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Sustaining Agricultural Growth (The Traps of Socio–Demographics in Emerging Markets)

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ABSTRACT

The motivation of the research is to identify the effect of the Global Innovation Index (GII), Urban Population (UP), Rural Population (RP), Social Globalization Index (SGI), and Demographic Pressures (DP) on Agriculture Value Added (AVA). The sample consists of four countries: China, Indonesia, USA, and India during 2013–2020 obtained from The Global Economy. The data analysis technique using comparative panel regression. In the long term, the increase in UP is significantly related to AVA in China, Indonesia, and India. Then, an increase in RP was significantly associated with AVA in India, and SGI had a significant effect on AVA in the USA. In the short term, every increase in GII has a significant effect on AVA in Indonesia and the USA. Furthermore, RP has had a significant effect on AVA in China. A case study, in India, reported that a decrease in SGI and DP had a significant impact on AVA. The increase in DP in the short term has a significant effect on the AVA in the USA. The originality of this research reports that the tendency in the agricultural sector opens our horizons about the number of agricultural clusters in the village changing functions, while many rural people move to urban areas.

1. INTRODUCTION

For centuries, a nation has always depended on the supply of products from other nations, resulting in international trade partners or what is often called "export-import" [1, 2]. This transaction involves cross-country, where there is a buying and selling network by commodity exporters and commodity importers [3]. Sea and land corridors are routes that are often crowded with trade intensity, while air transportation is generally intended for trading in weapons or complementary military defense equipment, logistical assistance due to war disasters, natural disasters that are difficult to predict, to technological adaptations that are urgent or secret. Trade wars are also inseparable from cooperation agreements between parties involved in legal, economic, geopolitical, cultural, and social factors [4].

In holistic terminology, the issue of international trade implies a competitive trade balance volume. Each history of export and import units is recorded in the State's foreign exchange. The disparity between income from exports and expenditure on imports determines the surplus or deficit of anomaly of goods or services. The World Population Review [5] reports the challenges faced by some nations with a global population density, such as China: 1,425,887,337 people (rank 1), India: 1,417,173,173 people (rank 2), USA: 338,289,857 people (rank 3), and Indonesia: 275,501,339 (rank 4) actually encourage extraordinary polemics. If not taken seriously, the exploding population of the country's "Top-4", can give rise to new controversies in terms of human resource productivity. This challenge must be an opportunity that can be exploited, considering that these four nations are also blessed with abundant natural resources, such as a large geographical area. With a significant area of land, the potential for developing agricultural areas continues to be carried out by China, India, the USA, and Indonesia as those with the status of "agrarian nations". Too, the increasing demand for agricultural commodities has become a domestic advantage that continues to be explored in fulfilling food and fulfilling global nutrition [6]. Agriculture is a very promising sector that combines natural habitat clusters with humans.

However, in its realization, the rapidly surging market demand for agricultural products has not been responded wisely by China, India, the USA, and Indonesia due to the impact of natural depletion which has depleted the protected area for wildlife and fauna. Although initially agricultural commodities could not be dammed for reasons of alleviating hunger, nutritional intake standards, the proportion of proponents of prosperity, and pressure for food security, urban populations have always grown rapidly, compared to populations in rural areas. Many agricultural workers are moving to cities and working in manufacturing and services, rather than continuing their profession as farmers or managing plantations because of widening household income inequality [7, 8, 9]. In fact, agriculture is a multidimensional concern for the revolution of human civilization [10, 11, 12, 13].

The concept that unites the interaction between innovation and human values is closely related to agriculture. Concerns related to agricultural productivity are highlighted. From Sub-Saharan Africa, labor cost-saving innovations have an impact on agricultural productivity [14]. Then, a survey by Feder et al. [15] confirmed that the adoption of innovations in various degrees of complementarity to support institutional processes and technology choices, has initiated the goals of the social and cultural environment of agriculture in developing countries. Recently, publications discussing the implications of urbanization for agriculture and food were reviewed by Satterthwaite et al. [16]. The growth of urban population is fuelling demand for agricultural products and at the same time, agricultural development in rural areas has reduced poverty. In the innovation literature, sustainable agriculture is explored to guide decisions that benefit farmers

in rural Austria with educational capabilities, extension services, focus on achievement, and self-empowerment training [17]. In agribusiness farming, the diffusion of innovation will review the level of success or failure of income. Losing agricultural land actually hampers prosperity. Interventions in technology and communication structures provide valuable lessons for farmers in ASEAN [18]. According to Bjerke and Johansson [19], innovation capacity and its contribution are adopted incrementally in Sweden. The uniqueness of the agricultural base, leads to the need for internal knowledge operating in agricultural enterprises rather than other sectors. Surprisingly, the social connectivity and intensive agricultural innovation from Eastern Ethiopia that were triggered by social networks among farmers themselves [20]. Despite the contradictions between these two patterns, the openness of the social system to the community has been proven to support local communities that are well-established in a reciprocal setting, flexibility of social networks, indigenous norms, member trust, and mutual cooperation.

