Innovation and its Relationship with Regional Competitiveness

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Abstract. Developing regional competitiveness as a means of fostering regional advancement is among the objectives of regional innovation. Nevertheless, there is still a concentration of highly competitive districts on the island of Java, according to statistics from the Ministry of Home Affairs and BRIN. The purpose of this study is to examine how Indonesian regional innovation and competitiveness relate to one another. Quantitative research methodology is applied. All of Indonesia's provinces, districts, and cities make up the study's population. 372 regions, comprising 33 provinces, 69 cities, and 270 districts, made up the samples that were used. Regional competitiveness variables, which are proxied using Regional Competitiveness Index (IDSD) data, and regional innovation variables, which are proxied using Regional Innovation Power Index (IID) data, are the variables used. Cross-sectional data from the Ministry of Home Affairs in 2022 was used. The approaches for data processing and analysis were performed with SPSS version 25. A Pearson Product Moment Correlation analysis was used to analyze the data. Consequently, the P-value is 0.000 and the correlation coefficient (r) is 0.264, which is less than the significance level of $\alpha = 5\%$. This demonstrates that, despite its importance, Indonesia's regional innovation and competitiveness still have a relatively low link. Accordingly, the advice that can be given based on the research's findings is to pursue innovations that are intended to advance regional competitiveness rather than just increasing the number of innovations.

Keywords: regional competitiveness, regional innovation, regional advancement

1 Introduction

As the largest economy in Southeast Asia [1], Indonesia holds significant potential in various aspects, particularly in innovation and competitiveness [2]. Thus, it's essential for the government, as an independent authority, to make strategic decisions based on these aspects. With a population of 275 million in 2022, Indonesia requires various strategic actions to meet its diverse needs that serve the public interest. One potential action the government could take is working towards innovative advancements in the public sector [3]. Innovation is a critical effort in supporting sustainable economic growth, as stated by Umar Juoro in Innovation Economics [4]. Through innovation, organizational renewal can be launched within the framework of meeting existing needs [5]. In 2022, Indonesia's Global Innovation Index is

ICAS 2023, November 29, Bandung, Indonesia

DOI 10.4108/eai.29-11-2023.2347783

ranked 75th out of 132 countries [6], indicating that Indonesia needs to take innovation more seriously to optimize the quality of existing innovations over their quantity.

In the realm of economic theory, Joseph Schumpeter's 1934 study was pivotal for illuminating the role of innovation in driving economic growth. Schumpeter emphasized that economic evolution hinges on the actions of innovators who introduce new ideas and concepts into the economy. These Schumpeterian innovators propel the economy forward by catalyzing economic development and breaking traditional cycles [7]. Through economic development, innovation provides technological change through the cumulative process of knowledge, which is the core of innovation.

In addition to the sole scope of the economy, innovation can also be adaptively connected to various other aspects that influence each other, including social aspects. Ruiz & Parra [8] in The social as the heart of social innovation and social entrepreneurship: An emerging area or an old crossroads? through a sociological-economic perspective, he states a process restriction to the spread of new social practices and policies to encourage changes in the social field of community organization without setting aside the interests of economic goals. This is supported by the ideas put forward by Phillips et al. [8] in the same journal expressed the opinion that social innovation aspires to meet human social needs, focusing on the foundation of the existing culture. This shows that innovation is important in strengthening social instruments in the local community.

China has benefitted from the development of social innovation. Miao C. et al [9] explained in their journal "Strategy, Resource Orchestration and E-commerce Enabled Social Innovation in Rural China" that e-commerce has become a new means for reducing poverty in rural areas through social innovation. To achieve this objective, a viable strategy is to conduct efficient resource management, including collaboration with interested parties. Two instances of such social innovation are the SC mode and BM case, which have significantly boosted the living standards of rural inhabitants through electronic commerce.

