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# **Analysis of factors affecting gross income multiplier of warehouse property in Medan City and Deli Serdang Regency, North Sumatra Province**

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**Abstract**--The transformation from traditional trade patterns to digital trade has impacted practically every element of life. E-commerce, or digital trade, indirectly impacts the property industry's development. The increasing demand for modern warehousing is one of them. The Gross Income Multiplier (GIM) is the ratio of a property value to its annual gross income potential. GIM can be a simple and easy method for calculating a property value. This research aims to determine the GIM of warehouse properties in the research area and investigate the factors that influence it. These factors are the distance to Belawan Port, building area, frontage, building age, road width, position/location, and building design. Purposive sampling was used in this study, with a total sample of 81 warehouse units in 30 warehouse complexes. Multiple linear regression analysis with observational data was the analytical approach employed in this study. According to the findings, the average GIM calculation for warehouse properties in the research area was 26.32. The regression analysis revealed that the distance to Belawan Port and the building age have a negative and significant effect on the GIM index of warehouses. Meanwhile, building area, frontage, and road width have

a positive and significant effect on the GIM index of warehouses. Besides, the research findings for the position/location have a positive and insignificant effect on the GIM index of warehouses. Furthermore, in the research area, building design has a negative and insignificant effect on the GIM index of warehouses. The adjusted-R<sup>2</sup> value obtained from testing the coefficient of determination was 0.719. Based on the findings, it can be stated that the GIM of warehouse properties in the research area was mainly affected by the distance to the Belawan Port, as it has the smallest significance value of 0.000 among the other independent variables.

**Keywords**--Gross Income Multiplier (GIM), Warehouse, Property Value, Gross Income.

## **Introduction**

The property value as an investment is a function of the potential revenue expected from the property. The value of such a property can be estimated using the Income Approach. The methods under the income approach include (1) the Discounted Cash Flow Method (DCF Method), (2) the Direct Capitalization Method. This Direct Capitalization Method generally comprises two techniques: Residual Technique and Gross Income Multiplier (GIM) (Appraisal Institute, 2013).

Many previous studies on GIM have been carried out, among others are conducted by Hartnett (1985); Boykin et al. (1994); Bjorklund and Soderberg (1999); Janssen and Soderberg (2000); Yani (2002); Dananto (2005); Djatmiko (2007); Khasanah and Rifki (2020). In addition, there have also been past studies about the level of warehousing capitalization, including Ali (2007); Panangian (2009), and a study on the factors that affect warehouse renting by Saejoon and Jongchil (2016); Hyunwoo et al. (2018).

Another exciting feature, as stated by Michael D. Hartnett in his article entitled Expanded Use of the Gross Income Multiplier in The Appraisal Journal, Vol. 56, Number 2, pages 158-162, is that GIM is a regularly utilized way of evaluating income-producing properties because of its simplicity. The simplicity of this technique, as stated by Hartnett, is not directly proportional to the frequent use of GIM analysis by appraisers in Indonesia, especially the North Sumatra Province, because no GIM index can be used to estimate the Market Value or Rent value of the valuation object.

The transformation of trade patterns from the traditional to the digital era has profoundly affected practically every element of life. Digital commerce, or e-commerce, has an indirect effect on the development of the property sector. Among these is the increasing demand for modern warehouses. Typically, retail businesses require shop space to store and promote their products to clients. However, people are beginning to shift away from traditional shopping habits, such as visiting stores to buy needs, and toward digital (online) stores, where warehouses have substituted stores' primary role of storing commodities. This

encourages property entrepreneurs to invest in modern warehousing properties as a lucrative business (Anggaranie, 2017).

This GIM can be a simple and easy tool for determining a property's value, which investors or other parties can use to determine the initial estimate of the property's value. With the growth of the warehouse property industry in North Sumatra Province, particularly in Medan City and Deli Serdang Regency, and the emergence of numerous warehouse industrial areas, tools for establishing initial policies to determine reasonable warehouse property values for both sellers and buyers are required.

This study aims to calculate the GIM of warehouse properties in the research area and investigate the factors that affect it. These factors include the distance to Belawan Port, the building area, frontage, building age, road width, position/location, and building design. The study's findings are likely to benefit the government, investors, property owners, appraisers, and the field of property valuation.

## **Literature Review**

### **Gross Income Multiplier (GIM)**

Property valuation is the process of determining the value of a property at specific valuation date, whether it is market value, investment value, insurance value, or another sort of value. According to KEPI & SPI Edition VII (2018), a property can be appraised using one of three approaches: (1) the Market Approach, (2) the Income Approach, or (3) the Cost Approach.

The Revenue Approach indicates the value by converting future cash flows to a single present value (KEPI & SPI Edition VII, 2018). The income approach is frequently used to appraise properties. It involves estimating all of the property's income and then deducting all operational costs. Additionally, it is capitalized at a rate that matches the return on investment and profit (return on investment). This income approach is often referred to as the income capitalization model.

Another technique is the income approach, notably GIM, which is the opposite of capitalization. The GIM is a multiplier used to convert potential gross income to a property's estimated value. According to Ventolo et al. (1998), an appraiser must first estimate the property's gross income for a specific period, typically one year. This potential gross income comes from room rents for apartment and office properties, room rents for a hotel property, and building rents for warehouse properties.

