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THE RELATIONSHIP BETWEEN SPECIAL ECONOMIC ZONES AND ECONOMIC GROWTH AND WELFARE: EMPIRICAL EVIDENCE FROM REGENCIES AND CITIES IN INDONESIA

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ABSTRACT
Research Originality — This study addresses the empirical gap in Indonesian literature by quantitatively evaluating the impact of special economic zones (SEZs) on regional economic growth and unemployment at the regency and city levels across the nation.
Research Objective — This research aims to analyze the relationship between SEZs, economic growth, and community welfare at the regency and city levels, with community welfare measured by the unemployment rate.
Research Methods — This research analyzed regencies/cities in 14 provinces that have SEZ, with the research conducted over the period of 2010 to 2021. Analysis was carried out using the two-stage least squares (2SLS) method.
Empirical Results — The results of the research showed that SEZs exhibited a significant positive relationship with regional economic growth, while SEZs showed an insignificant relationship with regencies/cities welfare as measured by unemployment rate indicator.
Implications — The findings of the research suggest that the implementation of SEZs can be maintained and continued. The regional governments can take advantage of SEZ by strengthening infrastructure and collaborating with the central government to increase the competence of local labor.

Keywords: Economic growth, special economic zones, two-stage least squares, unemployment rate
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INTRODUCTION

Background

Efforts to achieve equitable economic growth across all regions in Indonesia are aimed at improving public welfare. One key aspect to assess welfare is employment, particularly through the indicator of open unemployment rate (OUR). A high unemployment rate leads to reduced household income, which in turn hinders the ability to meet basic needs (Cita & Wirawan, 2016). Economic growth in a given region can create job opportunities, absorb labor, and ultimately lower unemployment. Therefore, regional economic growth is viewed as a critical factor in enhancing public welfare.

One initiative introduced by the government to spur regional economic growth is the development of special economic zones (SEZs). Indonesia is among the countries that have adopted SEZ policies to address regional economic disparities, especially in terms of economic growth. According to Statistics Indonesia (BPS), from 2010 to 2022, Java Island consistently contributed more than 50% of the national Gross Regional Domestic Product (GRDP), while other islands contributed less than 10%, except for Sumatra, which contributed over 20% (BPS, 2023a).

SEZs in Indonesia are designated in specific areas with geographic and economic advantages to support import, export, and other high-value economic activities in targeted regions (Dewan Nasional KEK, 2023). The core activities of SEZs are based on the region's economic potential. To maximize this potential, the government offers both fiscal and non-fiscal incentives to attract domestic and foreign investment. As of 2021, 19 SEZs were established: Arun, Sei Mangkei, Tanjung Api-api, Galang Batang, Nongsa, Batam Aero Technic, Tanjung Kelayang, Tanjung Lesung, Lido, Kendal, Gresik, Singhasari, Mandalika, Maloy Batuta

Trans Kalimantan (MBTK), Bitung, Likupang, Palu, Morotai, and Sorong. By December 2021, these SEZs had attracted IDR 76.75 trillion in investment, created employment for 28,984 workers, and engaged 179 business actors (Dewan Nasional KEK, 2022).

Regional economic growth is closely linked to the unemployment rate in that area. According to Okun's Law, there is a negative relationship between economic growth and unemployment. This relationship arises because increased production and consumption driven by economic growth lead to the creation of new jobs, greater labor absorption, a reduction in the number of unemployed individuals, and ultimately a decline in the unemployment rate. Conversely, a rise in unemployment in a given area leads to a decrease in income, which may hinder individuals from meeting their basic needs, thereby reducing overall welfare. Thus, the unemployment rate serves as an important indicator of societal welfare at the regional level.

APPLICATIONS FOR PRACTICE

- Special Economic Zones (SEZs) have a significantly positive relationship with the economic growth of the analyzed regencies/cities.
- SEZs exhibit an as yet insignificant relationship with open unemployment rate (OUR) in the regencies/cities under study.
- Based on the findings, the implementation of SEZs can be maintained and expanded to create new centers of economic growth, generate employment opportunities, and enhance the added value of local products.
- Regional governments are encouraged to enhance the supporting infrastructure for SEZs to boost productivity and absorb local labor, as well as to collaborate with the central government in enhancing the capacity of the local workforce in alignment with SEZ activities.

Indonesia has experienced a downward trend in its open unemployment rate (OUR) over the years; however, the level remains relatively high. At certain points in time, the OUR has not met the targets set by the government in the National Medium-Term Development Plan (RPJMN). For example, in 2015, Indonesia's OUR reached 6.18%, exceeding the target of 2014–2019 RPJMN of 5.0%–6.0%. The COVID-19 pandemic further exacerbated unemployment levels, with the OUR rising to 7.07% in 2020 and 6.49% in 2021, well above the target of 2020-2024 RPJMN of 3.6%–4.3%.

The implementation of SEZs in various countries has yielded mixed outcomes. SEZs have been reported to promote regional economic growth (Possebom, 2017; Riesfandiari et al., 2023; Widianto & Yudhistira, 2021; Zhao & He, 2022), increase investment (Cizkowicz et al*.,* 2017; Song et al., 2020), enhance regional labor absorption (Cizkowicz et al., 2017; Lu et al., 2019), and raise wage levels (Lu et al*.,* 2019). However, SEZs have also been found to have no significant impact on certain regional development indicators (Alkon, 2018), and in some cases, have had negative effects on specific sectors such as agriculture (Possebom, 2017).