Meanwhile, in Indonesia, the government is promoting innovation through policies outlined in Law No. 23/2014 on Regional Government. The law mandates that regional innovation is a requirement for all regions. Technical breakthroughs can be achieved through this legislation. Additionally, PP No. 38/2017 [10] on regional innovation creates new opportunities for regions and their citizens to develop innovative solutions, ultimately enhancing the performance and competitiveness of government administrators. This is based on the government's concern about the harmful impacts of bureaucracy, with an attempt to be more adaptable to the changes and demands in the environment [11]. Furthermore, previous responses have shown new conditions in government organizations known as the post-bureaucracy era [11], as well as re-bureaucratization [11].

Seen from its purpose, innovation aims to enhance efficiency within the community as a whole. This notion aligns with Adam Smith's (1776) concept in "An Inquiry into the Nature and Causes of the Wealth of Nations" that, in a competitive market, a community tends to adopt more effective production methods, ultimately driving the process of innovation. Therefore, the competitiveness of a society necessitates diverse pathways for fulfilling needs that lead to innovation. The intensity of innovation driven by competitiveness can foster regional progress through useful knowledge accumulation [4].

Meanwhile, the Indonesian government utilizes the Regional Innovation Index (IID) as a benchmark for evaluating innovation development in each region. By analyzing the index

score for each region, the government can adopt strategic measures to further advance innovation throughout the country. This work unit, under the Ministry of Home Affairs, is responsible for researching, assessing reports on regional innovations, and proposing candidates for regional innovation awards [10].

Additionally, the National Innovation Research Agency (BRIN) has requested the use of an instrument from the Regional Competitiveness Index (IDSD). This index evaluates a region's capacity to increase value-added productivity and competitiveness domestically and internationally, leading to high and sustainable welfare. The research aims to examine the correlation between regional innovation and the ability to optimize the region's potential.

1.1 Regional Innovation

According to Rogers [11], innovation is a concept, activity, or object that is deemed new by someone. Meanwhile, Law Number 11 of 2019 defines innovation as the outcome of thinking, research, development, assessment, and/or application that includes elements of uniqueness and has been implemented to deliver benefits, economic and/or social. Thus, innovation has implications for all forms of personal renewal endeavors, including those of public and government organizations. According to Adi [12], regional innovation encompasses all types of administrative renewal within regional government. This is affirmed by Government Regulation No. 38 of 2017 regarding Regional Innovation, which aims to enhance the performance of regional government administration.

According to Rahman and Ikram [13], in Efforts to Strengthen the Research and Development Agency and Regional Innovation in Palopo City, public sector organizations or governmental organizations require specific aspects to address the complexity present in innovation. These aspects include political processes, policies, quality, and related factors. Thus, innovation in the public sector can also be defined as a process of creating, developing, and implementing new ideas that can provide better benefits such as reducing costs and increasing the efficiency, and effectiveness of services [11]

Updates in the innovation mechanism exhibit various variations. Muluk [13] identified two types of innovation: 1) Product innovation which involves modifications in service design and product that differ from previous service products, and 2) Process innovation characterized by frequent quality improvement and a blend of modifications, processes, policies, and management adjustments required by the company. 3) Service method innovation involves introducing new methods of customer interactions or providing services. 4) Strategy or policy innovation focuses on vision, mission, goals, and strategies, and may require new policies to address current realities. 5) System innovation requires changes in organizational management through novel interactions or relationships with other actors.

Innovation in the public sector has various types, including product innovation, process innovation, service method innovation, and strategy or policy innovation. These types of innovation can be allocated to appropriate and relevant needs.

1.2 Regional Competitiveness

Regional competitiveness refers to the capacity of a region to generate high income and elevate living standards for its inhabitants (Mayer-Stamer in [14]).