It should be noted, there is a stark difference between "rural-urban". But, the village is homogeneous which is defined as a region that produces natural resources, including agricultural commodities. In a broad context, cities are considered as heterogeneous or areas that are highly dependent on villages [21]. Although there are differences between the two, their relationship is not separate. Thus, the contrasting characteristics between rural and urban areas, the division is quite complex and dynamic. Besides, the topic of "trade war" has been a concern for decades to come. The urgency of various parts of the world to protect regulations, especially suppressing population numbers that exceed the limit, is accompanied by whether human behaviour can change awareness in increasing its role in sustainable agriculture and how government tricks to reform the quality of integrated resources. The orientation of this article is to identify the factors that influence agricultural growth, which is reflected by the added value of the agricultural sector. Furthermore, the organization of the paper is divided into five sessions. Point 1 (Introduction), point 2 (Grand Theory and Existing Literature), point 3 (Research Method), point 4 (Results), point 5 (Discussion), and point 6 (Conclusions).

2. GRAND THEORY AND EXISTING LITERATURE

2.1 Agricultural economy

From a broad perspective, agricultural economics is a form of activity that manages biological resources by humans for the composition of energy, food, the environment, and industrial raw materials that play a strategic role in the structure of domestic economic development. According to van Arendonk [22], this sector is classified as a primary economic structure. In relation to research operations, agricultural economics is meant to add value to agriculture. Agricultural added value is articulated as the accumulation of national economic revenue from five sub-sectors within the scope of the agricultural sector including: livestock, fisheries, forestry, plantations, horticulture, and food crops [23]. Agricultural value added performance reflects how high the income level of workers/farmers is to access balanced food.

The production function describes the technical relationships that transform resources (inputs) into commodities (outputs) in a provision to set each value in the function domain with a single value, another set of variables becomes a range [24]. The function on agricultural production is written mathematically as follows:

$$y = f(x) \qquad (1)$$

where output (y) and input (x). The domain of the function is all x values greater than or equal to zero. The function range consists of the output level (y) obtained from the use of each input level (x). The above equation is the most popular form of the production function. From the shape, it is not possible to determine exactly how much output (y) can be obtained from a given level of input (x). In this case, a more specific form of the function $f(x)$ is needed.

2.2 Theory of demographic

Around the 18th century, scholars began to analyze population systematically. In contrast, although the population phenomenon has long been debated in various circles, the reality continues. Initially, the problem of population in the world was considered by "classical population" experts, i.e. Karl Marx and Thomas Malthus [25, 26]. Later, transformed for the next generation, which is most prominently by Thompson [27] in "Demographic Transition Theory" [28]. From this theory, studying human population science based on the dynamics of aging, migration, death, population movements that change over time due to birth, population distribution, structure, and population size.

The dangers of population growth were written by Malthus, who published a work entitled "essay on the principle of population" and defended his argument that "natural law" determines population growth [29]. Petersen [30], Weir [31], and Wrigley [32] explain that the population always increases faster than the increase in food, unless hampered by moral restrains, such as disease outbreaks, disasters, and degradation of agrarian fertility.

Marx disagreed with Malthus. Marx claims that human population does not interfere with food, but affects employment opportunities [33, 34, 35]. Poverty does not occur because of rapid population growth, but by the greed of capitalists who take some of the rights of the workers. The higher the level of human population, the greater the productivity, if technology does not replace humans [36, 37]. Humanity does not need to suppress the number of births. In this case, the "Malthus theory" of moral restraint to reduce birth rates is contradictory. This thinking has been justified by countries that adhere to socialist ideas such as: Russia, Vietnam, China, and North Korea [38, 39, 40, 41].

Furthermore, "Demographic Transition Theory" emerged after the reality showed that population growth in the western hemisphere was not only accommodated by Malthus' theory. During and after the industrial revolution, many western countries experienced the phenomenon of slow growth, and this continued into the 20th century or precisely after the first World war. Some of these countries, such as: Scandinavia, France, and England, have stopped their growth. This phenomenon is seen as attention to the existence of a "new paradigm" that builds the nature of explosive growth. This alternative was promoted by the demographer Thompson in 1929 and was named the "Demographic Transition Hypothesis" [42]. Thompson and his colleagues continue to refine their hypothesis consistently and is now called the

"Theory of the Demographic Transition" [43]. This theory rests on four interrelated elements that illustrate each item according to population growth and transition [44].

In its application, the above theory is often associated with the prosperity of society. In developing countries, demographic characteristics are high birth rates, but low mortality rates due to advances in health services. This causes the government to find it difficult to improve welfare, where many development goals are sucked into the rate of population growth. Uniquely for developed countries, its demographic characteristics are characterized by low birth and death rates. This condition makes it easier for governments in developed countries to divide budgets to revitalize welfare through social security and health insurance. As an evaluation, people in developed countries live in a more equitable distribution of welfare.

In practice, each individual has a desire and proportion of needs that are different from other individuals. These needs include: psychological, economic, and social needs. We say the need is not being met, then it can stimulate demographic pressure. The motive for the pressure experienced is inversely proportional to the ability of each individual.

From the perspective of pressure, there are two angles experienced by the population. When an individual moment is still within a certain tolerance limit, it will not move by staying in the area of origin and trying to adjust the facilities available in an environment. In more detail, if the individual's pressure is outside or exceeds his tolerance limit, he will consider moving to another place, where it is considered that there is an expectation of better fulfillment of desires. Residents who move from one area to another, of course, are expected to change what was originally a small place utility value to a high one

In the mobility mission, there are two actualizations that allow population aggression. First, residents experience stress at home. Everyone has a different excuse. The more heterogeneous the population structure in an area is, the higher the lifestyle and prestige they face. Second, there is a gap in place utility between one area and another. The study estimated by Irwansyah et al. [45] and Wijaya et al. [46], draw two parallel conclusions. In Romania, demographic pressures are integrated into economic growth. In developing countries, such as Indonesia, demographic pressures control Gross Domestic Product (GDP).