The relationship between economic growth and unemployment has been confirmed in several studies. Economic growth has been shown to have a significantly negative effect on unemployment (Cita & Wirawan, 2016; Louail & Benarous, 2021; Bailusy et al., 2023). On the other hand, economic growth may also positively influence unemployment levels if not accompanied by substantial improvements in production capacity (Leasiwal et al., 2022).

Quantitative studies examining the relationship between the implementation of SEZs and unemployment, as a proxy for welfare, remain limited in the Indonesian context. Existing research in Indonesia has generally used other welfare indicators. For instance, Taufiqurrahman and Khoirunurrofik (2023) investigated the impact of SEZs on poverty and concluded that SEZs contributed to poverty reduction. Using a qualitative approach, Yuli et al. (2023) found that SEZs positively affected welfare in terms of education, the economy, and health. From an economic perspective, SEZs increased incomes and job opportunities for local communities by generating employment. However, the scope of these studies is relatively narrow and does not reflect the broader national context. Quantitative research examining the relationship between SEZs and welfare, as measured by the unemployment rate, on a national scale remains scarce. This study aims to address this gap by empirically analyzing the quantitative impact of SEZs on the unemployment rate at the national level. Thus, the novelty of this research lies in its quantitative assessment of the empirical relationship between SEZs and unemployment within a broad national context.

This study analyzes the relationship between special economic zones (SEZs), economic growth, and welfare, measured through the open unemployment rate (OUR), at the regency/city level using a quantitative and simultaneous approach. This analysis is grounded in the theoretical relationship between SEZs and regional economic growth, the link between regional economic growth and unemployment as a measure of welfare, and the limited empirical research on this topic in the Indonesian context. Given that improvements in welfare, as indicated by declining unemployment rates, are driven by increased regional

economic growth, this study examines the relationship between SEZs and regional economic growth, as well as between SEZs and unemployment through the channel of economic growth at the regency/city level.

In light of these interrelated dynamics, this study employed a two-stage modeling approach. The model captured the relationship between SEZs and economic growth, and subsequently, the relationship between economic growth and the unemployment rate as an indicator of welfare. Accordingly, the study applied the two-stage least squares (2SLS).

This research is significant for assessing the effectiveness of SEZs in promoting economic growth, which is the primary objective of their establishment, and for evaluating their impact on welfare, particularly in terms of the unemployment rate. The analysis of the relationship between SEZs and unemployment seeks to determine the role and effectiveness of SEZs in generating employment and reducing unemployment, which can have detrimental effects on economic performance.

The study is expected to contribute to the existing literature by providing empirical evidence on the impact of SEZs on regional economic growth and welfare, particularly with respect to the unemployment rate, at the regency/city level. The findings are anticipated to assist central and regional governments in evaluating SEZ implementation and formulating policies aimed at enhancing regional economic growth and welfare. Additionally, this research may serve as a reference for future studies on the relationship between SEZs, or other policy instruments, and regional economic outcomes, including the use of variables, methods, analytical frameworks, and other research components.

This study examines the relationship between SEZs, economic growth, and unemployment rates across regencies and cities from 2010 to 2021. The units of analysis include all regencies and cities within the 14 provinces that host SEZs. The study covers 18 SEZs established between 2012 and 2021. The SEZs analyzed refer to those defined in Law No. 39 of 2009 concerning Special Economic Zones, as amended by Law No. 11 of 2020 on Job Creation, excluding other types of SEZs as defined by the United Nations Conference on Trade and Development (UNCTAD).

LITERATURE REVIEW

Economic Growth

Economic growth refers to the sustained increase in aggregate output within an economy (Blanchard, 2017). Regional economic growth is closely related to the theory of growth poles. According to Perroux (1950), growth does not occur uniformly across all regions but rather emerges in specific "poles" or centers and gradually spreads to other areas, ultimately influencing the broader economy. Regional economic growth is also driven by activities arising from clustering, localization, urbanization, and the concentration of firms and industries within a particular area, which in turn generate economies of scale and agglomeration economies (McCann & Van Oort, 2019).

Agglomeration Economy

Agglomeration economies arise when firms producing similar or complementary products are located in close proximity to one another (Bolter & Robey, 2020). These economies involve intra- and inter-industry interactions that are complementary and inseparable, including mechanisms such as matching, sharing, and learning externalities. Agglomeration economies also encompass integrated labor markets, input-output linkages, and knowledge spillovers, which together contribute to increasing returns to scale across regions (Behrens & Nicoud, 2015).

SPECIAL ECONOMIC ZONES (SEZS)

According to UNCTAD (2019), special economic zones (SEZs) are defined by three main characteristics: (i) they have clearly delineated geographical boundaries; (ii) they operate under distinct regulatory regimes that differ from the rest of the economy, such as in customs, taxation, and other relevant regulations; and (iii) they are supported by infrastructure. SEZs represent a form of place-based policy, which targets specific geographic areas for preferential treatment. This policy aims to boost regional economic growth (Lu et al., 2019). Place-based policies are considered effective in enhancing regional economic performance because they leverage the principles of agglomeration economies, namely, attracting economic activities to a designated area, which can stimulate localized economic growth (Moretti, 2010).

SEZ Policy in Indonesia

Indonesia's SEZ policy was initiated in 2009 with the enactment of Law No. 39 of 2009 on Special Economic Zones. The development of SEZs focuses on areas with geostrategic advantages and economic potential. These zones are intended to optimize high-value economic activities, such as industrial production, exports, imports, and other economic operations, to promote regional economic growth, reduce development disparities, and enhance the value-added of technological and human resource utilization (Dewan Nasional KEK, 2023). SEZ development aims to accelerate economic growth through the creation

of agglomerated industrial clusters, emphasizing the development of regionally competitive commodities. The SEZ policy is expected to serve as an innovative model for regional development, particularly in the industrial, tourism, and trade sectors, and contribute to job creation. SEZs are not limited to industrial activities but also encompass tourism, healthcare, education, and other potential sectors. Based on this scope, SEZs differ from previous types of economic zones and place-based policies implemented in Indonesia.