According to Lusht (1997), GIM is comparable to the frequently used pricing/earnings ratio in securities analysis. GIM is defined as the ratio of the property's value to the annual potential gross income or as the following formula (Lusht, 1997):

$$\text{GIM} = \text{MV} : \text{PGI} \dots\dots\dots (2.1)$$

where,

- GIM = Gross Income Multiplier
- MV = Property Market Value
- PGI = Potential Gross Income

### **Warehouse Properties**

A warehouse is a building used to store goods. Warehousing is the activity of storing goods in a warehouse. In a broader context, the warehouse refers to the movement of materials as well as the handling of raw materials and finished products (Warman, 2012). According to Siahaya (2013), a warehouse is a place or building used to store commodities, whether raw materials, semi-completed goods (work in process) or finished products.

Government Regulation in place of Law No. 2 of 1960 on Warehousing states in Article 1 that warehouses are all immovable rooms that can be closed and not visited by the public and meet the Ministry of Trade's requirements and are intended or intended used to store company goods.

### **Factors Affecting Warehouse GIM**

#### **The Distance to Belawan Port**

Distance is a unit of measurement used to describe how far the position between two points is. According to the Law of the Republic of Indonesia No. 17 of 2008 on Shipping, a port is defined as a location consisting of land and/or water with clear borders that are used for government and commercial activities such as ship docking, passenger transport, and/or loading and unloading of goods, in the form of terminals, and a ship's dock equipped with shipping safety and security facilities and port support activities, as well as a place for intra- and intermodal transportation.

According to Ali (2006), the distance to Tanjung Perak Port significantly impacts the renting value of warehouses in Surabaya. According to Beekmans and Beckers (2013), distance to a port is a determining factor in assessing the value of an industrial property located in the Netherlands. According to Saejoon and Jongchil (2016), the distance to the port is essential in determining the rental value of warehouse properties in South Korea.

#### **Building Area**

The building area is the size of the structure that stands on a plot of land. The warehouse building area is defined in this research as the building's floor area or the size of the warehouse building when it is used for its intended purpose. According to Ali (2006), building area has a significant effect on the rental value of warehouses in Surabaya. Meanwhile, Panangian (2009) claimed that the building area has a significant impact on the rental value of warehouses in Tangerang. According to Hyunwoo and Minyoung (2019), building area significantly impacts the rental rate for warehouse properties in South Korea.

**Frontage**

Frontage is the width/size of the front of the land facing the road. The frontage will benefit the price per m<sup>2</sup> of property, as the more extensive frontage will allow for numerous design solutions, higher visibility, benefits of sunlight, etc. Protopapasa and Dimopoulos (2019) claimed that frontage has a significant effect on the value of industrial land in Cyprus.

According to Akhtar and Dahnani (2011), frontage can raise the land value of industrial properties in Karachi City. According to Kowalski and Paraskevopoulos (1990), frontage has a significant effect on the value of industrial land in the City of Detroit and Michigan.

**Building Age**

The building age refers to the period when it can perform its functions and maintain its reliability following the specified specifications. Economic life is when assets (building) are projected to be used economically for their intended purposes (KEPI & SPI Edition VII-2018). Meanwhile, the building's remaining economic life/remaining usable life is the period defined from the date of the estimated value until the end of the asset's economic life/usefulness, i.e., the remaining time for the asset's (building's) function to be performed. A warehouse/industrial building of light construction has a 30-year economic life, while a warehouse/industrial building of medium or heavy construction has a 50-year economic life (Building Technical Costs-MAPPI).

Yani (2002) claims that the building age has a negative impact on the GIM of hospitality in Yogyakarta, which is consistent with Dananto (2005)'s statement that the building age has a negative effect on the GIM of hospitality in Central Jakarta. According to Ali (2006), building age has a significant effect on the rental value of warehouses in Surabaya. According to Saejoon and Jongchil (2016), building age has a negative effect on the rental rate for warehouse properties in South Korea. Meanwhile, Hyunwoo and Minyoung (2019) stated that the building age significantly affects the rental rate for warehouses in South Korea. When newer structures are constructed, the level of damage is reduced even further. The ability to use the latest materials and technology is increased, so the age of the building also affects rising property values (Popescu et al., 2009).

**Road Width**

The road width is width of a road in front of land and buildings that serves as a primary access to land and buildings. It is measured in meters (m). According to Kowalski and Paraskevopoulos (1990), road width significantly impacts the value of industrial land in the City of Detroit and Michigan. According to Akhtar and Dahnani (2011), increasing the road width in Karachi City can boost the land value of industrial properties. Meanwhile, Saejoon and Jongchil (2016) stated that road width positively affects warehouse renting prices in South Korea.

### **Position/Location**

The property's location affects its market value, regardless of whether it is in the middle, edge, or corner (hook) position. According to Shah et al. (2018), the more strategically located property is, the higher the rental value. Its distance from the city center can determine the shophouse's strategic location, its position, whether hook/corner or not, and the density of crowds surrounding the shophouse.

According to Downing (1973), the corner location significantly affects the value of Milwaukee's commercial and industrial land. According to Peiser (1987), the corner location significantly affects the value of industrial land in North Dallas. According to Fujiki (1989), the corner location significantly impacts the value of commercial and industrial land in Tokyo's Central Ward (Chou Ku). On the other hand, Nguyen and Nguyen (2021) stated that the corner location has a negative effect on the pricing of townhouses in Vietnam. Whereas in this study, a dummy variable was used to assign a value of 1 for the corner location and 0 for the non-corner location.

Warehouses on the corner location possess higher value since they benefit from two entry points from both roadsides in terms of accessibility and building facades. Along with its strategic location, the warehouse position is related to its land area, with the edge position typically having a larger land area due to surplus land.