2.3 Innovation and social

In a global context, the Innovation Index and the Social Index are closely related, which illustrates how much the government is committed to generating creativity and fostering brotherhood among its citizens as a maneuver to improve the level of prosperity for the long term.

The mechanism of the Global Innovation Index is a thematic component that tracks global innovation. In short, it examines the dominance of medical technological and non-technological innovations that are transforming healthcare across nations [47]. The index also participates in medical innovations in shaping the future of healthcare and bringing about its effect on economic growth.

In terms of complexity, the Social Globalization Index which contains the Konjunkturforschungsstelle (KOF) consists of three objects: political globalization, economic globalization, and social globalization. The construction of

the index includes: United Nations (UN) peacekeeping mission participation, membership of international organizations, number of ambassadors, high-tech exports, overseas franchises, international students, patent registration, migration, international tourism, foreign exchange reserves, external debt, domestic investment, portfolio investment, foreign direct investment, and trade balance flows [48, 49, 50, 51].

2.4 Framework

Figure 1 displays the proposed hypothesis and framework according to the relevance of publications to the demographic trap represented by innovation, urban population, rural population, social ties, and demographic pressure.
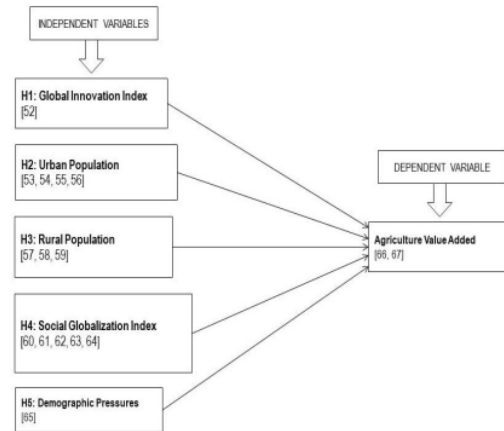

Figure 1. Conceptual elaboration

3. RESEARCH METHOD

3.1 Database

To starting the study, we collected data from the publication The Global Economy [68]. Then, the parent data is selected. Each secondary data has its own benchmark/unit of account, so it is processed using logarithms. After modification, data relating to innovation, urban population, rural population, social ties, and demographic stress were tabulated and coded in Microsoft Excel.

The range of observations studied are China, Indonesia, the United States of America, and India at a time frequency of eight periods (2013–2020). Besides the reasons why these four nations are the "top-4" with the largest population at the global level, they also have large-scale agricultural areas, making them dominant agricultural exporters in developing markets. The details of the data set are 192 populations, so from each case there are 48 samples.

3.2 Variables and modeling

There are six key variables, i.e. one dependent variable (Agriculture Value Added) and five dependent variables: Global Innovation Index, Urban Population, Rural Population, Social Globalization Index, and Demographic Pressures. Table 1 describes the representation of each variable.

Table 1. Core variables

Label	Variable	Measure
AVA	Agriculture Value Added	The net output of the agricultural sector after adding up all outputs and subtracting intermediate inputs, billion U.S. Dollars (US$).
GII	Global Innovation Index	The thematic component that tracks the innovation input–output of a nation, points (0–100).
UP	Urban Population	Population recorded living and settling part time/temporarily in urban areas, percent (%).
RP	Rural Population	Population refers to people living in rural areas, percent (%).
SGI	Social Globalization Index	Traditions reflect cultural closeness, personal contact, and the flow of information between a nation and the rest of the world, points (0–100).
DP	Demographic Pressures	Indicators that consider or represent the pressure of a nation that comes from the population itself and the environment around it, points (0: low – 10: high).

Source: [68].

Data interpretation uses comparative panel regression that tests five assumptions: correlation analysis, descriptive statistics, F test (simultaneous), T test (partial), and determination test (R^2). The procedures in these two approaches are to predict the feasibility of the relationship between variables. Hence, are the basic functions of the model:

$$Y_{i,t} = \alpha_0 + \alpha_{1\,i,t} + \alpha_{2\,i,t} + \alpha_{3\,i,t} + \alpha_{4\,i,t} + \alpha_{5\,i,t} + \mu_{i,t} \qquad (2)$$

Then, the function of the above equation is projected into a logarithmic proxy of the variables, arranged as follows:

$$lnY_{i,t} = \alpha_0 + \alpha_1 lnGII_{i,t} + \alpha_2 lnUP_{i,t} + \alpha_3 lnRP_{i,t} + \alpha_4 lnSGI_{i,t} + \alpha_5 lnDP_{i,t} + \mu_{i,t} \qquad (3)$$

Hypothesis decision-making, applied in the following two schemes:

when, $\rho > 0.05$ or $\rho > 0.01$, then reject H_1 and accept H_0
when, $\rho < 0.05$ or $\rho < 0.01$, then accept H_1 and reject H_0

where logarithm (ln), time-series and cross-section ($_{i,t}$), constant (α_0), regression intercept ($\alpha_1,...\alpha_5$), residual (μ), probability (ρ), hypothesis 0 (H_0), and hypothesis 1 (H_1).

