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Analysis of the Effect of Value Added Tax Incentives on Residential Property Demand in Indonesia

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This study investigates the impact of a government-borne value added tax (VAT) incentive on residential property demand across Indonesian provinces from 2018 to 2023. Introduced as part of the post-pandemic recovery efforts, the policy aimed to stimulate housing demand amid declining market activity. Using provincial panel data, the analysis employs an interrupted time series approach complemented by a dynamic panel regression to capture both the immediate and delayed effects of the fiscal intervention while controlling for income, unemployment, and property prices. The findings reveal a two-stage response: an initial contraction in demand following policy implementation, thereby reflecting short-term market rigidity, followed by a sustained upward trend as economic confidence improves. The positive effect is more substantial in Java provinces, thus suggesting that regional economic structures and financial depth shape policy responsiveness. Overall, the results confirm that VAT incentives effectively bolster residential property demand and function as an important fiscal lever for stabilizing cyclical downturns. The study highlights that VAT incentives should not be viewed solely as crisis-driven measures but counter-cyclical instruments applicable when market conditions weaken.

Keywords

Tax Incentives, Purchasing Power, Property Demand, Interrupted Time Series, Dynamic Panel Regression, Indonesia

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1. Introduction

Residential property ownership as a primary dwelling is a fundamental indicator of social welfare and economic stability (Aarland and Reid, 2019; Ong Vifor et al., 2024). In Indonesia, the realization of homeownership is heavily influenced by price affordability and purchasing power—both of which are highly sensitive to macroeconomic fluctuations (Delvina Wijaya and Anastasia, 2021; Sari and Wiguna, 2022). The COVID-19 pandemic in 2020 significantly disrupted this equilibrium. According to the Residential Property Price Survey 2020 of Bank Indonesia, residential property sales contracted by -30.08% year-on-year, thereby reflecting a sharp decline in consumer purchasing power. This slowdown was also evident in the growth of the property sector, which fell from 5.88% in Q4 2019 to merely 1.25% in the same quarter of 2020. Herianto et al. (2021) mention that the adverse impact signaled a shift in household preferences from long-term investments to essential goods and healthcare services, and this contributed to a contraction in gross fixed capital formation of -4.95% during the same year. These findings underscore the vulnerability of the property sector to global economic shocks.

Recognizing the strategic role of the property sector in the national economy and its multiplier effects across related industries, the government responded with countercyclical fiscal measures by introducing the Government-Borne Value Added Tax (VAT) incentive. First implemented in March 2021 and extended in subsequent years, this policy covers the purchase of landed houses and apartment units priced up to IDR 5 billion (approximately USD 347,000[1]). The incentive mechanism involves shifting the VAT burden to the government, thereby directly reducing transaction costs and enhancing price affordability. Consequently, the policy aims to restore consumer purchasing power, stimulate property demand, and accelerate post-pandemic economic recovery.

Legally, the VAT in Indonesia is a multi-stage tax levied on nearly all goods and services, including property (Mardiasmo, 2016). This characteristic renders the property sector particularly susceptible to VAT burdens, as they directly affect transaction costs. Therefore, any policy that reduces or eliminates VAT has the potential to influence consumer purchasing power and sales volume significantly (Aji and Haptari, 2022). In this context, the VAT incentive serves as a strategic instrument to mitigate weakening market demand while supporting national economic recovery.

Furthermore, the residential property market in Indonesia faces substantial structural challenges. Data from the Ministry of Public Works and Housing indicate a housing backlog of 12.75 million households in 2020 based on the

[1] Based on average exchange rate in March 2021.

National Socio-Economic Survey (Susenas) conducted by Statistics Indonesia (BPS), thus reflecting a persistently high number of households without adequate housing. On the other hand, the Residential Property Price Survey of Bank Indonesia reveals a heavy reliance on mortgage financing, which accounted for over 75% of residential property purchases during the same period of the time. The high proportion of mortgage usage indicates limited purchasing power, which made homeownership highly dependent on financing facilities. This condition highlights the urgency of VAT incentives as a tool to maintain housing affordability and revitalize property market dynamics.

In the real estate demand concepts proposed by Fanning (2014), external factors such as VAT incentive policies that enhance purchasing power for property products play a role in creating induced demand in the residential property market. However, Fanning (2014) also emphasizes that in the context of demand driven by purchasing power, property market demand is not only formed by induced demand but also by fundamental demand. Furthermore, Fanning (2014) explains that fundamental demand in the residential property market in a geographic region is influenced by income, unemployment, and residential property prices in that area. Based on this theory, it can be concluded that VAT incentives alone are insufficient to independently influence residential property demand.

Research on the impact of government policies on residential property market demand while considering the influence of fundamental demand factors is still limited in existing studies. In the context of VAT incentive analyses, the available literature primarily focuses on evaluating the economic impact on taxpayers and development of the property sector. Aji and Haptari (2022) analyze the impact of VAT incentive policies on company profitability in the real estate sector, while Aizar and Wijaya (2022) evaluate the effect of VAT incentives on the gross domestic product (GDP) growth of the real estate sector. Conversely, previous studies on residential property market demand tend to focus on analyzing the relationship between property demand factors and residential property demand without considering the role of government policies which can influence residential property market demand (Belsky, 2009; Brausewetter et al., 2024; D'Arcy and Keogh, 1997).