The Indonesian government offers both fiscal and non-fiscal incentives to investors operating within SEZs. Fiscal incentives include income tax holidays or allowances, exemption from value-added tax (VAT) on certain activities, exemption from import duties and taxes on imports (PDRI) or excise for qualifying goods, exemption from luxury goods sales tax (PPnBM) for eligible goods, deferral of import duties for SEZ developers during construction phases, 0% import duty on goods meeting domestic content requirements (TKDN), relaxed import regulations, and other fiscal benefits for tourism-related SEZs. Non-fiscal incentives include streamlined licensing processes; special regulations concerning labor, immigration, foreign ownership within tourism SEZs, land use, and spatial planning; infrastructure support from the government; a conducive business environment; and various other incentives (Dewan Nasional KEK, 2023).

As of 2021, the Indonesian government had built 19 SEZs, comprising 11 industrial SEZs (three of which were not yet operational) and eight tourism SEZs (four of which were not yet operational). Based on development progress, four SEZs had achieved optimal development (Sei Mangkei, Galang Batang, Kendal, and Mandalika), four were in suboptimal development stages (Arun Lhokseumawe, Tanjung Kelayang, Tanjung Lesung, and Palu), and six required special attention (Singhasari, MBTK, Bitung, Likupang, Morotai, and Sorong). Four newly created SEZs (Nongsa, Batam Aero Technic, Lido, and Gresik) were not operational yet, while the status of one SEZ, Tanjung Api-Api, was officially revoked the following year due to lack of progress (Dewan Nasional KEK, 2021).

Cumulatively, as of 2021, the total realized investment in SEZs from business entities and operators was IDR 76.75 trillion, with total employment reaching 28,984 workers. Galang Batang SEZ recorded the highest investment, amounting to IDR 15.74 trillion, while Kendal SEZ had the highest employment absorption. Several SEZs, such as Galang Batang, Sei Mangkei, Kendal, and Palu, had also begun export activities.

Unemployment

Unemployment, or open unemployment, refers to individuals within the labor force who are not currently employed but are actively seeking work, preparing to start a business, or not actively looking for work despite being available for employment. It also includes individuals who already have employment but have not yet started working. Being unemployed implies a lack of employment, which can reduce an individual's standard of living (Mankiw, 2012). Unemployment contributes to declining productivity and household income, subsequently reducing consumption levels and potentially leading to broader social issues such as crime and delinquency.

The unemployment rate is closely associated with a region's economic growth. According to Okun's Law, as cited in Louail and Benarous (2021), economic growth is negatively correlated with the unemployment rate. The cost of unemployment includes a reduction in societal welfare (Gorjón et al., 2020). Therefore, the unemployment rate, known in Indonesia as *Tingkat Pengangguran Terbuka* (TPT), serves as a key indicator of public welfare from a labor market perspective. In Indonesia, the magnitude of unemployment is measured using the TPT indicator, defined as the ratio of unemployed individuals to the total labor force, expressed as a percentage.

Empirical Review

Most studies on special economic zones (SEZs) report positive impacts on various regional socio-economic indicators. Several studies have shown that SEZs contribute positively to regional economic growth. For instance, Alder et al. (2016) found that the implementation of SEZs in China increased economic growth through a rise in the real GDP of the analyzed regions. Similarly, Cai et al. (2021) reported that free trade zones (FTZs) in China contributed to regional economic expansion. Possebom (2017) found a positive effect of FTZs on the real GDP growth of Manaus, Brazil. Zhao and He (2022) highlighted improvements in the quality of regional economic growth following the implementation of the Shanghai FTZ. Arbolino et al. (2023) also demonstrated that SEZs in several European Union countries positively affected regional economic growth.

In the Indonesian context, Widianto and Yudhistira (2021) reported that the Sei Mangkei SEZ contributed to the economic growth of Simalungun Regency, although the benefits were relatively modest. Similarly, Riesfandiari et al. (2023) found that the Sei Mangkei SEZ had a significantly positive impact on subdistrict-level economic growth in Simalungun Regency, but the magnitude of the benefit remained limited.

SEZs have also been found to positively affect other regional economic indicators. For example, Song et al. (2020) showed that SEZs in China promoted regional foreign direct investment (FDI). Lu et al. (2019) reported that SEZs had a favorable effect on wage levels. They also found that SEZs increased output, productivity, and the number of firms within designated areas. Li et al. (2023) found that SEZs contributed positively to regional innovation.

However, the effects of SEZs on regional employment absorption vary. Several studies report a positive impact of SEZs on employment in specific regions (Cizkowicz et al., 2017; Jensen, 2018; Lu et al., 2019). In contrast, Brussevich (2020) found that SEZs in Cambodia did not significantly affect overall employment levels but had a positive impact on female labor force participation.

SEZs have also been reported to improve local community welfare. A qualitative study by Yuli et al. (2023) on the Mandalika SEZ found that it had a positive impact on the local population's well-being in terms of education, economic conditions, and health. Economically, the study reported increased income and employment opportunities for local residents due to new job openings. However, this study had limitations, including a small sample size and a narrow geographic focus, making it difficult to generalize the findings more broadly.

Taufiqurrahman and Khoirunurrofik (2023) examined the impact of SEZs on poverty, one of the key indicators of social welfare in Indonesia. Their findings suggest that while SEZs reduced poverty in some regions, they also contributed to increased poverty in others.