4. RESULTS

Tables 2, 3, 4, and 5 summarize the correlation scores and the acquisition of descriptive statistics (mean and standard deviation/S.D) for cases in China (CHN), Indonesia (IDN), United States of America (USA), and India (IND). Learning from China, it is proven that with a probability of 1% (ρ <0.01), there is a negative correlation between AVA_Chn and RP_Chn (-0.911), GII_Chn with RP_Chn (-0.952) and DP_Chn (-0.932), and between RP_Chn and UP_Chn (-0.955) and SGI_Chn (-0.943).

Table 2. Correlation and descriptive statistics in China

	AVA_Chn	GII_Chn	UP_Chn	RP_Chn	SGI_Chn	DP_Chn	Mean	S.D
AVA_Chn	1	.759*	.907**	-.911**	.898**	-.550	954.8	85.43
		(.029)	(.002)	(.002)	(.002)	(.158)		
GII_Chn	.759*	1	.961**	-.952**	.902**	-.932**	50.39	3.68
	(.029)		(.000)	(.000)	(.002)	(.001)		
UP_Chn	.907**	.961**	1	-.995**	.964**	-.832*	58.48	2.9
	(.002)	(.000)		(.000)	(.000)	(.010)		
RP_Chn	-.911**	-.952**	-.995**	1	-.943**	.808*	41.52	2.89
	(.002)	(.000)	(.000)		(.000)	(.015)		
SGI_Chn	.898**	.902**	.964**	-.943**	1	-.783*	56.28	1.19
	(.002)	(.002)	(.000)	(.000)		(.021)		
DP_Chn	-.550	-.932**	-.832*	.808*	-.783*	1	6.35	.61
	(.158)	(.001)	(.010)	(.015)	(.021)			
N	48	48	48	48	48	48	48	48

Source: compilation of Authors. Standard errors in parentheses: **ρ <0.01, *ρ <0.05.

Another positive sign is the association of AVA_Chn with UP_Chn (0.907) and SGI_Chn (0.898), while GII_Chn appears to be strongly correlated with SGI_Chn (0.902), UP_Chn with GII_Chn (0.961) and SGI_Chn affects UP_Chn (0.964). There is a significant 5% probability (ρ <0.05) in the relationship of AVA_Chn to GII_Chn (0.759) and RP_Chn to DP_Chn (0.808). The correlation achievement that fell actually occurred in UP_Chn (-0.832) and SGI_Chn (-0.783) with DP_Chn. Table 2 also shows the mean (954.8) and S.D (85.43) points for the highest AVA_Chn. The lowest points are the mean and S.D points on DP_Chn, where the scores are 6.35 and 0.61

In Table 3, it is contrary to China, where there is a negative correlation value (ρ <0.01) in Indonesia: AVA_Idn to RP_Idn (-0.919), and GII_Idn to RP_Idn (-0.836), and UP_Idn to RP_Idn (-0.996). On the other hand, a positive correlation at 1% probability triggers a positive correlation between AVA_Idn and UP_Idn (0.904). In 5% probability (ρ <0.05), only GII_Idn is positively related to RP_Idn (0.810), but AVA_Idn is negatively correlated to GII_Idn (-0.731). There are different means and S.D points between AVA_Idn and DP_Idn. The highest gain is for the mean (129.62) and S.D (10.72), while the smallest is for the mean (6.92) and S.D (0.27).

Table 3. Correlation and descriptive statistics in Indonesia

	AVA_Idn	GII_Idn	UP_Idn	RP_Idn	SGI_Idn	DP_Idn	Mean	S.D
AVA_Idn	1	-.731*	.904**	-.919**	-.309	.517	129.62	10.72
		(.039)	(.002)	(.001)	(.456)	(.190)		
GII_Idn	-.731*	1	-.836**	.810*	.564	-.053	29.24	1.7
	(.039)		(.010)	(.015)	(.146)	(.901)		
UP_Idn	.904**	-.836**	1	-.996**	-.180	.228	54.98	1.63
	(.002)	(.010)		(.000)	(.670)	(.588)		
RP_Idn	-.919**	.810*	-.996**	1	.155	-.280	45.02	1.63
	(.001)	(.015)	(.000)		(.713)	(.502)		
SGI_Idn	-.309	.564	-.180	.155	1	-.112	53.68	.91
	(.456)	(.146)	(.670)	(.713)		(.792)		
DP_Idn	.517	-.053	.228	-.280	-.112	1	6.92	.27
	(.190)	(.901)	(.588)	(.502)	(.792)			
N	48	48	48	48	48	48	48	48

Source: compilation of Authors. Standard errors in parentheses: **ρ <0.01, *ρ <0.05.

For Table 4, there is poor performance in the relationship UP_Usa with RP_Usa (-0.836) and RP_Usa against SGI_Usa (-0.923). With the same probability level (ρ <0.01), UP_Usa actually has a positive impact on SGI_Usa (0.867). Based on 5% probability (ρ <0.05), RP_Usa to DP_Usa is negative (-0.798), but SGI_Usa and DP_Usa are positively correlated (0.709). From the largest mean and SD scores: AVA_Usa (194.81, 14.69), then the smallest: DP_Usa (3.61) and UP_Usa and RP_Usa which both achieved 0.49.