### **Building Design**

The building design has a significant impact on the value of a building. The design of the building is determined by the building's intended use and the preferences of its tenants. This uncertainty about utility and preferences reduces the value of a building and vice versa. If a building is well-designed for its intended function and adheres to the "trend" of the time, its value increases (Arifin, 2011).

According to Dunse, Neil et al. (2005) stated that building design significantly impacts the rental value of industrial properties in Glasgow. According to John F. McDonald and Yuliya Yurova (2007), building design significantly impacts selling prices and industrial property taxes in Chicago. According to Hyunwoo and Minyoung (2019), a warehouse's design with a loading dock significantly affects the rental rate for warehousing buildings in South Korea. Whereas in this study, warehouses with loading dock designs are assigned a dummy value of 1, while those without a loading dock are assigned a value of 0. According to Razali et al. (2020), the study's findings indicate that one of the factors affecting the value of the industrial property is the building's physical characteristics, including the building age, size, and design.

The ideal warehouse building is designed following its classification and satisfies all criteria: strength, quality, use, and aesthetics. A warehouse of this type undoubtedly has a higher sale value.

## **Data and Methods**

### **Sample and Research Data**

The warehouses in Medan City and Deli Serdang Regency, North Sumatra Province, were used for this research. This research lasted for three months, from November 2021 to February 2022.

The study's population consisted of warehouses in Medan City and the Deli Serdang Regency of North Sumatra Province. Purposive sampling was used in this study. Purposive sampling is a technique that considers specific things (Sugiyono, 2017). The study's criteria were warehouses sold or rented in Medan City and Deli Serdang Regency, North Sumatra Province. Only 81 data are based on population data collected in the field. According to Arikunto (2012), if the total population consists of less than 100 datasets, the entire sample is taken; however, if the total population contains more than 100 data points, 10-15% or 20-25% of the total population can be taken.

Primary data is data gathered directly from the field through interviews with the marketing management office of the warehousing complex and direct telephone conversations with the seller/tenant of the warehouse. Meanwhile, secondary data for this research was gathered from multiple organizations such as the management office of warehouse complex marketing, the Public Appraisal Service Office (Amin Nirwan Alfiantori and Partners), and other agencies or parties associated with this research from the period 2020 to 2021.

### **Variables**

The operational definition is based on observable and quantifiable properties of things. The operational definitions of the variables to be studied in this study are as follows: (1) the warehouse's Gross Income Multiplier (GIM) is a comparison of the warehouse's value to its annual potential gross income, (2) the distance to Belawan Port is the distance between the warehouse locations of each object of research and Belawan Port in km (kilometers), which is measured using the length of the road that can be passed by four-wheeled vehicles; (3) the area of warehouse building is the size of the warehouse building that is used as its function using m<sup>2</sup> (square meters); (4) frontage is the width of the research object land facing the road, which is measured using unit m (meters); (5) the warehouse building age is the age of the warehouse building since it was built (years) until the time the research is carried out; (6) the road width is the width of the road body in front of the object of research using m (meters); (7) the position/location is the position or the location of the property at a location (warehouses with a 3 in 1 warehouse design are assigned a value of 1 and for ordinary warehouses are assigned a value of 0). Table 3.1 contains the variables and operational definitions utilized in this study.

Table 3.1  
Definition and measurement scale of variables

No	Variable	Operational Definition	Measurement Scale
1	Gross Income Multiplier of Warehouses (Y)	Comparison of the selling price to the warehouse's annual rental cost	Ratio
2	Distance to Belawan Port (X <sub>1</sub> )	The length of the road that four-wheeled vehicles may drive from the warehouse to the Belawan Port, in km (kilometers)	Ratio
3	Warehouse building area (X <sub>2</sub> )	The warehouse floor area is determined by multiplying the length by the width, in m <sup>2</sup> (square meter)	Ratio
4	Frontage (X <sub>3</sub> )	Width of land adjacent to the road, in m (meters)	Ratio
5	Warehouse building age (X <sub>4</sub> )	Age of warehouse building since it was built (years)	Ratio
6	Width road (X <sub>5</sub> )	The road width in front of the location of the research object, in unit m (meters)	Ratio
7	Position/location (D <sub>1</sub> )	This position/location includes both the corner and the middle positions (dummy)	Nominal 1 = corner 0 = middle
8	Warehouse building design (D <sub>2</sub> )	This warehouse building design includes 3 in 1 warehouse or an ordinary warehouse (dummy)	Nominal 1 = 3 in 1 warehouse 0 = ordinary warehouse

## Results and Discussion

### Research Results

#### Description of Research Location

The study was conducted in Medan City and the Deli Serdang Regency, North Sumatra Province. The location was chosen based on the availability of warehouses for sale and rent in the region. The picture below illustrates the distribution of warehouse data among 30 warehouse complexes in Medan City and Deli Serdang Regency.