These studies have not extensively explored the role of government policy in shaping residential property demand dynamics. This research aims to bridge that gap through an analysis of the impact of VAT incentives on residential property demand, by considering income, unemployment, and residential property prices as fundamental demand factors in the residential property market. This study not only evaluates the effectiveness of VAT incentive policies in boosting consumer purchasing power and driving residential property transactions but also provides a comprehensive understanding of the dynamics of the residential property market in Indonesia.

2. Literature Review

The analysis of residential property demand in this study is closely linked to the fundamental concepts of demand and supply in economics. This is because demand in the residential property market is strongly associated with consumer purchasing power and government policies that can influence market equilibrium and stimulate demand (Marlina and Syahribulan, 2021; Sulastri and Kholis, 2022). Pindyck and Rubinfeld (2018) explain that the demand for goods or services is generally influenced by price and income, which are the primary determinants of consumer purchasing power. In cases of price increases or income declines, consumers tend to reduce their spending on goods or services. In the context of government policy, the demand theory provides the essential basis for understanding market dynamics in the event of policy intervention. For example, in the housing market, government policies such as home purchase subsidy programs that reduce the burden of purchase costs can increase consumer purchasing power and, in turn, demand for houses.

On the other hand, Pindyck and Rubinfeld (2018) explain that in the supply theory, price is the key determinant of the quantity of goods or services offered by producers. Higher prices encourage more producers to manufacture and sell goods or services. However, Pindyck and Rubinfeld (2018) also emphasize that supply is influenced by production costs. Increased costs or production burdens that reduce profit margins may force companies to decrease output or exit the market. If firms maintain their production levels despite rising costs, it may lead to price increases that ultimately impact purchasing power and market demand. The strong correlation between consumer purchasing power and demand for goods or services often prompts governments to intervene economically when purchasing power declines due to reduced economic activity (Taylor, 2014). According to the Keynesian economics concepts, when aggregate demand declines due to an economic shock that triggers a recession, the active involvement of the government becomes crucial in stabilizing the economy. This is based on the reality that in a recession, market mechanisms often fail to achieve equilibrium independently (Coddington, 2013).

To address such situations, Taylor (2014) suggests that governments can intervene through active fiscal and monetary policies. One commonly used form of expansionary fiscal policy is tax relief, which aims to enhance purchasing power and stimulate economic activity (Parker, 2011). Hermanto (2023) states that tax reductions, such as government-funded tax incentives, can generate additional aggregate demand in the economy. Thus, appropriate fiscal interventions by governments are crucial in mitigating the effects of a recession and restoring economic equilibrium.

As a strategic measure to address the contraction in economic growth within the property sector due to the COVID-19 pandemic, the Indonesian government introduced the VAT incentive for the sale of landed houses and apartment units

(Aizar and Wijaya, 2022). This policy was designed to directly stimulate consumer purchasing power for residential properties by transferring the VAT burden from buyers to the government (Sulastri and Kholis, 2022). The transfer of VAT liability to the government is expected to enhance the affordability of residential property prices and generate additional demand in the property market, thereby ultimately contributing to national economic recovery.

The VAT incentive policy applies to transactions conducted across all regions of Indonesia for the first-time purchase of landed houses or apartment units with a selling price less than IDR 5 billion (approximately USD 347,000[2]). In 2021, the VAT incentive was granted at 100% for purchases up to IDR 2 billion (approximately USD 139,000) and at 50% for the amount of the price between IDR 2 billion and IDR 5 billion, applicable during the tax period from March to December. In 2022, the VAT incentive was adjusted to 50% for purchases up to IDR 2 billion and 25% for the amount between IDR 2 billion and IDR 5 billion, valid for transactions during the tax period from January to September. The VAT borne by the government incentive continued in 2023, at a rate of 100% for purchases up to IDR 2 billion and 50% for the portion between IDR 2 billion and IDR 5 billion, applicable during the tax period of November and December.

Within the framework of real estate demand concepts outlined by Fanning (2014), purchasing power stimulus from expansionary fiscal policy plays a role in shaping *induced demand* in the property market. Government policies that enhance consumer purchasing power are critical in influencing property purchase decisions. The findings of Painter and Redfearn (2002) show that mortgage interest subsidies for residential property purchases accelerate the decisions of individuals to transition from renting to homeownership, thereby reflecting increased realized demand for residential property. Similarly, Besley et al. (2014) show that the *stamp duty holiday*, a tax reduction policy implemented by the United Kingdom (UK) government during the 2008 global financial crisis, led to an 8% increase in residential property transactions compared to pre-policy levels. Additionally, Goodman and Nichols (1997) find that homeownership credit subsidies significantly accelerate homeownership rates, thus highlighting a direct link between increased demand for residential property and ownership rates. These findings align with Greenwald and Guren (2021) and Phang (2013), who assert that rising homeownership rates reflect increasing purchases or demand for residential property.

Although previous studies in the literature suggest that expansionary fiscal policies are effective in stimulating property market demand, an analysis on the effectiveness of VAT incentives in boosting residential property demand must also account for factors that constitute the fundamental drivers of demand in the residential property market. This is because property market demand is not

[2] Based on average exchange rate in March 2021.

solely formed by *induced demand*, which is affected by VAT incentives, but also by *fundamental demand*, which is influenced by income, unemployment rates, and property prices (Fanning, 2014). In demand analysis based on the consumption theory, these factors interact and influence consumer purchasing power, which is the primary driver of residential property demand (Megbolugbe et al., 1991).