Table 4. Correlation and descriptive statistics in USA

	AVA_Usa	GII_Usa	UP_Usa	RP_Usa	SGI_Usa	DP_Usa	Mean	S.D
AVA_Usa	1	.172	-.274	.336	-.331	-.145	194.81	14.69
		(.684)	(.512)	(.416)	(.424)	(.731)		
GII_Usa	.172	1	.514	-.274	.284	.037	60.8	.74
	(.684)		(.192)	(.512)	(.496)	(.931)		
UP_Usa	-.274	.514	1	-.836**	.867**	.658	82.16	.49
	(.512)	(.192)		(.010)	(.005)	(.076)		
RP_Usa	.336	-.272	-.836**	1	-.923**	-.798*	17.83	.49
	(.416)	(.515)	(.010)		(.001)	(.018)		
SGI_Usa	-.331	.284	.867**	-.923**	1	.709*	85.34	1.18
	(.424)	(.496)	(.005)	(.001)		(.049)		
DP_Usa	-.145	.037	.658	-.798*	.709*	1	3.61	1.03
	(.731)	(.931)	(.076)	(.018)	(.049)			
N	48	48	48	48	48	48	48	48

Source: compilation of Authors. Standard errors in parentheses: **ρ <0.01, *ρ <0.05.

Referring to Table 5 below, there is a match in the correlation scores of China and India. Overall, at 1% probability (ρ <0.01), a positive correlation is connected between AVA_Ind against RP_Ind (0.977) and SGI_Ind (0.860), then RP_Ind with SGI_Ind (0.911). In addition, there are three negative correlations: AVA with UP_Ind (-0.945), UP_Ind to RP_Ind (-0.987) and SGI_Ind (-0.886). At 5% probability degree (ρ <0.05), it was found that AVA_Ind to GII_Ind (0.770), GII_Ind to SGI_Ind (0.717), and RP_Ind to GII_Ind (0.795). Yet, a negative correlation was found in the

relationship between GII_Ind and UP_Ind (-0.825). The largest mean and SD scores were AVA_Ind (401.6, 66.94), while the smallest was DP_Ind (8, 0.22).

Table 5. Correlation and descriptive statistics in India

	AVA_Ind	GII_Ind	UP_Ind	RP_Ind	SGI_Ind	DP_Ind	Mean	S.D
AVA_Ind	1	.770*	-.945**	.977**	.860**	.184	401.6	65.94
		(.025)	(.000)	(.000)	(.006)	(.663)		
GII_Ind	.700*	1	-.825*	.795*	.717*	-.025	34.79	1.67
	(.025)		(.012)	(.018)	(.045)	(.953)		
UP_Ind	-.945**	-.825*	1	-.987**	-.886**	-.236	66.15	1.05
	(.000)	(.012)		(.000)	(.003)	(.574)		
RP_Ind	.977**	.795*	-.987**	1	.911**	.284	33.84	1.05
	(.000)	(.018)	(.000)		(.002)	(.496)		
SGI_Ind	.860**	.717*	-.886**	.911**	1	.262	51.39	1.19
	(.006)	(.045)	(.003)	(.002)		(.531)		
DP_Ind	.184	-.025	-.236	.284	.262	1	8	.22
	(.663)	(.953)	(.574)	(.496)	(.531)			
N	48	48	48	48	48	48	48	48

Source: compilation of Authors. Standard errors in parentheses: **$p < 0.01$, *$p < 0.05$.

In Table 6, describe the output of the comparative regression technique. Sequentially, various results are displayed in the four models. R Square (R^2) indicates the strength of the dependent data explained by the combination of independent variables. When compared, the coefficient of R Square in India is far near perfect (99.9%). This figure is far above the coefficient of China (99.4%), Indonesia (95.2%), and the smallest is USA (57.7%). The closer to one (1), the model issued by the Indian regression is indicated to be very workable. It is known that 0.1% is a variable outside the fourth model (India), while in China, there are 0.6% of variables that are not covered in the first model, 4.8% are variables that are not taken into account in the second model (Indonesia), and variables outside the third model (USA) as much as 42.3%. The standard error (S.E) implies that the prediction error in the regression in India is actually the lowest (0.7%), followed by China (1.3%), Indonesia is in third place (3.4%), and the last or fourth position, i.e. USA (11.2%). In detail, simultaneous testing in the case of India, proved that GII, UP, RP, SGI, and DP had a significant impact on AVA ($p < 0.01$). Systematically, a simultaneous relationship was also found in China and Indonesia ($p < 0.05$). Interestingly, in the USA it had no significant effect ($p = 0.936$).

Table 6. Empirical calculation

	CHN	IDN	USA	IND
R Square	.994	.952	.577	.999
S.E	.013	.034	.112	.007
F-Statistics	65.195	7.886	.200	742.021
	(.015)*	(.036)*	(.936)	(.001)**
Constant	-8.260	13.970	9.839	-81.925
	(.472)	(.794)	(.894)	(.008)**
GII	-1.656	.484	3.392	-.019
	(.087)	(.043)*	(.024)*	(.881)
UP	5.851	.518	-6.589	12.616
	(.004)**	(.009)**	(.734)	(.010)**
RP	.865	-1.960	1.810	12.563
	(.027)*	(.742)	(.730)	(.003)**
SGI	-1.404	-1.556	1.148	-1.826
	(.400)	(.386)	(.000)**	(.023)*
DP	.127	.434	.180	-.945
	(.600)	(.453)	(.013)*	(.015)*
N	48	48	48	48

Source: compilation of Authors. Standard errors in parentheses: **$p < 0.01$, *$p < 0.05$.