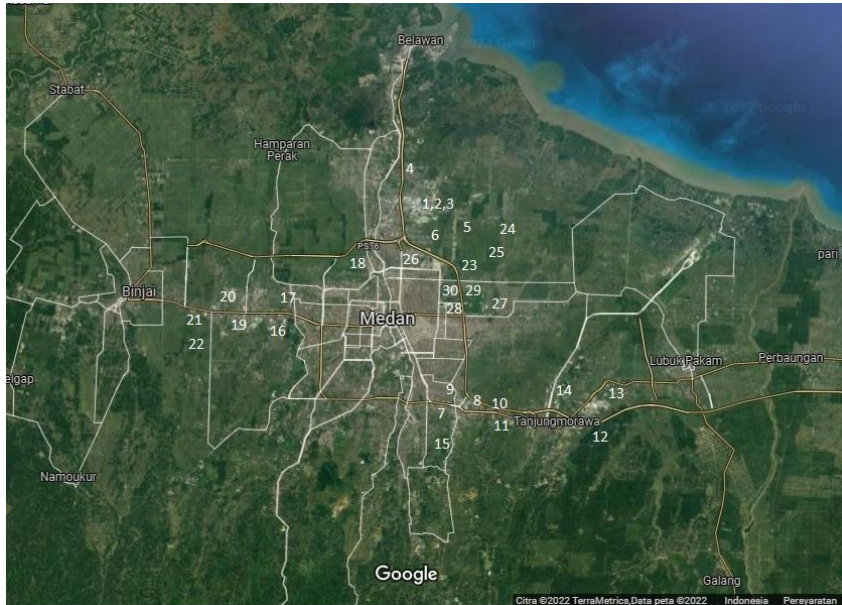


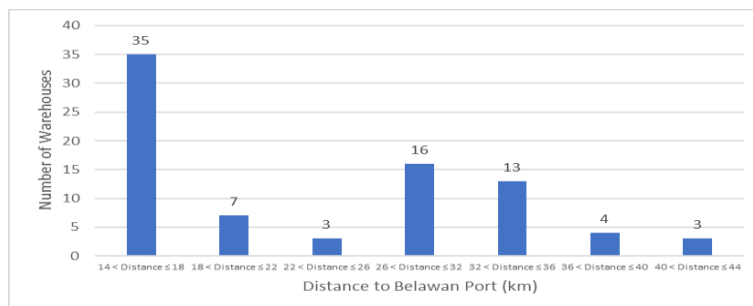
Figure 4.1 Data distribution map of the warehouse complexes in the research area

As seen in the illustration above, there are 26 warehouse units located in the administrative region of Medan City and 55 warehouse units located in the administrative area of Deli Serdang Regency (with the furthest distance of approximately 15 km from the center of Medan City).

**Description of Observational Data**

The study sampled 81 warehouse units as observational data. The population of this study is warehouses sold and rented in 30 Warehouse Complexes located in Medan City and Deli Serdang Regency. The observational data were classified into 8: distance to Belawan Port, building area, frontage, building age, road width, position/location, building design, and Gross Income Multiplier (GIM).

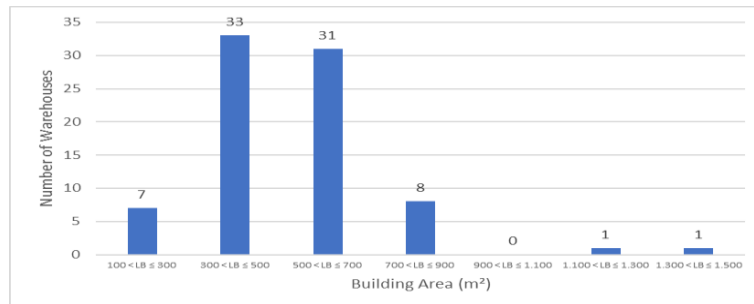
**Observational Data Based on Distance to Belawan Port**



Graph 4.1 Distance to Belawan Port as Observational Data (X<sub>1</sub>)  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.1, the distance to the Belawan Port is between 14 and 44 km, with the majority of the distance between 14 and 18 km, and with a total of 35 warehouse units (43.21%).

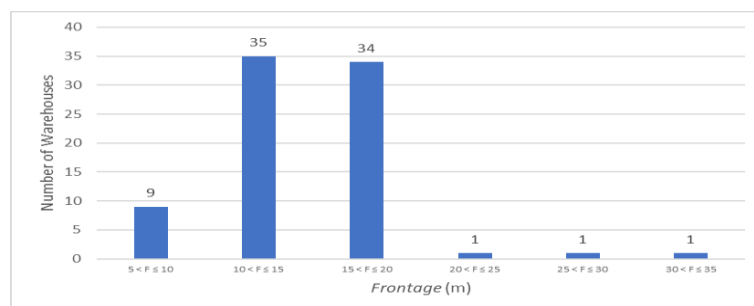
### Observational Data Based on Building Area



Graph 4.2 Building Area as Observational Data (X<sub>2</sub>)  
Source: Study Results, 2022 (Processed Data)

As seen in Graph 4.2, the building area for observational data is between 100 and 1,500 m<sup>2</sup>. The majority of the observation data building area is between 300 and 500 m<sup>2</sup>, with 33 warehouse units (40.74%).

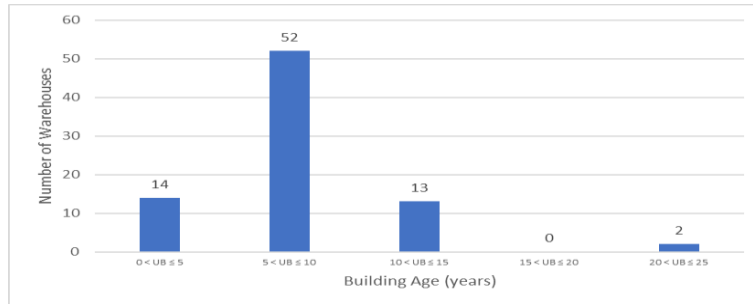
### Observational Data Based on Frontage



Graph 4.3 Frontage as Observational Data (X<sub>3</sub>)  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.3, the frontage of the observational data ranges from 5 to 35 m, with the majority of the frontage being 10 to 15 m and comprising 35 warehouse units (43.21%).