To see the high and low competitiveness of a region can be seen from the Regional Competitiveness Index. To see the extent of the productivity of a region which ultimately reflects the ability of the region to compete, both in the national and global arena can be seen from the value of the regional competitiveness index (IDSD). This index illustrates the condition and ability of a region to optimize all its potential through increased value-added productivity and competition, both domestic and international for high and sustainable welfare.

IDSD can aid local governments in comprehending the competitive advantages of their regions, allowing for suitable actions to enhance regional competitiveness [15].

The IDSD aims to attain a comprehensive and unified gauge of regional competitiveness that exhibits the region's level of productivity, progress, competition, and autonomy in both absolute and relative terms [15].

In today's globalized world, competition among regions and countries is fierce, as evidenced by The World Economic Forum's 2019 Global Competitiveness Index. This index measures four key indicators: enabling environment, human capital, markets, and innovation ecosystem, which are then broken down into 12 pillars to determine the IDSD [16] Increasingly intense and global competition compels regions to maximize their potential to attract investments, stimulate job creation, improve community well-being, and promote sustainable economic growth.

According to BRIN [15], the measurement of competitiveness is based on several indicators, including comparative advantage, competitive advantage, and absolute advantage. Additionally, BRIN explains a measurement framework to determine competitiveness index levels within a region. This measurement framework comprises the four pillars mentioned earlier and an additional twelve pillars, which include institutions, infrastructure, ICT adoption, macroeconomic stability, health, skills, product markets, labor markets, financial systems, market size, business dynamism, and innovation capabilities (Schwab, 2019 in [15]).

IDSD is a valuable tool for comprehensively monitoring and assessing regional optimization efforts. Local governments can use IDSD as a reference for improving identified shortcomings and also to strengthen the region's competitive advantages.

1.3 Relationship between Regional Innovation and Regional Competitiveness

Efforts by the government to advance regional development have multiple elements, including innovation and competitiveness [17]. Positive continuity will result from the simultaneous increase in the intensity of these two variables. This is necessary due to the complex needs of society and the requirement for efficient fulfillment. Innovation is seen as a means to identify and implement superior alternative methods compared to previous ones. According to E. Voronina [18] through her research in the social and political fields, the innovative environment is "an economically organized space that provides a platform for the development of innovative resources" and "an integrated pool for the accumulation and realization of innovative potential in business". Thus, the implication of the environment referred to here is the shape of the area itself.

Several studies have demonstrated a correlation between regional competitiveness and innovation, indicating a positive relationship with the development of a region. Maksymenko and Komandrovska [18] observed this relationship in their research, identifying several supporting variables, such as the level of regional competitiveness, that contribute to the development of regional innovation. Additionally, with support from WIPO, BRR, and OECD, and their mathematical findings, this study has successfully demonstrated the connection between knowledge management, innovation development, and the growth of intellectual capital in Ukraine.

Using correlation-regression analysis, a strong relationship was established between innovative development and country competitiveness (r=0.96), between the global innovation index and the sustainable development index (r=0.86), which is based on three components: ecological, institutional, and economic development. The global innovation index (GII), sustainable development index, and competitiveness index are significant variables for determining a country's level of intellectual and innovative development. WIPO employs the global innovation index ranking to illustrate a country's scientific, technical, and innovative potential, which in turn leads to readiness for the development of domestic intellectual capital.

The findings of this study suggest that knowledge management and intellectualization of the business environment, employment in science-intensive occupations, effective monetary and credit policies, innovation and investment activities, innovation commercialization, human resource development, ICT application, university-industry cooperation, and clustering have both positive and negative effects on socio-economic development and can boost potential GDP. Amidst the current unstable socio-economic environment in Ukraine, scientific, technical, and innovative activity persists. This is largely thanks to the mobility of scientific and pedagogical work and the heightened activity of higher education students. Additionally, despite the lack of support from business structures, state authorities have played a pivotal role in the development of this concept.