Aligning with this theory, Thorns (2009) argues that property prices are one of the key factors that influence purchasing power and demand for property products. This argument is supported by Ayuningtyas and Astuti (2018), who find that rising residential property prices contribute to declining purchasing power and reduced demand for residential property products. On the other hand, in analyzing property demand within a geographical region, income levels and unemployment rates, in addition to property prices, serve as key indicators of consumer purchasing power for residential property (Belsky, 2009). Ganthari and Syafri (2019) suggest that rising income in a particular region is correlated with increased demand for residential property in that area. Conversely, in the context of purchasing power influenced by economic well-being, Budhijana (2020) finds that unemployment significantly affects poverty rates, thereby reflecting declining welfare in specific regions. Consistent with this view, Fanning (2014) states that residential property demand tends to be higher in areas with lower unemployment rates.

Based on the explanations above, it is evident that purchasing power stimulus through expansionary fiscal policy plays a crucial role in enhancing purchasing power and demand in the residential property market. Additionally, income, unemployment, and property prices are the primary factors that shape *fundamental demand* in the residential property market. Rising residential property prices negatively impact consumer purchasing power, which leads to decreased demand. Meanwhile, higher income positively affects residential property demand, whereas unemployment reduces purchasing power and property demand. A hypothesis is thus proposed from the discussion above, as follows: VAT incentives positively influence residential property demand, taking into consideration the fundamental demand factors in the residential property market, including income, unemployment and residential property price.

3. Research Method

The conceptual framework used to explain the research phenomenon in this research is based on a positivist paradigm, where facts in research serve as the sole foundation for scientific statements (Wekke, 2019). Referring to the positivist paradigm, this study is designed as an associative study aimed to analyze the relationships between variables quantitatively, thus producing findings that are measurable and empirically testable (Ibrahim et al., 2023). This

study aims to analyze the impact of VAT incentives on residential property demand in Indonesia, by using a unit of analysis that comprises 34 provinces over the period of 2018–2023. Each province is observed repeatedly throughout this timeframe, which results in a panel data structure that integrates cross-sectional variation across regions with temporal dynamics over time. This approach is selected for its analytical flexibility in identifying patterns that emerge from differences in regional characteristics as well as temporal developments (Hsiao, 2022). Moreover, it enables the control of unobserved heterogeneity that would otherwise be overlooked in analyses based solely on a single data dimension (Bhattarai, 2019). The data panel in this study is sourced from Statistic Indonesia and obtained through secondary data documentation methods.

Table 1 Variable Operationalization and Measurement

No.	Variable	Measurement	Description	Reference
1	Residential Property Demand (Demand)	Homeowner-ship rate	Homeownership rate in percentage units	An increase in the residential ownership rate reflects an increase in the purchase or demand for residential property (Greenwald and Guren, 2021; Phang 2013)
2	VAT Incentive (Tax)	Dummy variable	A value of 1 is assigned for the years when the incentive was applied (2021 to 2023), and a value of 0 is assigned for the years before the implementation of the VAT incentive (2018 to 2020)	The dummy variable is one of the different test methods to assess the effectiveness of tax incentive policies (Siregar and Patunru, 2021)
3	Income (Income)	Gross regional domestic product (GRDP)	Provincial GRDP in millions of rupiah	GRDP is an indicator of the ability of a province to generate income (Prasasti and Prasasti, 2006)

(Continued…)

(Table 1 Continued)

No.	Variable	Measurement	Description	Reference
4	Unemploy-ment (Unemploy-ment)	Unemployment rate	Open unemployment rate in percentage units	Demand for residential property tends to be higher in areas with low unemployment compared to areas with higher unemployment (Fanning, 2014)
5	Residential Property Price (Price)	Construction Cost Index	Construction Cost Index Value	An increase in the rate of construction cost has an effect on the increase in residential property prices (Putri et al., 2024)

Source: Compiled by authors (2025)

The key variables analyzed in this study include the dependent, independent, and control variables. The dependent variable is residential property demand, which is influenced by the independent variable, namely the VAT incentive. The measurement of residential property demand in this study employs homeownership rate as a proxy, thus reflecting the dynamic changes in demand for residential property products (Greenwald and Guren, 2021; Phang, 2013). This approach is supported by empirical findings in Indonesia, which show a linkage between housing demand and the rate of homeownership. Sari and Wiguna (2022) identify a positive correlation between the growth of mortgage financing, an indicator of heightened demand for housing products, and the increase in homeownership rates during the period of 2016–2022. This relationship provides an empirical basis for considering the homeownership rate as a representative measure of annual changes in residential demand, thereby making it a relevant indicator for analyzing short-term housing market dynamics. On the other hand, VAT incentives as an independent variable are measured using dummy variables, which is one of the variable measurement approaches in various testing methods to assess the effectiveness of tax incentive policies (Siregar and Patunru, 2021).

Meanwhile, the fundamental demand factors of the residential property market, which comprise income, unemployment, and residential property prices, serve as the control variables. The use of fundamental demand factors as control variables is to isolate the effect of the VAT incentive on residential property demand so that the observed relationship between these variables accurately

reflects the impact of the VAT incentive. The operationalization and measurement of the research variables are comprehensively detailed in Table 1. To analyze the impact of the VAT incentive on residential property demand, this study employs an interrupted time series (ITS) approach. As a quasi-experimental design, ITS is particularly suitable for evaluating policy interventions implemented at the national level, where a conventional control group is not available. The method enables the assessment of whether the VAT incentive policy introduced in 2021 has led to a statistically significant change in the level and trend of residential property demand over time. The conceptual foundation of this approach was established by Campbell and Ross (1968), who emphasize its effectiveness in identifying the impact of an intervention by comparing pre- and post-policy periods within the same observational unit.