Although the constant in India was severe, where the score reached -81.925 ($p = 0.008$), the UP and RP variables had a significant effect on AVA ($p < 0.01$). The SGI and DP variables partially also have an effect on reducing AVA, if both increase, it will increase AVA in the long term, where p <0.05. Table 6 also shows that when the value of the constant in China decreases by 8.260, it further increases the partial impact between UP ($p < 0.01$) and RP ($p < 0.05$) on AVA.

Other attention is also focused on the case of Indonesia. With a constant score of 13.970, partially significant

correlation between GII ($\rho <0.05$) and UP ($\rho <0.01$) on AVA. The implication in the USA is the exact opposite with India. Technically, the increase in the positive constant (9.839) was proven to affect AVA through GII and DP ($\rho <0.05$) and AVA also increased through SGI ($\rho <0.01$) in the short term.

5. DISCUSSION

Agriculture is an ancestral heritage that holds the continuity of life in the country. Today, every nation is competing to improve the agribusiness system, so that it becomes a source of national income. Even so, the implementation of the domestic agricultural sector also controls global food security, where trade flows allow cooperation across countries (see Figure 2).
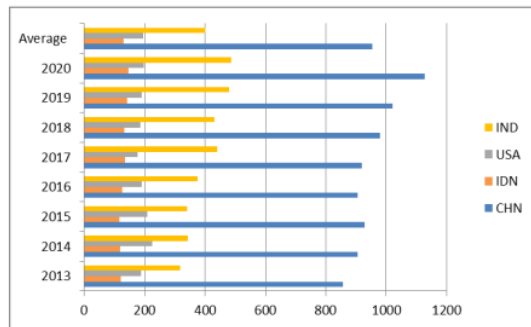
Figure 2. Dynamics of AVA in CHN–IDN–USA–ENG, billion US$
Source: [68].

During 2013–2020, the average frequency of AVA in China: US$ 954.8 billion or ranks first. In second place is India: 401.6 billion US$, third from the USA: 194.8 billion US$ and lastly or fourth in Indonesia: 129.6 billion US$. The year 2020 is the period with the largest AVA in China: 1,126.70 billion US$, while in Indonesia at the same time as China: 145.1 billion US$, USA in 2014: 223.8 billion US$, and India in 2020: 487.2 billion US$. The success of AVA China in first place is inseparable from the popularity of rice product producers. Heilongjiang province continues to maintain its title as the producer of the highest quality rice in China. In fact, the area of rice plantations is around 15.94 million hectares. The government also facilitates renewable technology to farmers, so that they are able to maximize the total agricultural area of 80.47 million hectares per year. The province is also home to 37.73 million people with an area of 473,000 km², which concretely recorded a Gross Regional Domestic Product value of up to 1.6 trillion yuan, an increase of 4.7% compared to 2018. The Food and Agriculture Organization of the United Nations [69] informs that India (rank 2) and Indonesia (rank 3) are the countries producing rice products in the world. Rice is seen as a leading commodity that is not only enjoyed by the lower-middle class, but also the upper-middle class, and the rich [70, 71]. From India, it is expansive to become the world's rice granary, and it is in Bangalore province and Jaipur province. India's rice export volume to all corners of the world reached 9.5 million tons. The Asian region dominates the world's rice exporters. Six out of ten rice exporting countries come from Asia, the rest from the Americas. The staple food of most Asian people

is rice so that rice is the main product of agricultural products in several Asian regions [72].

Side by side with China and India, the locomotive producing rice commodities is the most skilled in Indonesia, such as the cluster of Central Java–East Java–West Java. In 2020, rice production in Indonesia will reach 31.33 million tons. Even though it has an area that is not wider than other provinces, most regions on the island of Java have controlled the highest rice production in Indonesia [73]. The exodus to sorghum in the USA is the highest at the global level and far outperforms Mexico in 2nd place and Nigeria in 3rd place. Sorghum is speculated as an alternative food to grow from a small discussion platform to a big discussion. The durability of this food alternative in dry areas, especially in uncertain weathers such as in the province of Kansas which in 2021 produces the largest volume of any US state. In Kansas, about 265 million bushels of sorghum are produced into grain products [74].
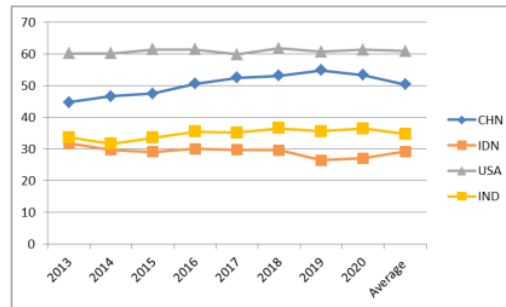
Figure 3. Dynamics of GII in CHN–IDN–USA–ENG, points
Source: [68].

For 8 periods, compared to the three countries, the USA has the largest average GII of 60.8 points. Then, followed by rank 2: China (50.4), rank 3: India (34.8), and rank 4: Indonesia (29.2). This is the worst thing for Indonesia, considering that its population will reach 278,163,604 people in 2022 or its growth from 2002 to 2022 is around 29.9%. The year 2015–2016 was the highest GII period in the USA with 61.4 points, while in China in 2019: 54.8 points, in 2018 for India: 36.6 points, and in Indonesia: 31.8 points (see Figure 3). One of the indications that affect the smallest level of GII in Indonesia, such as barriers to marketing, management, slow flow of investment in manufacturing, access to finance, and institutional gaps, and raw materials for business agglomeration [75, 76, 77].