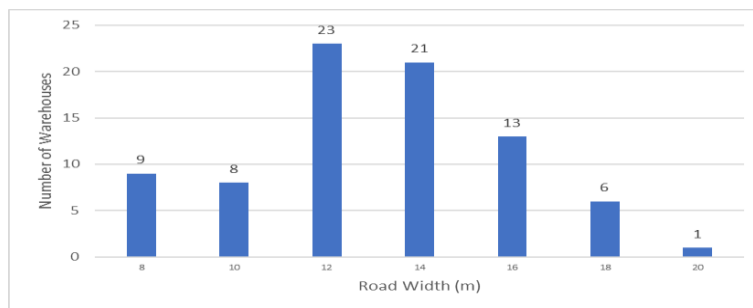
### Observational Data Based on Building Age



Graph 4.4 Building Age as Observational Data ( $X_4$ )  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.4, the building age of observational data ranged from 0 to 25 years, with the majority of observational data for building age being between 5 to 10 years, comprising 52 warehouse units (64.20%).

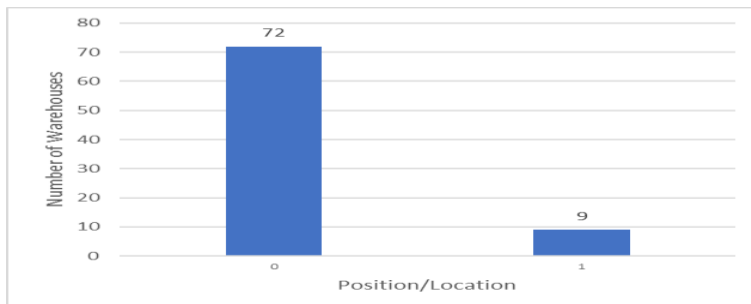
### Observational Data Based on Road Width



Graph 4.5 Road Width as Observational Data ( $X_5$ )  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.5, the road width of the observational data varies between 8 and 20 m, with the majority of the observational data being 12 m and having 23 warehouse units (28.40%).

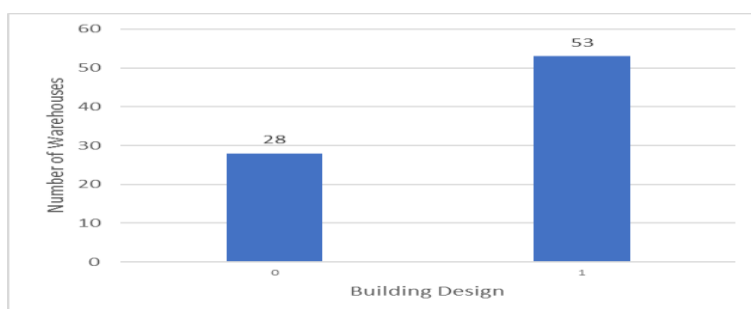
### Observational Data Based on Position/Location



Graph 4.6 Position/Location as Observational Data (D<sub>1</sub>)  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.6, the position/location of the observational data is primarily in the middle, with a total of 72 warehouse units (88.89%).

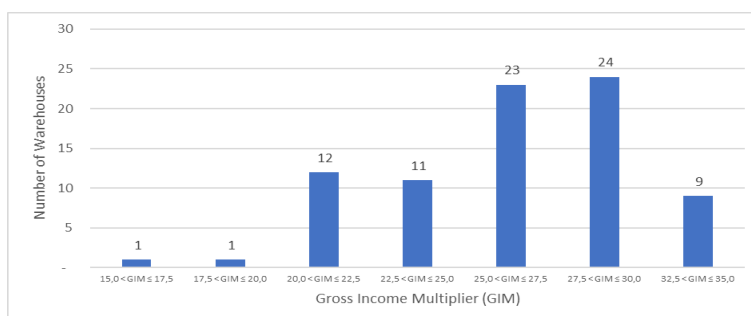
### Observational Data Based on Building Design



Graph 4.7 Building Design as Observational Data (D<sub>2</sub>)  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.7, the majority of observational data for building design are 3-in-1 warehouses with a total of 53 warehouse units (65.43%).

### Observational Data Based on Gross Income Multiplier (GIM)



Graph 4.8 Gross Income Multiplier (GIM) as Observational Data (Y)  
Source: Study Results, 2022 (Processed Data)

As illustrated in Graph 4.8, the Gross Income Multiplier Index (GIM) of observational data ranges between 15 and 35, with the majority of Gross Income Multiplier (GIM) ranging between 27.5 and 30, with a total of 24 warehouse units (29.63%).

### Results of Descriptive Statistical Analysis

The term descriptive statistical analysis refers to determining the description of data based on its maximum and minimum values, average (mean), and standard deviation. Table 4.1 presents descriptive statistics for distance to Belawan Port, building area, frontage, building age, road width, position/location, building design, and Gross Income Multiplier (GIM).