To further account for potential regional heterogeneity, the ITS model is extended by incorporating interaction terms between post-intervention indicators (Post, Time, and TimeAfterPost) and a regional dummy variable (Java). The dummy variable takes the value of 1 for provinces located on the island of Java and 0 for those outside of Java, thereby reflecting structural and economic differences across regions. The provinces of Java are generally characterized by higher levels of urbanization, stronger economic performance, and more dynamic property markets than other regions in Indonesia (Bhinadi, 2009; Hassan and Pitoyo, 2017; Pravitasari et al., 2024; Siwi et al., 2022). By including these interaction terms, the analysis evaluates whether the VAT incentive has produced differential regional effects in both magnitude and trend persistence.

To complement the ITS findings and confirm the potential lagged effects of the VAT incentive, this study also applies a dynamic panel regression framework. This method allows for the inclusion of the lagged term of the dependent variable as an explanatory factor, thereby capturing temporal dependencies and adjustment processes that may not be immediately observable following the policy intervention (Bond, 2002). The dynamic specification provides a robustness check for the ITS results by identifying whether changes in residential property demand occur with a delay after the implementation of the VAT incentive. Accordingly, the empirical model can be expressed as follows: *Demand = f(PostTax, TimeAfterPost, PostTax*Java, TimeAfterPost*Java, Income, Unemployment, Price)*

The process of quantitative data analysis in this study begins with the compilation of a dataset that includes information on homeownership rates, GRDP, unemployment rates, and the Construction Cost Index (CCI). To obtain accurate statistical parameter estimates, the researchers conducted a multivariate outlier analysis on the compiled dataset by using the Mahalanobis distance method. Data are identified as outliers if the Mahalanobis distance exceeds the predetermined cut-off value, which is based on the chi-square distribution with specific degrees of freedom and significance levels (Li et al., 2019). Findings by Al Sayed et al. (2018) indicate that removing multivariate

outlier data from the research model can yield more accurate estimation results. Therefore, the outlier data identified within this study are excluded from the dataset for further analysis.

The quantitative data analysis methods applied in this study consist of descriptive and inferential analyses. The former provides a concise and clear summary of the data, including the mean, median, maximum, minimum values, and standard deviations for each observed variable in tabular form. In contrast, the latter is employed to investigate the relationships between research variables by using a panel data regression analysis. The model is specified as follows: $Demandit = \alpha + \beta_1 Post_t + \beta_2 Time_t + \beta_3(Post_t \times Time_t) + \beta_4(Post_t \times Java_i) + \beta_5(Time_t \times Java_i) + \beta_6(TimeAfterPost_t \times Java_i) + \beta_7 Income_{it} + \beta_8 Unemployment_{it} + \beta_9 Price_{it} + \varepsilon_{it.}$

where

$Demand_{it}$	represents the homeownership rate in province *i* at time *t*.
$Post_{it}$	is a dummy variable equal to 1 for the years following the policy intervention (2021–2023) and 0 otherwise. The coefficient β1 estimates the immediate change in the level of residential property demand following the implementation of the VAT incentive.
$Time_{it}$	is a continuous variable that represents the time trend, starting from 1 in the initial period. The coefficient β_2 captures the pre-existing trend in property demand.
$Post_t \times Time_t$	The interaction term is the core of the ITS model. The coefficient β3 estimates the change in the trend of property demand after the policy was introduced, relative to the pre-intervention trend.
$Post_t \times Java_i$	is an interaction term between the post-intervention and regional dummies for provinces located on the island of Java. The coefficient β_4 captures whether the immediate change in residential property demand following the implementation of the VAT incentive differs between Java and non-Java provinces.
$Time_t \times Java_i$	represents the interaction between the time trend and regional dummy. The coefficient β_5 measures whether the underlying trend in residential property demand over time differs between provinces in Java and those outside Java, regardless of the policy intervention.
$TimeAfterPost_t \times Java_i$	is an interaction term that captures the differential change in the post-intervention trend of residential property demand between Java and non-Java provinces. The coefficient β_6 indicates whether the VAT incentive has produced a more sustained or more pronounced effect on

	the growth rate of property demand in Java compared to other regions after 2021.
$Income_{it}$, $Unemployment_{it}$, and $Price_{it}$	are control variables included to account for other fundamental factors that influence property demand, thereby mitigating the risk of omitted variable bias.
ϵ_{it}	is an error term that includes all unobserved factors.

In the inferential analysis that uses a panel data regression, model selection testing is the initial stage conducted before parameter estimation and hypothesis testing. The panel data regression model selection test is performed to ensure that the regression model generates valid estimates according to the characteristics of the panel data used in the study (Kyriazidou, 1997). The model selection test determines the appropriate panel data regression approach among the common effects (pooled ordinary least squares (OLS)), fixed and random effects models with the use of the Chow, Hausman, and Breusch-Pagan LM tests (Amini et al., 2012; Bhattarai, 2019; Binkley and Young, 2018), respectively. Once the regression model is determined, the researchers conduct classical assumption testing to ensure that the regression model estimates meet the best linear unbiased estimate (BLUE) criteria. Classical assumption testing includes tests for normality, heteroskedasticity, multicollinearity, and autocorrelation.

