

Moreover, the population in Indonesia's trade partner countries has a significant positive effect on Indonesia's export value, or the hypothesis  $H_{1a}$  is accepted. The regression coefficient of 1.23 demonstrates that Indonesia's export value is elastic toward the population. If the population of Indonesia's trade partner countries increases by 1 percent, then Indonesia's export value will increase by 1.23 percent. It shows the high dependency of the population of Indonesia's trade partner countries towards the import products from Indonesia to fulfill their resident needs. Thus, population growth will make Indonesia's trade partner countries (importer) import more from Indonesia (exporter). This result supports the findings by Hermawan (2011); Mardiah (2020); Supriana (2011) in which the population of the trade partner countries affects Indonesia's export value positively.

The per capita PPP GDP of Indonesia's trade partner countries also has a significant positive effect on Indonesia's export value or hypothesis  $H_{1b}$  is accepted. Indonesia's export value tends to be elastic concerning per capita GDP PPP because the regression coefficient is 1.82. If the per capita GDP PPP increases by 1 percent, the export value will increase by 1.82 percent. It indicates the high purchasing power of the people in Indonesia's trade partner countries, so it urges the importers in Indonesia's trade partner countries to import from Indonesia. This result is in accordance with Hermawan (2011); Mardiah (2020), where the per capita GDP PPP influences the export value positively, although only for certain commodities. So does Suryanta's (2012) research that found that the per capita GDP influences a certain commodity in a certain trade partner country positively.

The distance between Indonesia and its trade partner countries has a significant negative impact on Indonesia's export value, or the hypothesis  $H_{1c}$  is not rejected. The regression coefficient of  $-1.82$  means that if there is an additional distance between Indonesia and its trade partner countries by 1 percent, then Indonesia's export value will decrease by 1.82 percent, indicating that the export value is also elastic to the distance on trade. This finding is in line with the gravity theory, i.e., the farther the



distance between two countries, the smaller the export value due to the transport cost that becomes more expensive. This finding strengthens the results from previous studies by Ambarita & Sirait (2020); Bato (2014); Effendi (2014); Mahendra & Solikin (2019); Mardiah (2020); Purnamasari et al. (2020); Ridwannulloh & Sunaryati (2018); Rizal (2018); Supriana (2011); Suryanta (2012) which also find that the gravity model is proven.

Table 5 tells that from six cultural dimensions, only the masculinity index and the long-term orientation index have a significant effect. The masculinity culture or the tendency of Indonesia's trade partner countries to attain success has a significant negative effect on Indonesia's export value. Hence the hypothesis  $H_{4d}$  is proven. The regression coefficient of  $-0.015$  shows that for a trade partner country that has a 1-point higher masculinity index than other trade partner countries, Indonesia's export value to that trade partner country will be 1.5 percent lower than Indonesia's export value to the other trade partner country. If the masculinity index of a country is higher than the other country, then the desire of the first country to be successful can motivate that country to reduce its dependency on the import products from Indonesia. This result does not support Waristi (2014) who also found that the effect of the masculinity index is negative but insignificant. However, it must be noticed that Waristi (2014) used the trade value as an indicator which consists of export and import values, while this study only considers the export value. This study chooses to use export as the only indicator for the trade performance and not the total export because Indonesia's trade partner countries will be different if they are viewed from the export and import sides. By combining both values, the interpretation of the cultural dimensions will be more complex because the position of the countries being studied will be mixed between exporter and importer.

The impact of the long-term orientation index or the tendency of the society in Indonesia's trade partner countries to have a long-term orientation on Indonesia's export value is significant, or the hypothesis  $H_{1h}$  is proven. This finding reinforces DiRienzo & Das (2020) but does not support Kristjánsdóttir et al. (2017) who found that the impact of the long-term orientation index is positive but insignificant. Like Waristi (2014), Kristjánsdóttir et al. (2017) also utilized the trade value as an indicator, whereas this study only employs the export value, and DiRienzo & Das (2020) used the GITE index.

The regression coefficient of the long-term orientation index of  $0.012$  denotes that for a trade partner country that has 1 point higher long-term orientation index than other trade partner countries, Indonesia's export value to that trade partner country will be 1.2 percent higher than Indonesia's export value to the other trade partner country. The significant positive effect indicates that the North-South trade theory is applied

(Rowthorn, 2004) in which developed countries are likely to move their production factories to the developing countries because most of Indonesia's trade partner countries are developed countries (see Table 1 in the introduction section). It is a strategy by countries with strict environmental policies (green havens) to produce pollution in developing countries with less stringent environmental policies (*pollution havens*) (Poelhekke & van der Ploeg, 2015).