Table 4.1 Descriptive Statistics

	N	Minimu m	Maximu m	Mean	Std. Deviation
Distance to Belawan Port (km)	81	14.30	43.90	23.8136	8.54238
Building Area (m <sup>2</sup> )	81	144.00	1500.00	514.8395	194.58651
Frontage (m)	81	8.00	35.00	14.8210	4.48003
Building Age (years)	81	1.00	25.00	8.8765	3.98241
Road Width (m)	81	8.00	20.00	13.0617	2.86507
Position/Location	81	.00	1.00	.1111	.31623
Building Design	81	.00	1.00	.6543	.47855
GIM of Warehouse	81	17.39	34.48	26.3168	3.47239
Valid N	81				

Source: Study Results, 2022 (Processed Data)

According to Table 4.1, the shortest and the longest distance to Belawan Port are 14.30 and 43.90 km, respectively, with an average and standard deviation of 23.8136 and 8.54238 km, respectively. Meanwhile, the smallest and the largest building area are 144 and 1,500 m<sup>2</sup>, respectively, with an average and standard deviation of 514.8395 and 194.58651 m<sup>2</sup>, respectively. The minimum and the maximum frontages are 8 and 35 m, respectively, with an average and standard deviation of 14,8210 and 4,48003 m, respectively. The minimum and maximum building age are 1 and 25 years, respectively, with an average and standard deviation of 8.8765 and 3.98241 years, respectively. The minimum and the maximum road width are 8 and 20 m, respectively, with an average and a standard deviation of 13.0617 and 2.86507 m, respectively. The position's minimum and maximum values are 0 and 1, respectively, with an average and standard deviation of 0.1111 and 0.31623, respectively. The building design has a minimum and maximum value of 0 and 1, respectively, with an average and standard deviation of 0.6543 and 0.47855, respectively. Meanwhile, the smallest and the greatest warehouse Gross Income Multiplier (GIM) value are 17.39 and

34.48, respectively, with an average value and standard deviation of 26.3168 and 3.47239, respectively.

### **Results of Classical Assumption Deviation Test Normality Test**

The probability value or Asymp. Sig (2-tailed) of 0.200 is larger than the significance threshold of 0.05 as determined by the normality test, so the data distribution is normally distributed. This indicates that the assumption of normality has been achieved.

### **Multicollinearity Test**

According to the multicollinearity test, the collinearity statistics for all independent variables are indicated by the Variance Inflation Factor (VIF) value. The VIF value for the distance to Belawan Port, the building area, the frontage, building age, the road width, the position/location, and the building design are 1.674, 2.887, 2.916, 1.076, 1.337, 1.059, and 1.542, respectively, which all are smaller than 10. Meanwhile, the tolerance value for the distance to Belawan Port, the building area, the frontage, building age, the road width, the position/location, and the building design are 0.346, 0.343, 0.929, 0.748, 0.944, and 0.648, respectively, which all are greater than 0.1. According to the VAF and tolerance values, the existing independent variables do not exhibit multicollinearity, so the regression model does not exhibit multicollinearity.

### **Heteroscedasticity Test**

According to the heteroscedasticity test, the probability value or Sig. Glejser for the distance to Belawan Port, building area, frontage, building age, road width, position/location, and building design are 0.953, 0.196, 0.981, 0.944, 0.442, 0.314, and 0.894, respectively, which values are all greater than 0.05, indicating that the regression model does not exhibit heteroscedasticity.

### **Hypothesis Testing Results (Goodness of Fit) Coefficient of Determination Test Results (R<sup>2</sup>)**

Table 4.2 Coefficient of Determination Test Results (R<sup>2</sup>)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.862 <sup>a</sup>	.743	.719	1.84172

a. Predictors: (Constant), distance to Belawan Port (km), building area (m<sup>2</sup>), frontage (m), building age (years), road width (m), position/location, building design

b. Dependent Variable: Gross Income Multiplier (GIM) of Warehouse

Source: Study Results, 2022 (Processed Data)

According to Table 4.2, the Adjusted R-Square column contains the coefficient of determination (R<sup>2</sup>) value. The coefficient of determination (R<sup>2</sup>) is reported to be

0.719. This value indicates that all independent variables, namely distance to Belawan Port, building area, frontage, building age, road width, position/location, and building design, have a simultaneous effect of 71.9% on the Gross Income Multiplier (GIM) Index variable, with the remaining 28.1% influenced by other variables.

### F Test Results

Table 4.3 F Test Results

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	716.988	7	102.427	30.197	.000 <sup>b</sup>
Residual	247.612	73	3.392		
Total	964.600	80			

a. Dependent Variable: Gross Income Multiplier (GIM) of Warehouse

b. Predictors: (Constant), distance to Belawan Port (km), building area (m<sup>2</sup>), frontage (m), building age (years), road width (m), position/location, building design

Source: Study Results, 2022 (Processed Data)

According to table 4.3, the value of Sig. is 0, and the value of  $F_{count}$  is 30.197. Since  $Sig. = 0 < 0.05$  and  $F_{count} = 30.197 > F_{table} = 2.14$  (the  $F_{table}$  is presented in the appendix), it can be concluded that the simultaneous effect of all independent variables, namely distance to Belawan Port, building area, frontage, building age, road width, position/location, and building design, is statistically significant toward the Gross Income Multiplier (GIM) Index.