After conducting the normality test by using the quantile-quantile (Q-Q) plot method (Alifah et al., 2023; Ruxton et al., 2015), heteroskedasticity test by using the modified Wald test (Bascle, 2008; Laskar and King, 1997), multicollinearity test by using the variance inflation factor (VIF) method (Thompson et al., 2017), and the autocorrelation test by using the Wooldridge test method (Drukker, 2003), it was found that the regression model exhibits heteroskedasticity and has autocorrelation issues. As a corrective measure and to ensure that the regression model produces accurate estimates, the researchers applied a regression method that is robust to violations of classical assumptions by using the clustered-robust standard error method (Hamilton et al., 1992; Huber, 1981). This regression method enables the calculation of the residual covariance matrix while accounting for specific variations and correlations within clusters, without assuming homoscedasticity across observations (Colin Cameron and Miller, 2015). By employing the clustered-robust standard error method, regression estimates can produce more reliable standard errors compared to conventional methods that assume homogeneous and independent residual variances.

4. Results and Discussion

4.1 Results

The observational data in this study consist of homeownership rates, GRDP, unemployment rates, and the CCI across 34 provinces in Indonesia. Using the Mahalanobis distance calculation in STATA, the cut-off value for identifying outliers (df=3, α=5%) is 7.8147279. Based on this threshold, four provinces - DKI Jakarta, West Java, East Java, and Papua - are identified as outliers, as their Mahalanobis distance values exceed the cut-off. These provinces are subsequently removed from the dataset to ensure an accurate statistical analysis. Table 2 outlines the process of determining the research sample size.

Table 2 Process of Determining Research Sample Size

Description	Number of Data
Number of data obtained	34
Number of outlier data	4
Number of research samples	30

Source: Compiled by author (2025)

Referring to Table 3, 30 data samples that comprise 180 observations from 2018 to 2023 reveal that the residential property demand variable, measured by homeownership rates, has an average of 81.13% and a median of 82.88%. The highest homeownership rate was recorded in West Sulawesi in 2023 at 93.35%, while the lowest was in the Riau Islands in 2020 at 66.37%. The VAT incentive variable, represented as a dummy variable, takes a value of 1 for the years when the VAT incentive policy was implemented (2021 to 2023) and 0 for years outside of that period (2018 to 2020). The income variable, measured by the GRDP at the provincial level, has an average value of IDR306,537,631 million, a median value of IDR 185,702,869 million, a minimum value of IDR 36,467,704 and a maximum value of IDR 1,696,815,659 million. The unemployment variable, measured by the open unemployment rate, has an average value of 4.90%, median value of 4.61%, minimum value of 1.14%, and maximum value of 10.64%. The residential property price variable, measured by the CCI, has an average value of 102.43, median value of 100.26, minimum value of 87.44, and maximum value of 134.02.

Table 3 Descriptive Statistics of Research Variables

	Mean	Median	Max	Min	Std. Dev.
Demand	81.13	82.88	93.35	66.37	7.007815
Tax	0.5	0.5	1	0	0.501394
Income	306,537,631	185,702,869	1,696,815,659	36,467,704	318,954,056
Unemployment	4.90	4.61	10.64	1.14	1.619694
Price	102.43	100.26	134.02	87.44	10.0542

Source: processed by author with Stata 15 (2025)

The panel data regression model selection test results in Table 4 indicate that the p-value from the Chow test (0.0000) is smaller than the significance level (α) of 5%. Thus, the null hypothesis in the Chow test, which indicates that the common effects model (pooled OLS) is the appropriate model to explain the relationship between variables in the panel data regression, is rejected. Consequently, the fixed effects model (FEM) is more appropriate than the pooled OLS model. To further determine whether the FEM or random effects model (REM) is more suitable, the Hausman test was conducted. Based on Table 4, the p-value from the Hausman test (0.4373) is higher than the significance level (α) of 5%. Therefore, the null hypothesis in the Hausman test, which suggests that the REM is the appropriate model to explain the relationship between variables in panel data regression, cannot be rejected. In addition, the Breusch–Pagan LM test yields a p-value of 0.0000, thereby indicating that the REM is more appropriate than the common effects model. These results collectively indicate that the REM is the most suitable for explaining the relationship between research variables.

Table 4 Panel Data Regression Model Selection Test Results

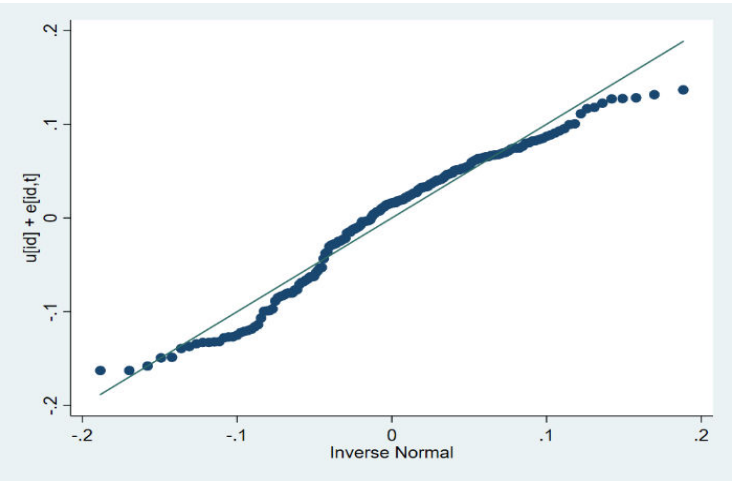
Model Selection Test Method	p-value	Result
Chow test	0.0000	FEM
Hausman test	0.4373	REM
Breusch-Pagan Lagrange Multiplier test	0.0000	REM

Source: compiled by author with Stata 15 (2025)

Based on the results of the model selection test, the variation in the dependent variable is influenced by both cross-sectional and time-series effects that are random in nature and not correlated with the explanatory variables. The REM accounts for these variations by incorporating individual-specific random components into the regression structure. The estimation of the REM is performed by using the generalized least squares approach, which corrects for potential inefficiency in the OLS estimator due to correlated error components. To ensure that the estimated parameters obtained from the random effects estimation fulfill the BLUE criteria, it is necessary to verify that the model satisfies the classical assumption tests, including residual normality, homoscedasticity, non-multicollinearity, and non-autocorrelation.