2 Method

The research method used is the quantitative method. The population of this research includes all provinces, districts, and cities in Indonesia, totaling 372 regions. There are two variables used in this study, namely regional innovation variables and regional competitiveness variables. Regional innovation variables are proxied using Regional Innovation Index (IID) data, while regional competitiveness variables are proxied using Regional Competitiveness Index (IDSD) data.

Both of these sets of data are secondary, originating from different sources. The IID was obtained from the Minister of Interior's Innovation Index of Provinces, Districts, and Cities in 2022, while the IDSD was derived from the National Research and Innovation Agency's 2022 Competitiveness Index Report of Territories.

The data were processed and analyzed using SPSS version 25. To test the relationship between innovation and regional competitiveness, the analysis used Pearson Product Moment Correlation techniques as described by Sugiono (2009). The study obtained the value of the Pearson correlation coefficient through formula (1):

$$r = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{(n-1)s_x s_y} \quad (1)$$

where r represents the Pearson Product Moment correlation coefficient (Bruce, et al., 2020). xi denotes the value of i-th regional innovation index, $\bar{x}$ is the regional innovation index's average, and s_x is the standard deviation of the regional innovation index. Similarly, yi denotes the value of i-th regional competitiveness index, $\bar{y}$ is the regional competitiveness index's average, and s_y is the standard deviation of regional competitiveness index. The correlation coefficient ranges from +1 (indicating a perfect positive correlation) to -1 (representing a perfect negative correlation), whereas 0 denotes no correlation.

Furthermore, to determine the significance of the correlation between the regional innovation and competitiveness variables, the following hypothesis is employed:

H0: $\rho = 0$,

H1: $\rho \neq 0$

where ρ is the Pearson Product Moment correlation parameter between the innovation variable and the regional competitiveness variable. The criteria for acceptance or rejection of H0 is if the P-value of the SPSS output is smaller than α, then H0 is rejected. This means that there is a significant linear relationship between the regional innovation variable and the regional competitiveness variable. Vice versa, if the P-value is greater than α, then H0 is accepted. This means that there is no significant linear relationship between the regional innovation variable and the regional competitiveness variable.

3 Result and Discussion

3.1 Regional Innovation

Regional innovation in Indonesia has gained momentum since the enactment of Law No. 23 of 2014 and has been technically implemented through Government Regulation No. 38 of 2017 concerning regional innovation. The number of innovative regions has grown annually, with 542 regions innovating as of 2022, comprising 34 provinces, 93 cities, and 415 districts. Of all provincial, regency, and city regions that have implemented innovations, there have been 26,900 total innovations produced. These comprise 1,610 new innovations, 1,473 innovations in the trial phase, and 23,817 innovations that have been implemented. New innovation refers to the process of disseminating novel concepts or ideas through replication, adaptation, and adoption, as outlined in the Perbup No. 40 of 2021[19]. Trial innovation comprises the stage when innovations are tested in a laboratory, as defined in PP No. 38 of 2017 [10], while implementation innovation involves the establishment of local regulations or directives that govern and report the outcomes to the minister by the regional head per the same regulation.

Based on the scores, the Ministry of Home Affairs classifies regions into three categories: highly innovative, innovative, and less innovative. Table 1 below displays the innovation categories assigned to each provincial, district, and city region.

Table 1. Number of Provincial/Regency/City Regions by Innovation Category in 2022

Category	Province	District	City
Very Innovative	9	23	12
Innovative	24	267	74
Less Innovative	1	94	6
Not Rated	-	31	1
TOTAL	34	415	93

Source: Ministry of Home Affairs, 2023

When analyzed using the 2022 index, North Maluku Province has the lowest index number at 33.11, while South Sumatra Province has the highest at 79.47. The difference between the smallest and largest index numbers at the provincial level is fairly significant at 46.36. Deiyai Regency holds the lowest index number at the kabupaten level, with an IID value of 0.40. The district with the highest index number is Banyuwangi at 96.30 on the IID scale. The difference between the smallest and largest indices at the district level is notably large at 95.90. As for the city level, Binjai City registers the smallest index value at 10.00, while Mojokerto City has the highest index value at 70.78. The range between the smallest and largest indices at the city level is high at 60.78.