The experiments reviewed by Baryshnikova et al. [78], Devaux et al. [79], Horton et al. [80], and Zeng [81] attempted to examine inclusive value chains in agriculture through the effectiveness of innovation. As a result, the orientation in the technological revolution changes the innovation web on traditional food to the 5.0 agricultural system. Innovation value chain planning affiliated through an international network of professionals, intervening in complex farmer livelihood frameworks. The participatory market chain approach in innovative applications, has made a commitment to facilitators to respond more efficiently to the commercialization of agriculture in Latin America, the European Union (EU), Asia and Africa. The trend in the 59 countries that are members of the Organisation for Economic Co-operation and Development–World Trade Organisation (OECD–WTO), the reaction to more innovative technology,

makes the research and development system (R&D) effective to compete at the international level. Especially in China, it makes sense to incorporate inputs such as R&D to stimulate innovation–technology into outputs.
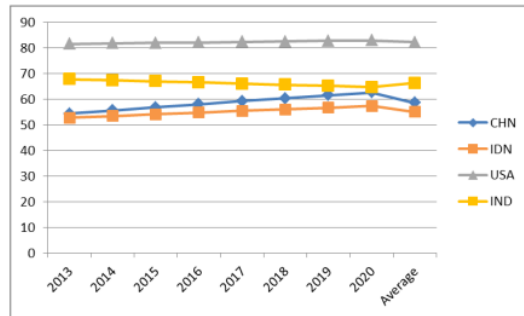

Figure 4. Dynamics of UP in CHN–IDN–USA–ENG, %
Source: [68].

Based on Figures 4 and 5, there are points of unequal distribution of population in the "top–4" of the world's largest population. In fact, the population in urban areas increases sharply every year, but, in rural areas, it decreases. The distribution of urban population in the USA is the highest, where the average is 82.17%. Then, it is ranked 2nd in India: 66.16%, followed by China: 58.48%, and the last rank is Indonesia: 54.98%. Although the population density ratio in these four nations is below countries such as Macao, Monaco, Singapore, Hong Kong, and Gibraltar, the population levels in some cities in China, Indonesia, USA, and India tend to be abnormal. In 2022, India and China are listed in the "10 most populous cities" in the world, of which 32,065,760 residents live in Delhi, Mumbai with 20,961,472 residents, Shanghai is home to 28,516,904 residents, and 21,333,332 residents live in Beijing. On the one hand, Indonesia occupies the 29th position with a large population in the capital (Jakarta) up to 11,074,811. Then, 8,930,002 residents thronged big cities like New York, bringing the USA to 41st [82].
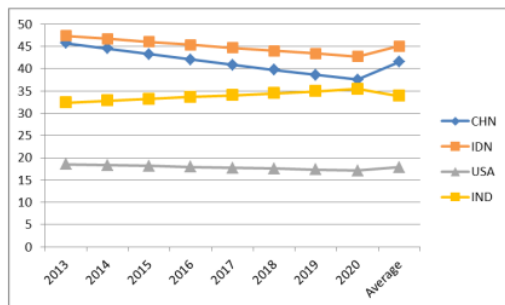
Figure 5. Dynamics of RP in CHN–IDN–USA–ENG, %
Source: [68].

In rural areas, the average Indonesian population living in villages is 45.02%. China: 41.52% (second position), India: 33.85%, and USA: 17.84%. In the 1990s, the government issued a massive "transmigration" policy that moved some urban residents to remote areas throughout Indonesia as a preventive measure to stabilize national development, including cultivating land for agricultural cultivation. The

logical factor that triggers the small number of villagers is the "migration effect" of people moving from one location to another, either from the USA or abroad. Second, generally post-retirement workers prefer to enjoy old age and want happiness through a village atmosphere, some even among retirees who buy land to cultivate crops [83]. Villagers in the USA who are classified as productive age tend to choose to work in cities [84].

Gebre and Gebremedhin [85], Lagakos [86], Riaz et al. [87], and Tacoli [88] examine rural–urban perspectives on agricultural ecosystems. The mutual benefit in the level of dependence of the village with the city and vice versa should not ignore agriculture as the mainstay of the economy in rural areas. The manifestation of rural development is absolutely necessary for urban areas to function. A series of recent evidence reveals that the rural–urban gap is, in fact, fueled by substantial uncontrolled migrants. The extraordinary sensitivity of diversity from the failure to strengthen decentralization has actually pushed the urban poor to adjust to moving to agricultural areas. For example, in Pakistan, cointegration in the linkage between problematic urbanization, reduces agricultural growth.
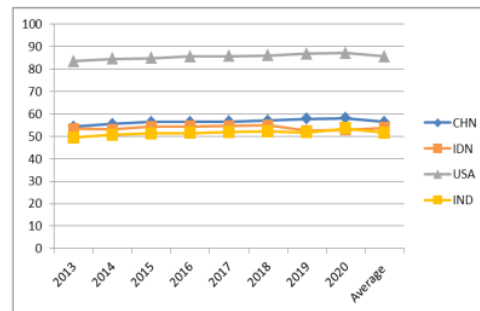

Figure 6. Dynamics of SGI in CHN–IDN–USA–IND, points
Source: [68].