Residual normality evaluation which uses a Q-Q plot is a method that visualizes the alignment of the residual distribution with a normal distribution. Deviations from the diagonal line in the Q-Q plot indicate deviations from normality in the residual distribution pattern. Based on Figure 1, the overall residual distribution exhibits a pattern that closely follows the diagonal line, thereby suggesting that the residuals approximate a normal distribution (Yang and Berdine, 2021). Although the plot shows slight deviations at both ends, they are minor and do not affect the main interpretation. Thus, the residual distribution generally satisfies the normality assumption, thereby allowing further statistical analysis of the research sample data.

Figure 1 Q-Q Plot Graph



Source: compiled by authors with Stata 15 (2025)

The results of the extended classical assumption test presented in Table 5 show that the regression model only satisfies the classical assumption of non-multicollinearity. This conclusion relies on the VIF values for each research variable, which are all below 10, thus indicating the absence of strong correlations among the variables (Thompson et al., 2017). On the other hand, the probability value (Prob > chi2) from the heteroskedasticity test is 0.0000 and (Prob > F) from the autocorrelation test is 0.0029, which are both smaller than 0.05. This result suggests the presence of non-uniform residual variability and temporal dependence in the error term of the regression model (Bascle, 2008; Drukker, 2003; Laskar and King, 1997). Violations of these two assumptions can compromise the validity of the regression model, particularly in generating accurate parameter estimates, both in terms of regression coefficient significance and standard errors. The researchers applied a more robust regression analysis to address these classical assumption violations and ensure unbiased and reliable conclusions, explicitly by using the clustered-robust standard error method (Colin Cameron and Miller, 2015).

Table 5 Classical Assumption Test Results

Test	Value		Result
Multicollinearity	VIF Income	1.43	Accepted
	VIF Unemployment	1.57	Accepted
	VIF Price	1.35	Accepted
Heteroskedasticity	Prob > chi2	0.0000	Not Accepted
Autocorrelation	Prob > F	0.0029	Not Accepted

Source: compiled by authors with Stata 15 (2025)

The results from the fixed-effects ITS regression indicate that the research variables collectively have a significant influence on residential property demand (Table 6), as supported by a Wald chi² of 1246.16 and a significance level of Prob > chi² = 0.0000. The within R-squared value of 0.6558 suggests that approximately 65.58% of the variation in residential property demand within each province over time can be explained by the variables included by the model.

Table 6 Clustered-Robust Standard Error Regression Test Results

Variable	b/se
Time	0.00244
	(0.00368)
Post	-0.0263***
	(0.00603)
TimeAfterPost	0.0276***
	(0.00622)
Java*Time	0.000334
	(0.00864)
Java*Post	0.0210***
	(0.00680)
Java*TimeAfterPost	-0.00110
	(0.0233)
LnIncome	-0.00924
	(0.0128)
LnUnemployment	-0.0127
	(0.0144)
LnPrice	-0.199**
	(0.0852)
Constant	5.486***
	(0.488)
R-squared	0.6558
Wald chi²	1246.16
Prob > chi²	0.0000

Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, and * p<0.1.
Source: complied by authors with Stata 15 (2025)

The primary findings from the ITS model are mainly on the VAT incentive policy, as captured by the Post and TimeAfterPost coefficients. The coefficient of Post (Change in Level) is -0.0263 (p<0.01), which signifies a significant and immediate 0.0263 percentage point decrease in residential property demand at the time the policy was implemented in 2021. This initial negative shock may be attributable to concurrent external factors, such as broader economic conditions or lingering pandemic effects, that coincided with the introduction of the policy (Arkandana et al., 2023). This pattern is consistent with the Residential Property Price Survey 2021 of Bank Indonesia, which recorded a contraction in the growth of residential property sales of 11.60% at the end of the year.

TimeAfterPost (Change in Trend): TimeAfterPost is the change in trend. Its coefficient, the core of the ITS analysis, is 0.0276 ($p<0.01$). This positive and highly significant coefficient indicates that the VAT incentive policy successfully produced a positive and substantial change in the demand trend of residential property. Following the intervention, demand began to increase by an additional 0.0276 percentage points per year, a notable shift from the pre-intervention trend, which was not statistically significant. These findings are also consistent with the results of Residential Property Price Survey, which indicate a positive growth trend in 2022 and 2023, with residential property sales increasing by 4.54% at the end of 2022 and 3.37% at the end of 2023.

The results of the dynamic panel regression further reinforce the presence of a lag effect of the VAT incentive policy, as previously identified in the ITS analysis (Table 7). The coefficient of the lagged incentive variable (L.Tax) is positive and highly significant (0.0421; $p<0.01$), thus indicating that the policy on residential property demand gradually has an impact rather than an immediate impact upon implementation. This finding confirms that the incentive program produced a delayed market response, which is consistent with the ITS results that show a progressive increase in demand following the initial implementation period. The lack of significance of the contemporaneous incentive variable (0.00213; $p>0.10$) supports this interpretation, thereby suggesting that both developers and consumers required time to adjust to the policy changes, administrative processes, and market conditions before responding effectively to the stimulus. Moreover, the positive and significant coefficient of the lagged demand variable (0.383; $p<0.01$) shows the persistence of demand, wherein past demand continues to influence current demand, which reflects the inherently dynamic nature of the property market.