### T-Test Results

Table 4.4 T-Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	23.704	1.376		17.25	.000
Distance to Belawan Port (km)	-.193	.031	-.475	6.190	.000
Building Area (m <sup>2</sup> )	.006	.002	.341	3.388	.001
Frontage (m)	.161	.078	.208	2.050	.044
Building Age (years)	-.138	.054	-.159	-2.57	.012

				7	
Road Width (m)	.235	0.83	.194	2.83	.00
Position/Location	.245	.670	.022	.366	.71
Building Design	-.281	.534	.039	-.526	.60
					0

a. Dependent Variable: Gross Income Multiplier (GIM) of Warehouse  
Source: Study Results, 2022 (Processed Data)

The following multiple linear regression equation is derived from table 4.4:  

$$Y = 23.704 - 0.193 (X_1) + 0.006 (X_2) + 0.161 (X_3) - 0.138 (X_4) + 0.235 (X_5) + 0.245 (D_1) - 0.281 (D_2)$$

According to the results in Table 4.4, the following is known:

- 1) The regression coefficient of the distance to Belawan Port is -0.193, with a significance value (Sig.) of  $0.000 < 0.05$ . Thus, the distance to the Belawan Port has a significant negative effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 2) The regression coefficient of the building area is +0.006, with a significance value (Sig.) of  $0.001 < 0.05$  (significance level). Therefore, building area has a significant positive effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 3) The regression coefficient of the frontage is +0.161, with a significance value (Sig.) of  $0.044 < 0.05$  (significance level). Therefore, frontage has a significant positive effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 4) The regression coefficient for the building age is -0.138, with a significance value (Sig.) of  $0.012 < 0.05$  (significance level). Then, the building's age has a significant negative effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 5) The regression coefficient for road width is +0.235, with a significance value (Sig.) of  $0.006 < 0.05$  (significance level). Therefore, the road width has a significant positive effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 6) The regression coefficient of location/position is +0.245, with a significance value (Sig.) of  $0.716 > 0.05$  (significance level). Therefore, position/location has a positive effect and insignificant on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.
- 7) The regression coefficient of the building design is -0.281, with a significance value (Sig.) of  $0.6 > 0.05$  (significance level). Therefore, the building design of has a negative effect and insignificant on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province.

### **Discussion of Study Results**

#### **Distance to Belawan Port has a Negative and Significant Effect on the Warehouse GIM Index**

The study's findings indicated that distance to the Belawan Port had a negative and statistically significant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. This is supported by the regression results for the distance to the Belawan Port ( $X_1$ ), which have a significance value (Sig.) of  $0 < 0.05$  (significance level). Therefore, the effect of the distance to Belawan Port ( $X_1$ ) is significant on the Gross Income Multiplier Index (Y).

This finding is consistent with the findings of the previous study, including Ali (2006), who found that the distance to Tanjung Perak Port had a negative and significant effect on warehouse rental values in Surabaya, and also Beekmans and Beckers (2013), who found that the distance to the port has a negative and significant effect on the value of an industrial property located in the Netherlands.

For ages, ports have facilitated trade between different regions of the world. One of the first trade routes connecting continents was developed through shipping routes. These ports are still bustling today, handling numerous huge shipments, bulk containers, and other shipments. This has resulted in a surge in demand for industrial estates or estates near ports. For intelligent investors, purchasing commercial land near a port might result in a faster return on investment. There are numerous benefits to establishing a business branch near the port. Consider some of them: reduced transport costs, time savings, cost savings, and better facility access.

#### **Building Area has a Positive and Significant Effect on the Warehouse GIM Index**

According to the study's findings, the building area of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province, had a positive and significant effect on the GIM index. This is confirmed by the regression results of building area ( $X_2$ ), which have a significant value of  $0.001 < 0.05$  (significance level), indicating the effect of building area ( $X_2$ ) on the Gross Income Multiplier Index (Y) is significant.

This finding is consistent with the findings of previous studies, namely Ali (2006), who discovered that building area has a positive and significant effect on the level of warehouse capitalization in Surabaya, and Panangian (2009), who also found that building area has a positive and significant effect on the level of warehouse capitalization in Tangerang.

However, these results contrast with Hyunwoo and Minyoung (2019). They found that the building area has a negative and significant effect on the rental rate of warehouse properties in South Korea. The large size of the warehouse building provides additional benefits to its users, including the ability to store items in large quantities or with large sizes/capacities.

### **Frontage has a Positive and Significant Effect on the Warehouse GIM Index**

The study's results suggested that frontage had a significant positive effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. As seen by the findings of the frontage ( $X_3$ ) regression, a significance value (Sig.) of  $0.044 < 0.05$  (significance level) suggested that the effect of frontage ( $X_3$ ) on the Gross Income Multiplier Index ( $Y$ ) is significant. This is consistent with the findings of previous researchers, namely Kowalski and Paraskevopoulos (1990), who concluded that frontage had a positive and significant effect on industrial land values in Detroit and Michigan. Additionally, Akhtar and Dahnani (2011) agreed that frontage had a positive and significant effect on the land value of industrial property in Karachi because more extensive frontage would allow for various design solutions, higher visibility, sun benefits, and more.

### **Building Age has a Negative and Significant Effect on the Warehouse GIM Index**

The study's results suggested that the building age significantly affects the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. This is verified by the regression findings for the building age ( $X_4$ ), which have a significance value (Sig.) of  $0.012 < 0.05$  (significance level). Consequently, the effect of building age ( $X_4$ ) on the Gross Income Multiplier Index ( $Y$ ) is significant.

This is in line with the results of previous researchers, including Ali (2006), who found that building age has a negative and significant effect on warehouse rental values in Surabaya. Moreover, Saejoon and Jongchil (2016) also stated that building age has a negative and significant effect on the rental rate of warehouse properties in South Korea. Furthermore, Hyunwoo and Minyoung (2019) claimed that the building age has a negative and significant effect on the rental rate of warehouse properties in South Korea.