SEZs may not always generate positive effects on specific indicators. Alkon (2018) found that SEZs in India did not contribute to regional development indicators. The failure was attributed to political-economic incentives among local politicians, who viewed SEZs as opportunities for rent extraction rather than as tools for promoting broad-based development.

SEZs can also have divergent effects across economic sectors. Possebom (2017) reported that the free trade zone (FTZ) in Manaus, Brazil, had a positive impact on total manufacturing and service production but negatively affected agricultural production. This negative effect stemmed from the misallocation of economic sectors.

The type and primary activity of SEZs have been reported to influence regional economic growth differently. Violita, (2023) found that tourism-focused SEZs in Indonesia had a significantly positive effect on regency/city-level economic growth, whereas industrial SEZs had not yet demonstrated a significant impact on regional economies.

Numerous studies have examined the relationship between economic growth and unemployment. Economic growth has been reported to have a significantly negative effect on unemployment rates (Cita & Wirawan, 2016; Leasiwal, 2021; Louail & Benarous, 2021; Bailusy et al., 2023;). However, Leasiwal et al. (2022) observed that economic growth may positively correlate with unemployment when not accompanied by a substantial increase in production. In several studies, economic growth serves as an intermediary variable to explore the indirect relationship between its determinants and unemployment rates. For example, Cita and Wirawan (2016) and Bailusy et al. (2023) employed gross regional domestic product (GRDP) to connect its determinants with the open unemployment rate (OUR), thereby illustrating how the determinants of economic growth relate to unemployment levels.

Regional economic structures influence both economic growth and unemployment. Cita and Wirawan (2016) found that a primary-sector-dominated economic structure had a significantly negative effect on both economic growth and unemployment. Similarly, Rahmah and Muttaqin (2023) reported that agriculture, industry, and trade sectors significantly affected unemployment rates. Economic structure has also been used as a control variable in regional economic growth analyses by Possebom (2017), Widianto and Yudhistira (2021), and Arumandani and Zen (2023).

The COVID-19 pandemic and vaccination efforts have also been reported to influence regional economic growth and unemployment. Junaidi et. al. (2020) found a significantly negative relationship between the pandemic and economic growth. COVID-19 was also shown to increase unemployment rates in certain regions (Sani et al., 2022). Musyarof and Qomari (2021) reported that COVID-19 vaccination had a positive impact on economic growth and a negative impact on unemployment. Deb et al. (2022) observed increased economic activity following the rollout of COVID-19 vaccines. Similarly, Khatiwada et al. (2024) reported a significantly negative relationship between vaccination rates and unemployment.

METHODS

This study employed secondary data obtained from the National SEZ Council, Statistics Indonesia (BPS), and legal documents concerning the designation of the COVID-19 pandemic, specifically Presidential Decree No. 11 of 2020, Presidential Decree No. 12 of 2020, and Presidential Decree No. 24 of 2021. The unit of analysis was the regency/city (*kabupaten/kota*) level. The study covered all regencies/cities in 14 provinces: Aceh, North Sumatra, Riau Islands, Bangka Belitung, Banten, West Java, Central Java, East Java,

West Nusa Tenggara, East Kalimantan, North Sulawesi, Central Sulawesi, North Maluku, and West Papua. These provinces were selected because they host SEZs established between 2012 and 2021.

Regencies/cities in South Sumatra were excluded from the analysis because Tanjung Api-Api, an SEZ in the province has not taken off since its development in 2014. It is likely that there was no economic agglomeration capable of enhancing economic growth or reducing unemployment. During the period of analysis, no SEZs were created in other provinces. Excluding Tanjung Api-Api, the study covered 18 SEZs, both industrial and tourism-based, including Arun SEZ, Sei Mangkei SEZ, Galang Batang SEZ, Batam Aero Tech SEZ, Nongsa SEZ, Tanjung Kelayang SEZ, Tanjung Lesung SEZ, Lido SEZ, Kendal SEZ, Singhasari SEZ, Gresik SEZ, MBTK SEZ, Likupang SEZ, Bitung SEZ, Palu SEZ, Morotai SEZ, and Sorong SEZ. These SEZs represent the entire set of SEZs designated in Indonesia during the analysis period (excluding Tanjung Api-Api), ensuring broad geographic and sectoral representation.

A total of 242 regencies/cities were included in the analysis, encompassing both SEZ-hosting and non-SEZ-hosting areas within the 14 provinces. Regencies/cities with SEZs served as the treatment group, while the control group consisted of those without SEZs. The goal of this comparison was to assess the presence or absence of SEZs in specific regions.

The analysis covered the period from 2010 to 2021. This timeframe was chosen to capture economic growth and welfare trends (as measured by the unemployment rate) before and after SEZ implementation, beginning two years before the first development of SEZ in 2012.

Based on the selected regency/city groupings and the analysis period, this study examined the relationship between SEZs, economic growth, and welfare (measured by the unemployment rate), both before and after SEZ implementation and across regions with and without SEZs. With the combination of 18 SEZs and the time series analysis, a total of 2,904 observations were generated.

This study employed two dependent variables, one independent variable, and a set of control variables. The dependent variables were regional economic growth, measured by the gross regional domestic product (GRDP) at constant 2010 prices, and regional welfare, proxied by the open unemployment rate (TPT) at the regency/city level. TPT was selected as the indicator of welfare in this study because special economic zones (SEZs) have the potential to stimulate economic growth, which in turn is associated with job creation and increased labor absorption, including the local workforce. Therefore, SEZs may contribute to reducing TPT at the regency/city level.