Table 7 Dynamic Panel Regression Results

Variable	b/se
L.LnDemand	0.383***
	(3.32)
Tax	0.00213
	(0.51)
L.Tax	0.0421***
	(6.92)
LnIncome	-0.0158
	(-1.85)
LnUnemployment	-0.0142
	(-1.15)
LnPrice	-0.263***
	(-3.86)
Constant	4.242***
	(5.24)

Notes: t statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.
Source: complied by authors with Stata 15 (2025)

The validity tests also confirm the adequacy of the model specification (Table 8). An Arellano–Bond test is conducted, which indicates the presence of first-order autocorrelation, as expected (AR(1); p=0.034), but no evidence of second-order autocorrelation (AR(2); p=0.377), thereby implying that the model is specified correctly. The Hansen test of overidentifying restrictions yields a p-value of 0.217, which suggest that the instruments are valid and not correlated with the error term. The difference-in-Hansen tests further confirm the exogeneity of both the generalized method of moments (GMM) instruments for levels (p=0.756) and external instruments (p=0.088), thus indicating that the moment conditions are correctly specified. Overall, these diagnostic results demonstrate that the model satisfies the standard GMM validity criteria, thereby reinforcing that the lagged effect of the VAT incentive policy is statistically valid.

Table 8 Dynamic Panel Model Diagnostic Tests

Test Description	Test Statistic		p-value
Arellano-Bond Test for AR(1)	z:	-2.12	0.034
Arellano-Bond Test for AR(2)	z:	0.88	0.377
Hansen Test of Overidentifying Restrictions	chi^2:	14.31	0.217
Difference-in-Hansen (GMM Instruments for Levels)	chi^2:	1.89	0.756
Difference-in-Hansen (IV Variables)	chi^2:	6.55	0.088

Source: complied by authors with Stata 15 (2025)

While the dynamic panel results provide evidence of a consistent lagged effect, the interaction term Java×Post captures the differential immediate impact of the VAT incentive policy in the Java region relative to non-Java provinces. The coefficient of Java×Post is 0.0210 ($p < 0.01$), which indicates that the implementation of the VAT incentive in 2021 had a significantly more substantial positive level effect on residential property demand in Java compared to other regions. This result suggests that the policy stimulus was more rapidly transmitted to the property market in Java, likely due to the higher market responsiveness of the region, more developed financial systems, and higher concentration of middle- to upper-income households (Bhinadi, 2009; Hassan and Pitoyo, 2017; Pravitasari et al., 2024; Siwi et al., 2022). In contrast, provinces outside Java may have experienced slower or more constrained policy transmission, thereby reflecting structural differences in market depth and access to housing finance. Collectively, these findings underscore the regional heterogeneity in policy effectiveness, thus affirming that the immediate impact of the VAT incentive is disproportionately greater in Java, consistent with its more dynamic and financially integrated property market.

For analysis of the control variables, the price variable exhibits a negative and significant coefficient of -0.199 ($p<0.05$), which aligns with the fundamental economic theory. This result suggests that a one-unit increase in property price

is associated with a 0.199 percentage point decrease in residential property demand. On the other hand, income and unemployment are statistically insignificant in this model ($p>0.05$), thereby indicating that their influence on residential property demand is not pronounced after accounting for the other factors.

4.2 Discussion

Generally, residential property demand depends on fundamental factors like income, employment, and price levels (Fanning, 2014). Our research, however, reveals a more nuanced dynamic, particularly in the context of a significant economic shock like the COVID-19 pandemic. The combination of ITS and dynamic panel regression analyses shows that, beyond fundamental determinants, the VAT incentive policy exerted a significant and time-distributed influence on residential property demand across Indonesian provinces during and after the COVID-19 pandemic.

The research findings align with the established economic theory regarding the inverse relationship between price and demand. The price variable exhibits a significantly negative coefficient, thereby indicating that higher construction costs are associated with lower residential property demand. This result confirms the principle that elevated production costs lead to higher prices, ultimately dampening market demand (Pindyck and Rubinfeld, 2018; Tsai, 2013). Conversely, our model finds that income and unemployment do not have a statistically significant effect on demand. This unexpected result, consistent with previous research (Hanifah and Hanifa, 2021; Oktaviana et al., 2021), may be a consequence of measurement errors or the dominant influence of other unobserved factors, such as consumer confidence or wealth, during the study period.

Amid these dynamics, the VAT incentive policy has played a pivotal and multifaceted role in shaping market recovery. The ITS model identifies a two-phase policy effect. The first phase, represented by the negative and highly significant coefficient of the *Post* variable (-0.0263; $p < 0.01$), shows an immediate contraction in residential property demand when the policy was launched in 2021. This initial decline reflects a short-term adjustment shock associated with the broader macroeconomic environment. At the time, the property market in Indonesia was still recovering from the severe contraction in sales growth (-30.08% year over year in 2020), while consumer focus remained on essential consumption rather than long-term investment (Herianto et al., 2021). This finding is consistent with the Residential Property Price Survey (2021), which reports an 11.60% decrease in residential sales at the end of 2021. The evidence indicates that even though the incentive policy was expansionary in nature, the market required time to absorb and respond to its effects due to lingering economic uncertainty and administrative adjustments (Arkandana et al., 2023).