From a theoretical standpoint, it is argued that the building age over a specified period and for a specified usage has a significant effect on its value. One of the reasons is that buildings with a long (old) life will impose extra maintenance expenses.

### **Road Width has a Positive and Significant Effect on the Warehouse GIM Index**

According to the study's findings, road width had a significant positive effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. As shown by the results of the road width ( $X_5$ ) regression, which have a significant value of  $0.012 < 0.05$  (significance level), the effect of building age ( $X_5$ ) on the Gross Income Multiplier Index ( $Y$ ) is significant.

This is similar to the findings of previous researchers, namely Kowalski and Paraskevopoulos (1990), who confirmed that road width had a positive and significant effect on the value of industrial land in Detroit and Michigan.

Furthermore, Akhtar and Dahnani (2011) also concluded that road width has a positive and significant effect on the land value of industrial properties in Karachi. Additionally, Saejoon and Jongchil (2016) claimed that road width has a positive and significant effect on rental rates for warehouse properties in South Korea. The road width in a warehousing area is critical infrastructure. This is because heavy trucks will cross the road, which will make driving the heavy vehicle easier if the road width is sufficient.

### **Position/Location has a Positive and Insignificant Effect on the Warehouse GIM Index**

According to the study's findings, the position has a positive but insignificant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. As the results of the position/location ( $D_1$ ) regression indicates that the direct effect of position/location ( $D_1$ ) on the Gross Income Multiplier Index ( $Y$ ) is insignificant. This is proven by a significance value (Sig.) of  $0.716 > 0.05$  (significance level), indicating that the direct effect of position/location ( $D_1$ ) on the Gross Income Multiplier Index ( $Y$ ) is insignificant.

This is in contrast to the findings of previous researchers, namely Downing (1973), who stated that the corner position had a positive and significant effect on the value of commercial and industrial land in Milwaukee. Besides that, Peiser (1987) also concluded that the corner position has a positive and significant effect on the value of industrial land in North Dallas. In addition, Fujiki (1989) revealed that the corner position has a positive and significant effect on the value of industrial land in Central Ward (Chou Ku) Tokyo.

### **Building Design has a Negative and Insignificant Effect on the Warehouse GIM Index**

According to the study's findings, the building design in Medan City and Deli Serdang Regency, North Sumatra Province, has a negative and insignificant effect on the GIM index. As the results of the building design ( $D_2$ ) regression suggest that the effect of building design ( $D_2$ ) on the Gross Income Multiplier Index ( $Y$ ) is insignificant. The significance value (Sig.) of  $0.6 > 0.05$  (significance level) indicates that the effect of building design ( $D_2$ ) on the Gross Income Multiplier Index ( $Y$ ) is insignificant.

This is in contrast to previous research findings, such as Dunse, Neil et al. (2005), who found that building design has a positive and significant effect on the rental value of industrial properties in Glasgow. Additionally, McDonald, John F., Yurova, and Yuliya (2007) also found that building design positively affects selling prices and industrial property tax in Chicago. Moreover, Hyunwoo and Minyoung (2019) stated that building design positively and significantly affects rental rates for warehouse properties in South Korea.

## Conclusion

Based on the study's findings, it can be concluded that:

- 1) The distance to Belawan Port has a negative and significant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. As marine transportation infrastructure, ports provide a critical and vital role in the growth of industry, warehousing, and commerce, as they are an integral part of the transportation and logistics chain. According to the study's results, the distance to the Belawan Port has the most significant impact on the GIM of warehouse properties in the research area, as it has the lowest significance value among other independent variables, with the shorter the distance to the Belawan Port, the higher the warehouse GIM index.
- 2) The building area has a positive and significant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. The large size of the warehouse building provides additional benefits to its users, including the ability to store items in great quantities or with large sizes/capacities. According to the study results, the larger the building's floor area, the higher the warehouse GIM index.
- 3) The frontage has a positive and significant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. The width/size of the front of the ground facing the road is referred to as the frontage; a broader frontage allows for more design options and increased visibility. According to the research findings, the larger the frontage, the higher the warehouse GIM index.
- 4) The building age has a negative and significant effect on the GIM index of warehouses in Medan and Deli Serdang Regency, North Sumatra Province. The greater the physical depreciation of the building, the lower its value will be; this is because one of the reasons is the increased maintenance costs associated with buildings that have a long (old) life. According to the study's findings, the newer the building, the higher the GIM index of the warehouse.
- 5) The road width has a positive and significant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. The road width in a warehousing area is critical infrastructure; this is because the road will be passed by heavy trucks, making driving the heavy vehicle easier if the road width is sufficient. According to the study's findings, the broader the road, the higher the warehouse GIM index.
- 6) The position/location has a positive but insignificant effect on the GIM index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. This factor is irrelevant because the corner/middle position of the warehouse property is not a significant factor in determining the warehouse's GIM. The air circulation/sunlighting does not benefit the warehouse property significantly. This is different from the residential property buildings that demand enough air circulation and sunlight.
- 7) The building design has a negative and insignificant effect on the GIM Index of warehouses in Medan City and Deli Serdang Regency, North Sumatra Province. According to the study's findings, a warehouse with a three-in-one warehouse design is not better than an ordinary warehouse. This is because an ordinary warehouse with the concept or design of the entire building is

used to store goods. After all, it has a larger storage area without requiring additional space as offices and retail locations.

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