The independent variable was the presence of an SEZ in a given region and year, represented as a dummy variable (1 = SEZ present, 0 = no SEZ). The presence of SEZs was determined based on their official year of establishment. The control variables included economic structure (i.e., the proportion of tourism activities, industrial and manufacturing activities, and agricultural activities), population (population density), the COVID-19 pandemic (dummy variable: 1 = pandemic period, 0 = non-pandemic), and COVID-19 vaccination (dummy variable: 1 = vaccination implemented, 0 = not implemented). Operational definitions of all variables used in the study are presented in Table 1.

This study employed the two-stage least squares (2SLS) method. Drawing on economic theory and previous empirical findings, such as the evidence that SEZs influence regional economic growth (Possebom, 2017; Widianto & Yudhistira, 2021; Riesfandari et al. 2023), and Okun's Law, which posits a negative relationship between economic growth and unemployment, the study adopted a model in which SEZs were hypothesized to affect welfare (measured by TPT) indirectly through their influence on regional economic growth. The relationship between regional economic growth and TPT is also reported in previous research (Cita & Wirawan, 2016: Louail & Benarous, 2021; Leasiwal, 2021; Bailusy et al., 2023). The model used in this study is as follows:

$$ln\_PDRB_{it} = \alpha_0 + \alpha_1 KEK_{it} + \alpha_i \sum x_{it} + \varepsilon_{it} \dots (1)$$

$$TPT_{it} = \beta_0 + \beta_1 \widehat{ln\_PDRB}_{it} + \varepsilon_{it} \dots (2)$$

where:
ln_PDRB_{it} is the natural logarithm of the GRDP at constant prices for regency/city *i* in year *t*;
TPT_{it} is the open unemployment rate for regency/city *i* in year *t*;
KEK_{it} indicates the presence of an SEZ in regency/city *i* in year *t*;
x_{it} represents the control variables for regency/city *i* in year *t*;
ε_{it} is the error term.

As shown in equations (1) and (2), the analysis was conducted in two stages. In the first stage, SEZ status was used as an instrument to estimate its direct effect on regional economic growth. In the second stage, the estimated regional economic growth was used to assess its effect on TPT. Accordingly, in this model, SEZs were hypothesized to affect the open unemployment rate indirectly, through their impact on regional economic growth.

Table 1 Operational Definitions of Variables

Aspect	Variable	Unit	Reference Sources	Description	Data Source
Regional Economic Growth	PDRB	log	Widianto & Yudhistira (2010), Riesfandiari et al. (2023), Violita (2023)	GRDP at constant 2010 prices for regencies/cities	BPS
Welfare (measured by unemployment rate)	Open Unemployment Rate (TPT)	Percentage	Cita & Wirawan (2016), Leasiwal et al. (2022), Bailusy et al. (2022), Rahmah & Muttaqin (2023)	TPT at the regency/city level	BPS
SEZ Policy	SEZ Presence	Dummy (1 = present, 0 = not present)	Widianto & Yudhistira (2010), Zhao & He (2023)	SEZ implementation year based on official designation	National Council for SEZs
Economic Structure	Share of Tourism Activities	Percentage	Cita & Wirawan (2016), Possebom (2017), Widianto & Yudhistira (2021), Arumandani & Zein (2023), Rahmah & Muttaqin (2023)	Ratio of GRDP from accommodation, food, and beverage sectors to total GRDP (constant 2010 prices)	BPS, processed
	Share of Manufacturing Activities	Percentage	Cita & Wirawan (2016), Possebom (2017), Widianto & Yudhistira (2021), Arumandani & Zein (2023), Rahmah & Muttaqin (2023)	Ratio of GRDP from manufacturing sector to total GRDP (constant 2010 prices)	BPS, processed
	Share of Agricultural Activities	Percentage	Cita & Wirawan (2016), Possebom (2017), Widianto & Yudhistira (2021), Arumandani & Zein (2023), Rahmah & Muttaqin (2023)	Ratio of GRDP from agriculture sector to total GRDP (constant 2010 prices)	BPS, processed
Population	Population Density	Per 100 people/km^2	Possebom (2017), Arumandani & Zein (2023)	Ratio of total population to land area at regency/city level	BPS, processed
COVID-19 Pandemic	COVID-19	*Dummy (1 = pandemic, 0 = no pandemic)*	Musyarof & Qomari (2021), Junaidi et al. (2020), Sani et al. (2023), Deb et al. (2023)	Year(s) during which the COVID-19 pandemic occurred	Presidential Decree No. 11/2020, No. 12/2020, No. 24/2021
COVID-19 Vaccination	COVID-19 Vaccination	*Dummy (1 = implemented, 0 = not implemented)*	Musyarof & Qomari (2021), Khatiwada et al. (2024)	Year(s) of COVID-19 vaccination implementation	

Source: Processed by the authors.

RESULTS AND DISCUSSION

Results

The descriptive analysis presents the mean, standard deviation, and coefficient of variation for all variables included in this study. The results of the descriptive analysis are summarized in Table 2. The table displays the variable summary for all regencies/cities analyzed, covering both the entire study period as well as the periods before and after the implementation of special economic zones (SEZs).