The second phase reveals the actual effectiveness of the policy. The *TimeAfterPost* coefficient, which measures the change in trend, is positive and highly significant (0.0276; $p < 0.01$), thereby indicating a sustained upward trajectory in residential property demand following the implementation of the policy. This positive and statistically robust shift in trend reflects the successful transmission of the VAT incentive policy in stimulating long-term demand growth. The result aligns with the Keynesian framework (Coddington, 2013; Taylor, 2014), which emphasizes that government fiscal intervention can effectively increase aggregate demand during periods of economic stagnation. The subsequent recovery in residential property sales, recorded by Bank Indonesia of a 4.54% growth in 2022 and 3.37% in 2023, further corroborates the effectiveness of the policy in revitalizing the housing market.

The dynamic panel regression results provide additional confirmation of this delayed but significant policy impact. The positive and highly significant coefficient of the lagged VAT incentive variable (L.Tax = 0.0421; $p < 0.01$) highlights a clear *lag effect*, thereby suggesting that the influence of the policy on demand gradually materialized rather than immediately. Meanwhile, the contemporaneous incentive variable is statistically insignificant ($p > 0.10$), thus reinforcing the interpretation that both developers and consumers required time to adjust to new administrative procedures, financing terms, and post-pandemic market conditions (Arkandana et al., 2023). This finding underscores the adaptive behavior of the market participants. The finding also aligns with the theoretical concept of *adaptive expectations* in demand formation (Pindyck and Rubinfeld, 2018), as well as the long lasting and slow-moving nature of the housing market described by Greenwald and Guren (2021).

Beyond temporal dynamics, the analysis also uncovers regional heterogeneity in the effectiveness of the policy. The interaction term *Java*×*Post* is positive and significant (0.0210; $p < 0.01$), thus indicating that the VAT incentive policy produced a stronger immediate positive effect in the Java region than in non-Java provinces. This regional disparity reflects structural differences in market depth, financial accessibility, and the responsiveness of housing demand. The more advanced financial system, greater urbanization, and higher concentration of middle- to upper-income households in Java supported more rapid policy transmission (Bhinadi, 2009; Hassan and Pitoyo, 2017; Pravitasari et al., 2024). Conversely, in non-Java regions, weaker financial intermediation and limited access to mortgage financing likely constrained the short-term impact of the stimulus (Afrianty and Soesilo, 2024).

Collectively, these findings underscore that the VAT incentive policy was not a temporary or superficial stimulus but a strategically designed fiscal instrument that successfully reoriented the residential property market after the pandemic shock. The observed lag effect captures the delayed but sustained behavioral response of the market participants. At the same time, the regional heterogeneity illustrates how the same policy can produce varying outcomes depending on local economic capacity and institutional readiness. These

empirical results are consistent with global evidence which shows that targeted fiscal incentives, such as the stamp duty holiday of the UK (Besley et al., 2014) or homeownership subsidies (Goodman and Nichols, 1997; Phang, 2013), can effectively restore housing market activity following economic contractions.

5. Conclusion

This study provides a comprehensive understanding of the impact of the VAT incentive policy on residential property demand in Indonesia, particularly within the context of macroeconomic recovery after the COVID-19 pandemic. The analysis, which employs both ITS and dynamic panel regression models, shows that the VAT incentive did not yield an immediate increase in residential property demand; instead, it induced a significant and sustained shift in the growth trajectory over time. The empirical findings reveal a short-term decline in demand immediately following policy implementation, followed by a strong and positive trend that signifies gradual market adjustment and renewed consumer confidence. These results underscore that the VAT incentive policy did not merely function as a short-term stimulus but a strategic fiscal instrument capable of restoring and sustaining demand growth amidst broader economic uncertainties.

From a theoretical standpoint, these findings reinforce the Keynesian principles by highlighting the critical role of fiscal policy interventions in stimulating aggregate demand during economic stagnation. Furthermore, the evidence of regional heterogeneity, where the policy effect was more pronounced in Java compared to non-Java regions, illustrates how disparities in financial intermediation, institutional readiness, and market depth can influence the transmission of fiscal incentives. This insight is crucial for designing future policies that are sensitive to regional structural differences, thereby ensuring that economic benefits are distributed more evenly across provinces.

From a policy perspective, the results provide strong empirical support for the continuation and optimization of VAT incentives as a sustainable fiscal measure. Policymakers should consider maintaining such incentives while calibrating their magnitude and duration according to fiscal capacity and market responsiveness. A well-targeted and time-bound incentive scheme can stimulate housing market recovery, generate multiplier effects across related sectors such as construction, materials, and finance, and ultimately contribute to broader macroeconomic stability. Additionally, policy design should account for regional disparities by strengthening mortgage financing accessibility and financial intermediation in non-Java regions to enhance the nationwide effectiveness of fiscal interventions.

Despite its contributions, this study acknowledges several limitations. The model explains 65.58% of the variation in residential property demand across

the provinces, thus suggesting that unobserved factors, such as consumer sentiment, mortgage interest rates, and liquidity conditions of developers, may also influence housing demand. Moreover, the use of homeownership rates as a proxy for residential property demand may not fully capture the complexity of housing market transactions. Future research should incorporate more granular indicators, such as volume of disbursed regional mortgages, transaction-level housing data, and household-level behavioral variables, to yield a more comprehensive understanding of policy impacts. Integrating qualitative insights, such as the responses of developers and consumers to fiscal incentives, could also enrich future analyses and provide more in-depth policy implications for fostering an inclusive and resilient housing market.

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