Further, this research uses the mixed-effect regression model with the random effect for the per capita GDP because the random effect is not found for the constant. The distance and the cultural variables cannot be estimated its random effect because they are constant in time. Table 6 presents the random effect for per capita GDP and the mean of the per capita GDP within the research period (2002-2019). As explained after model (3), the random effect is the sum of the fixed effect ( $b_2$ ) and the deviation effect for each country from its fixed effect ( $u_{1j}$ ).

**Table 6**  
The Effect and the Mean of GDP PPP per Capita<sup>1</sup> (Constant 2017 International \$) and the Total Contribution of GDP PPP per Capita

Country	Effect	GDP		Contribution	
		Mean <sup>1</sup>	Rank	(million \$) <sup>2</sup>	Rank
Netherlands	1.888	52,388	3	808.249	1
Philippines	1.883	6,314	18	14.326	17
Belgium	1.878	48,119	6	619.092	3
Spain	1.858	37,912	12	321.301	6
Hongkong	1.850	51,068	4	515.289	5
Japan	1.843	38,351	11	279.133	7
USA	1.835	56,134	2	517.341	4
Vietnam	1.833	5,351	19	6.804	19
Mexico	1.820	18,500	15	58.176	15
Italy	1.819	42,827	10	267.017	8
South Korea	1.806	34,431	13	156.373	12
Thailand	1.805	14,586	16	32.749	16
United Kingdom	1.801	43,507	8	226.323	10
Malaysia	1.799	21,669	14	63.043	14
Singapore	1.799	78,754	1	641.260	2
Australia	1.791	45,584	7	221.457	9
Germany	1.774	48,314	5	204.025	11
China	1.765	9,486	17	10.436	18
France	1.697	43,004	9	73.127	13

Notes: (1) Calculated based on the World Bank (2020) data in 2002-2019.  
(2)  $\text{Ln}X = \text{Effect} \times \text{LN}(\text{Mean GDP})$  and  $\text{Contribution} = X = e^{\text{Ln}X}$  with  $e =$  the natural number.

The country with the greatest per capita GDP PPP effect is the Netherlands, and the country with the lowest per capita GDP PPP effect is France. The greater the effect of per capita GDP PPP and the higher per capita GDP PPP value of a country, then the bigger its contribution to Indonesia's export value. Overall, most of the rank

of the contribution (total effect) of per capita GDP PPP does not differ too much from the rank of the mean of per capita GDP PPP. Thus, countries whose mean of per capita GDP PPP is relatively high tend to give a bigger contribution to Indonesia's export.

## CONCLUSION, LIMITATION, AND SUGGESTION

This research aims to prove whether the gravity theory applies to Indonesia's export to 19 main trade partner countries and to know how the effect of population, per capita GDP PPP, distance, and Hofstede's cultural dimensions on Indonesia's export. Overall, population, per capita GDP, distance, and Hofstede's cultural dimensions can explain 62.08 percent, and within-country groups, it can explain 78.21 percent of Indonesia's export variance.

This research demonstrates that the gravity theory is proven on Indonesia's export because the distance has a negative significant effect on export activity, which means that the farther the distance of Indonesia from its trade partner, the less Indonesia's export value. The population and the per capita GDP PPP have a positive influence on the export value. The higher per capita GDP PPP of a country, then it tends to bring greater total effect. Indonesia's export value is elastic to the distance, population, and per capita GDP PPP. Lastly, from six of Hofstede's cultural dimensions, only two dimensions significantly impact Indonesia's export value, viz. the masculinity index (the character of having a desire to reach success) with a negative impact and the long-term orientation with a positive impact.

The negative effect of the masculinity index and the positive effect of the long-term orientation indicates that the lower the dependency of Indonesia's trade partner country on the export products from Indonesia, particularly if the country is capable of producing the products itself, then it could bring a threat on the continuity of Indonesia's export to that country. If most exports are mineral resources that cannot be produced by that country, they will still depend on Indonesia for a while. However, it will not last in the long term. If the export product is not a mineral resource, then Indonesia has to try to produce products needed by the trade partner countries made using raw materials from Indonesia's export products. In this way, the dependency of the trade partner countries can be preserved in the long term.

This study is limited by examining trade only from the export side. A further similar study can be improved by investigating trade from the import or the net export (export minus import) side and expanding the number of trade partner countries. However, it should be noticed that Indonesia's trade partner data might not be available in the World Development Indicator of the World Bank and the Hofstede Insights.

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