3.2 Regional Competitiveness

Regional competitiveness is the capacity of a region to fully optimize its potential. It is demonstrated through elevated value-added productivity and competition, both nationally and globally, resulting in high and sustainable prosperity. The Regional Competitiveness Index (IDSD) serves as a tool to measure competitiveness at the provincial, district, and city levels. IDSD is employed to analyze regional competitiveness, which reflects the productivity level of a region. The IDSD is a composite index comprising four components: the enabling environment, human resources, market, and innovation ecosystem.

BRIN categorizes regional competitiveness into four categories based on scores, including regions with scores of 2.51-3.00, 3.01-3.50, 3.51-4.00, and 4.01-4.50. The IDSD scores of 3.51 or higher are still concentrated in Java, while several provinces with scores ranging from 3.00 to 3.51 are scattered throughout different islands. The average provincial IDSD score at the provincial level mirrors the National IDSD score. In 2022, the National IDSD score is 3.26. A total of 14 provinces have IDSD scores above the national average, including West Sumatra Province, Bengkulu Province, Riau Islands Province, DKI Jakarta Province, West Java Province, Central Java Province, DI Yogyakarta Province, East Java Province, Banten Province, Bali Province, East Kalimantan Province, South Sulawesi Province, Southeast Sulawesi Province, and North Maluku Province. These provinces have surpassed the national standards for IDSD.

The IDSD scores show that the districts of Sleman, Badung, Sidoarjo, Bantul, Sukoharjo, Tangerang, Banyumas, Buleleng, Gresik, and Kudus have the highest rankings. Meanwhile, Medan City, Bengkulu City, Makassar City, Malang City, Padang City, Surakarta City, Surabaya City, Yogyakarta City, Bandung City, and Semarang City have the highest IDSD scores at the city level.

3.3 Relationship Between Regional Innovation and Regional Competitiveness

One of the goals of regional innovation is to create regional competitiveness [20]. In this statement, it is assumed that regions with high innovation will have high competitiveness. Based on the data processing carried out, the following results are obtained.

Table 2. Correlation Results between Regional Innovation and Regional Competitiveness

		Regional Innovation	Regional Competitiveness
Regional Innovation	Pearson Correlation	1	.264**
	Sig. (2-tailed)		.000
	N	372	372
Regional Competitiveness	Pearson Correlation	.264**	1
	Sig. (2-tailed)	.000	
	N	372	372

**. Correlation is significant at the 0.01 level (2-tailed)
Source: processed

Based on Table 2, the Pearson correlation value (r) between the regional innovation variable and the regional competitiveness variable is 0.264 with a P value or Sig. (2-tailed) of 0.000 (less than $\alpha = 0.05$). This shows that the correlation between the two variables is positive and significant, although the relationship is very weak.

4 Conclusion

Based on these results, it is evident that regional innovation in Indonesia has been able to improve the competitiveness of its regions. This is consistent with the results of research conducted by Zhanna Maksymenko and Veronika Komandrovska [18], where innovative development and state competitiveness have a positive correlation. Regional innovation is considered to have increased the ability of a region to optimize all the potential of the region. Regional innovation is also considered to have been able to increase value added productivity and competition, both domestically and internationally for high and sustainable welfare.

Regional innovation enhances a region's potential to optimize its resources effectively. Regional innovation is seen to enhance productivity and competition, leading to higher welfare domestically and internationally. However, the cross-sectional data used in this research in 2022 only reflects the relationship between innovation and competitiveness in a single year, so it is important to be cautious in interpreting these findings. Therefore, researchers with an interest in conducting similar research should utilize panel data to comprehensively analyze current conditions in Indonesia.

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