As presented in Table 2, the average value of the SEZ dummy variable was only 0.034, indicating that SEZs account for a small portion of the total observations. The SEZs analyzed included 10 industrial SEZs

Table 2 Descriptive Statistics of Variables Overall, Before, and After SEZ Implementation

Variable	All			Before			After		
	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV
GRDP (Billion Rupiah)	22,112,150	35,687,810	1,614	24,353,860	38,225,210	1,570	19,718,980	33,173,250	1,682
Unemployment Rate (TPT) (%)	6.042	3.116	0.516	6.446	3.289	0.510	5.683	2.873	0.506
SEZ (dummy, 1 = present)	0.034	0.181	5.324	0.000	0.000	-	0.074	0.263	3.528
Share of Tourism Activities (%)	2.223	1.941	0.873	2.440	2.021	0.828	1.995	1.854	0.929
Share of Manufacturing (%)	16.861	17.619	1.045	19.293	18.555	0.962	14.146	16.427	1.161
Share of Agriculture (%)	22.930	15.742	0.687	21.159	14.812	0.700	24.982	16.526	0.662
Population Density (100 persons/km^2)	14,320	25,920	1,810	17,340,93	28,623,94	1,650,658	11,123	22,583	2,030
COVID-19 Pandemic (dummy)	0.167	0.373	2.234	0.017	0.128	7.529	0.341	0.474	1.390
COVID-19 Vaccination (dummy)	0.083	0.276	3.325	0.000	0.000	-	0.180	0.384	2.133

Source: Processed by the authors

and eight tourism SEZs. As of 2021, 12 of the 18 SEZs were operational, while six remained in the designation stage.

The average GRDP of the regencies/cities analyzed across the full period was IDR 22,112.150 billion. Prior to SEZ implementation, the average GRDP was IDR 24,353.860 billion, which decreased to IDR 19,718.980 billion after SEZ implementation. The GRDP figures exhibited relatively high standard deviation and coefficient of variation, indicating considerable heterogeneity and variation in regional economic growth among the observed regencies/cities.

The average open unemployment rate (TPT) across the regencies/cities analyzed was 6.042%. The percentage was lower in the post-SEZ designation period compared to the pre-designation period. In each time frame, the TPT also displayed a relatively high standard deviation and coefficient of variation, suggesting that unemployment conditions vary widely across regions.

The economic structures of the regencies/cities are diverse, reflecting the dominant economic activities in each area. As shown in Table 2, the sectors with the largest shares were agriculture, manufacturing, and tourism, which were three key sectors targeted for development within SEZs.

The average population density across the regencies/cities analyzed was 1,432 people/km^2. Following SEZ designation, average population density decreased compared to the period before SEZ implementation. This indicates a more dispersed population distribution among the regions after SEZ establishment.

A descriptive analysis was also conducted for regencies/cities with SEZs based on their respective provinces. In general, regions with SEZs showed an upward trend in GRDP, except for Aceh Province. Although Aceh experienced an overall downward trend in GRDP, an increase was observed in 2017, the year its SEZ was established. Comparing GRDP in 2010 and 2021, the region with the highest GRDP increase was the SEZ region in Central Sulawesi Province. GRDP by province for SEZ regions is shown in Appendix 1.

In terms of the unemployment rate (TPT), most SEZ regions across the sample provinces experienced a declining trend, except for those in the provinces of Riau Islands, West Java, Central Java, and East Java. The greatest decrease in TPT occurred in the SEZ in East Kalimantan Province, which was established in 2014. TPT figures by province for SEZ regions are shown in Appendix 2.

For the empirical analysis, this study employed both models with and without control variables. The models met the requirements for two-stage least squares (2SLS) estimation, as indicated by the Kleibergen-Paap F-statistic of 19.556 for the model without control variables and 35.536 for the model with control variables. Both values were statistically significant, indicating that the special economic zone (SEZ) variable is a sufficiently strong instrument. The model with control variables yielded a higher R^2 value compared to the model without them; therefore, the interpretation of the analytical results was based on the model with control variables. The 2SLS estimation results regarding the relationship between SEZs, economic growth, and unemployment rate (TPT) as a proxy for regency/city-level welfare are presented in Table 3.

As shown in Table 3, the first stage analysis showed that SEZs were significantly positively associated with regency/city-level economic growth. Regencies or cities with SEZs exhibited economic growth that was 13.5% higher than those without SEZs. However, the second-stage analysis indicates that this economic growth is not significantly associated with the unemployment rate, suggesting that SEZs have not had a significant impact on TPT as a measure of welfare at the regency/city level.

Discussion

As shown in Table 3, the results of the first and second stages revealed that while SEZs significantly contributed to economic growth at the regency/city level, the resulting growth did not significantly correlate with the unemployment rate. In other words, SEZs have not significantly reduced unemployment at the regency/city level, indicating that they have not meaningfully improved local welfare.

Table 3 2SLS Estimation Results of the Relationship Between SEZs and Economic Growth and Unemployment Rate at the Regency/City Level

Variable	Without Control Variables		With Control Variables	
	(1) ln(GRDP)	(2) Unemployment Rate	(3) ln(GRDP)	(4) Unemployment Rate
SEZ	0.229***		0.135***	
	(0.052)		(0.023)	
ln(GRDP)		-1.910		-2.248
		(2.119)		(2.821)
Tourism Share			0.094**	-0.425
			(0.031)	(0.300)
Industry Share			0.005	0.034
			(0.005)	(0.027)
Agriculture Share			-0.050***	-0.024
			(0.006)	(0.161)
Population Density			0.026***	-0.053
			(0.006)	(0.081)
COVID-19 Pandemic			0.130***	0.819**
			(0.021)	(0.334)
COVID-19 Vaccination			0.016***	-0.396***
			(0.005)	(0.096)
N	2,904,000	2,904,000	2,904,000	2,904,000
r2	0.022	0.051	0.687	0.082
Kleibergen-Paap rk Wald F statistic	19.556**		35.536***	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Source: Processed by the authors

The first stage analysis, which revealed a significant positive relationship between special economic zones (SEZs) and regency/city-level economic growth, is consistent with the findings of Alder et al. (2016), Possebom (2017), Widianto and Yudhistira (2021), Cai et al. (2021), Riesfandiari et al. (2023), and Arbolino et al. (2023). This indicates that SEZs have successfully generated agglomeration effects stemming from the concentration of industries or specific economic activities. The geographic proximity of these activities leads to economies of scale, enhancing economic activity and output within SEZs and producing positive externalities in surrounding areas. Consequently, SEZs contribute to increased economic growth in the respective regencies or cities.