The social level in the global context, which is converted to SGI, proves that the percentage of SGI in the USA is above the average SGI in China, Indonesia, and India, which is 85.34 points. In 2013–2020, the average SGI in China: 56.38 (position 1), Indonesia: 53.68 (position 2), and India: 51.40 (position 3). The dominance of SGI points in China, USA, and India is supported by its biggest achievements in 2020: 57.96, 86.91, and 53.46. Too, only Indonesia with the highest SGI was in 2018 at 54.74 points (see Figure 6). The collapse, culture, social, and tradition when the recession of trust triggered by SARS-CoV-2 in 2019 or what was called "COVID-19" featured news content related to the issue of "transporting", so that it was conveyed with negative perceptions to the public [89]. The collapse of public trust also creates health vulnerabilities, especially existential mental threats [90].

Arifin [91], Ceylan and Özkan [92], Dos-Santos [93], Kołodziejczak [94], and Meikle [95] state that market expansion and globalization, brought reactions to fast-growing middle-high and middle-income nations in the market developing that offers opportunities for agricultural producers. Characteristics such as: product innovation, flexibility of delivery time, cost, and quality of the farm, create a different value chain by market participants. In the concept of "Solow Growth", the per capita income of the

agricultural economy in EU integration is semi-elastic. The essence of the introduction of employment in agriculture, framed by the level of surplus demand for services. In competence, the performance of the most vital agricultural commodities in Indonesia include: manga, cashew, cocoa, tea, and coffee, the level of competitiveness tends to be conservative. The future of local agribusiness in the Mississippi Delta–USA is aligned with global development.
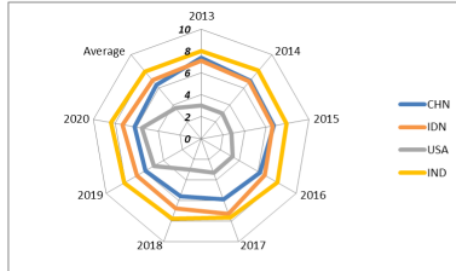

Figure 7. Dynamics of DP in CHN–IDN–USA–IND, points
Source: [68].

Surprisingly, the proportion of DP in the USA is the lowest when compared to China, Indonesia, and India. His average throughout 2013–2020 was 3.6 points. China with the lowest DP: 6.4, ranks 3rd in Indonesia: 6.9, and the highest in India: 8. In aggregate, the level of DP in the four case studies fluctuates. In 2020, DP reached 8.4 points in India and 5.5 points in the USA as the largest, followed by China in 2014 (7.4), and Indonesia for 2017 and 2020 (7.3). This fact is in line with the report from Investopedia [96]. Of the "top 10 economies" at the global level, despite India's reputation as a rich nation, its GDP growth was 8.9% and its GDP per capita touched 2,277 US$. It is only contemporary, where due to the inequality of population across regions, the population is experiencing demographic pressure. In 2021, the USA, whose GDP grew by 5.7%, was able to simulate a GDP per capita of around US$ 69,287, but the happiness of the population was high enough, thus eliminating demographic pressures. Another overview based on Investopedia [96] also highlights China in 2nd place with GDP rate and GDP per capita level: 8.1% and 12,556 US$, respectively. Finally, Indonesia is in the 16th position which has a GDP rate of 3.7% and a nominal GDP per capita of 4,291 US$.

Rationally, anticipating climate change, especially the level of agricultural health, urges permanent mitigation policies considering that health and migration patterns in India are determined by terrestrial water storage anomalies [97]. Calicioglu et al. [98] focuses on solutions to agricultural intensification that are useful in maintaining the food supply of the world's population, which always brings climate change.

6. CONCLUSIONS

The open economy has polarized the entire market share, agriculture is no exception. Consequently, it makes all nations race to increase innovation and social level to integrate the agricultural sector. At the same time, the population density is not balanced, causing turmoil between rural and urban areas, thus potentially triggering demographic pressures. Priorities in research to investigate

the factors that influence AVA include: GII, UP, RP, SGI, and DP. The result, concluded four points: (1) The effect of increasing UP and RP, has a significant effect on AVA in China, (2) The increase in GII, SGI, and DP has a significant effect on the increase in AVA in Indonesia, (3) The increase in GII, SGI, and DP also significantly affects AVA in the USA, and (4) Although UP, RP, SGI, and DP have a significant effect on AVA, but SGI and DP have a negative effect that reduces AVA in India.

By examining the negative implications of each variable in the four observations above, practitioners and the academic community can develop the discipline of agricultural economics, referring to the novelty of this research. Next studies also follow up on the prospect of AVA, which highlights not only emerging markets, but also frontier markets. In addition, the polemic of the competitive level of HR competition, does not create job opportunities. Therefore, the point labor force is absorbed. Demographic pressures in China, Indonesia, and the USA proved positive. Even though it is only negative in India, stakeholders are obliged to control the density of housing through refreshing agricultural concepts that are more humanistic and creative.

Finally, all interested stakeholders consider public policies related to modern agricultural convergence. The problem of increasingly narrow agricultural space and cornered by "extortion" of non-integrated economic sectors, such as the manufacturing industry, requires emergency action, designing structural recommendations, and initiating intense communication between agricultural institutions.

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