However, regarding employment absorption, the results of this study differ from those of several previous studies. The discrepancy between this study and the findings of Ciżkowicz et al. (2017), Jensen (2018), and Lu et al. (2019) may be attributed to differences in the duration of SEZ policy implementation across countries such as Poland, China, and Indonesia. In Poland and China, SEZ policies have been in place for a longer period, potentially leading to more significant effects on employment creation and unemployment reduction. These findings also contrast with those of Yuli et al. (2023) and Taufiqurrahman and Khoirunurrofik (2023), possibly due to differences in research scope, study period, and geographical focus.

Nonetheless, the findings of the present study are in line with those of Brussevich (2020), who found that SEZs did not significantly impact regional employment levels in Cambodia, suggesting that SEZs are unlikely to substantially reduce regional unemployment. According to Brussevich (2020), this may be due to the reallocation of workers from non-SEZ firms to SEZ firms within the same region, resulting in no net increase in total employment. A similar pattern may be occurring in Indonesian regencies or cities with

SEZs, thereby explaining the lack of significant impact on the unemployment rate (TPT). Moreover, the insignificant relationship between SEZ-driven economic growth and TPT may also be influenced by population inflows into SEZ regions that exceed the number of available job opportunities. Sanders and Brown (2012) noted that regions with high job growth tend to experience substantial in-migration, but if migration outpaces job creation, it can lead to increased unemployment.

The non-significant relationship between SEZs and TPT may also be due to the relatively short duration of SEZ implementation in Indonesia, with several SEZs still in the development phase and not yet operational. SEZ policy in Indonesia began in 2012 with the establishment of Sei Mangkei SEZ and Tanjung Lesung SEZ, with additional SEZs being designated gradually up to 2021. Thus, the average implementation period for SEZs in Indonesia is less than ten years. Of the 18 SEZs analyzed in this study, only 12 are currently operational.

Another contributing factor to the insignificant relationship between SEZ-driven economic growth and the regency/city unemployment rate may be the limited availability of local labor with the qualifications required by emerging sectors. This mismatch hampers optimal local labor absorption and reduction of the unemployment rate. Several SEZs have reported low local labor absorption due to a shortage of workers with skills that align with SEZ industry demands. Executive Office of the President (2022) reported that the management of Tanjung Kelayang SEZ faced problems arising from the lack of sufficiently qualified workforce available for recruitment in the tourism sector. Turang et al. (2020) also observed that the high proportion of foreign and non-local workers in Likupang SEZ was driven by the low levels of education and skills among the locals. Similarly, West Nusa Tenggara Provincial Government (2020) stated that, based on labor market analysis and workforce needs, the availability of adequately qualified local labor to fill specific positions in Mandalika SEZ remains limited.

The insignificant relationship between SEZs and the unemployment rate (TPT) at the regency/city level may also be attributed to the impact of the COVID-19 pandemic. According to the Chair of the Financial System Stability Committee (2022), although several business sectors began to experience positive growth as of December 31, 2021, some sectors had not fully recovered from the effects of the pandemic. As a result, output in these sectors had not returned to pre-pandemic levels, limiting their capacity to absorb labor effectively.

Although this study did not find a significant relationship between SEZs and the reduction in TPT, SEZs were found to contribute positively to regional economic development in Indonesia, particularly through improvements in macroeconomic indicators. SEZs have become one of the national strategic programs with the greatest multiplier effect on both the economy and employment (Khoirunurrofik & Anas, 2023). Through this multiplier effect, SEZs have the potential to absorb labor and significantly reduce unemployment in the regions where they are established.

CONCLUSION

The results of this study indicate a significant positive relationship between SEZs and economic growth at the regency/city level, while the relationship between SEZs and regional welfare, as measured by TPT, remains statistically insignificant. Given the evidence supporting the positive impact of SEZs on local economic growth, the continued implementation of SEZ policies is justified to foster new centers of economic growth, generate employment opportunities, and enhance the added value of local products.

Local governments are expected to leverage the presence of SEZs by enhancing the supporting infrastructure, thereby increasing productivity and increasing local labor absorption. Regarding local labor absorption in SEZs and the goal of reducing regional unemployment, which is an important indicator of welfare, collaboration between the central and local governments is essential. Such synergy may encompass enhancing the capacity of the local workforce to align with the activities conducted within SEZs. One potential approach is to upgrade the skills and competencies of local workers through vocational training centers.

Limitations of the Study

This study has several limitations. It is unfortunate that this study did not account for the influence of other regencies/cities beyond the scope of the analysis. It also did not consider the potential spillover effects of economic growth or changes in unemployment rates to or from neighboring regencies/cities. Future research could conduct spatial analyses to capture these spillover effects. Additionally, the study covered a limited period of twelve years, thus primarily reflecting short-term relationships and not fully capturing the long-term effects of SEZs on regional economic growth and welfare as measured by TPT. Different results may arise if the geographical scope or the time period of the analysis differs from those used in this study. Furthermore, selection bias may exist, as SEZ locations are not randomly assigned but are designated by the government based on specific criteria. Omitted variable bias is also a possibility due to the exclusion of other relevant control variables that may influence the model outcomes.

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Appendix 1 GRDP of Regencies/Municipalities with SEZs by Province

Province	GRDP of Regencies/Municipalities with SEZs (billion rupiah)												Increase/Decrease (percent) (2010 vs 202) (2010 vs 2021)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Aceh	13,145.840	1,337.620	13,566.075	1,335.415	12,708.940	10,867.465	10,822.990	11,068.301	11,563.585	11,982.691	12,001.080	12,086.004	-8.062
North Sumatra	17,011.370	18,024.800	19,117.540	20,122.010	21,194.280	22,304.110	23,508.970	24,715.670	25,996.210	27,348.700	27,625.700	28,648.780	68.410
Riau Islands	36,265.600	39,061.230	41,912.275	44,866.510	48,034.220	51,235.565	53,994.910	55,553.300	58,302.345	61,656.210	59,965.905	62,501.220	72.343
Bangka Belitung	4,143.550	4,389.150	4,656.470	4,934.000	5,167.070	5,400.940	5,669.063	5,969.672	6,290.863	6,500.417	6,352.859	6,710.007	61.939
Banten	12,279.540	12,984.400	13,738.880	14,387.880	15,097.100	15,974.130	16,855.620	17,866.430	18,812.950	19,644.130	19,511.670	20,115.910	63.816
West Java	92,931.570	98,378.720	104,286.980	110,685.280	117,339.500	124,486.980	131,760.370	139,561.450	148,203.350	156,876.010	154,113.600	159,582.650	71.721
Central Java	18,798.280	20,032.430	21,075.720	22,386.120	23,536.830	24,762.330	26,139.415	27,649.777	29,245.665	30,916.390	30,449.020	31,632.280	68.272
East Java	50,205.745	53,495.010	57,162.380	60,442.945	64,443.220	68,349.135	72,048.725	76,132.290	80,475.325	84,863.105	82,081.040	84,968.890	69.241
West Nusa Tenggara	6,833.070	7,577.200	8,616.440	9,153.910	9,728.880	10,274.090	10,854.980	11,553.460	11,916.530	12,398.520	11,571.001	12,037.484	76.165
East Kalimantan	59,132.110	69,528.390	77,552.440	80,730.970	83,496.500	84,689.770	83,771.690	86,520.240	88,582.500	95,815.407	92,868.683	92,039.287	55.650
North Sulawesi	6,005.170	6,382.410	6,812.645	7,273.610	7,773.460	8,166.960	8,659.615	9,207.705	9,777.705	10,275.530	10,326.565	10,865.165	80.930
Central Sulawesi	8,699.060	9,462.180	10,295.690	11,252.680	12,159.120	13,100.250	13,821.260	14,585.800	15,315.030	16,180.288	15,462.908	16,385.581	88.360
North Maluku	617.700	645.400	687.180	728.720	773.860	821.320	872.950	927.180	989.170	1,031.740	1,052.456	1,075.942	74.185
West Papua	7176.900	7,325,930	7,228.140	7,248.530	7,471.950	7,647.420	7,715.820	7,975.390	8,426.890	8,599.910	8,385.300	8,520.900	18.727

Source: BPS (2023b)

Notes:
SEZ established
SEZ in operation

Appendix 2 Open Unemployment Rate (OUR) of Regencies/Municipalities with SEZs by Province

Province	OUR of Regencies/Municipalities with SEZs (percent)												Increase/Decrease (percent) (2010 vs 202)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Aceh	12.305	8.155	13.175	12.715	12.405	15.055	15.055	10.765	11.325	9.830	10.275	9.735	-20.886
North Sumatra	6.30	4.620	5.410	5.560	7.480	5.750	5.750	5.620	5.100	4390	4.580	4.170	-35.148
Riau Islands	6.570	8.095	6.575	6.690	7.480	6.485	6.485	7.950	7.410	7.865	10.325	10.130	54.186
Bangka Belitung	3.770	2.970	1.760	2.590	3.030	4.570	4.570	2.570	2.930	2.900	4.820	3.510	-6.897
Banten	11.340	11.320	9.300	12.340	7.030	10.220	10.220	8.300	8.190	8.670	9.150	7.700	-32.099
West Java	10.640	10.730	9.070	7.920	7.650	10.010	10.010	9.550	9.830	9.110	14.290	12.220	14.850
Central Java	5.570	6.540	6.310	6.430	6.150	7.070	7.070	4.930	6.020	6.260	7.560	7.550	35.548
East Java	6.095	5.720	5.265	4.860	4.945	5.310	5.310	4.570	4.430	4.550	6.850	6.700	9.926
West Nusa Tenggara	5.310	5.300	5.750	5.370	6.370	7.420	7.420	2.900	2.980	2.350	3.740	2.330	-56.121
East Kalimantan	12.710	9.410	6.490	6.090	5.650	5.140	5.140	4.610	5.850	5.450	5.450	5.350	-57.907
North Sulawesi	11.705	10.140	9.270	8.815	10.265	10.975	10.975	9.665	8.655	7.165	9.055	9.040	-22.768
Central Sulawesi	10.910	5.400	7.030	7.030	5.690	8.320	8.320	6.560	5.810	6.320	8.380	7.610	-30.247
North Maluku	8.480	4.830	3.920	4.270	3.700	9.970	9.970	6.110	5.800	4.780	4.700	6.270	-26.061
West Papua	5.760	3.600	1.270	3.270	3.810	5.660	5.660	4.560	3.080	2.940	3.290	3.360	-41.667

Source: BPS (2023c)

Notes:
SEZ established
SEZ in operation