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Identification of Growth Constraints in North Sumatra: A Growth Diagnostics Approach

Doddy Purwoharyono[1*], Sasmita Kartika Sari[1], Hafid Wahyu Ramadhan[2]

[1]University of Indonesia
Jl. Margonda Raya, Depok, Jawa Barat, Indonesia
[2]National Development Planning Agency
Jl. Taman Suropati No.2 Jakarta, DKI Jakarta, Indonesia
[*]**Correspondence**: doddy.purwoharyono@ui.ac.id

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ABSTRACT

North Sumatra economy is one of the highest contributors to the regional economy of Sumatra. The declining long-term growth trend of North Sumatra needs to be diagnosed so that a sustainable long-term economic growth can be achieved. This study focuses on analyzing binding constraint to investment and growth in North Sumatra using the HRV (Hausmann et al., 2005) growth diagnostic framework. The application of the HRV growth diagnostic framework in this study uses the benchmark method. To benchmark North Sumatra with other comparable regions, the hierarchical cluster method is used based on the characteristics of GRDP per capita, Total Population, Area, and Population Density. The benchmarking results found that government failures, especially micro risks including ease of doing business, low access and certainty of land ownership, high transaction costs, high levels of corruption and crime are the main obstacles to investment and economic growth in North Sumatra.

Keywords: *Binding Constraints, Economic Growth, Growth Diagnostics, Investment, North Sumatra.*
JEL classification*: E22, O11, R11*

*Coresponding author:
E-mail: doddy.purwoharyono@ui.ac.id

INTRODUCTION

North Sumatra (Sumut) contributes about 5.2% to the national Gross Regional Domestic Product (GRDP) in 2024 (BPS, 2025), the largest share in Sumatra Region. Despite its abundant natural resources and diverse industrial base, spanning from palm oil, mining, and tourism, Sumut's annual economic growth has remained near 4.9% over the past few years, this figure falls behind other major provinces such as West Java and East Java, whose growth rates could surpass above 5.1%. This stagnation is not merely a numerical trend—it raises structural concerns.

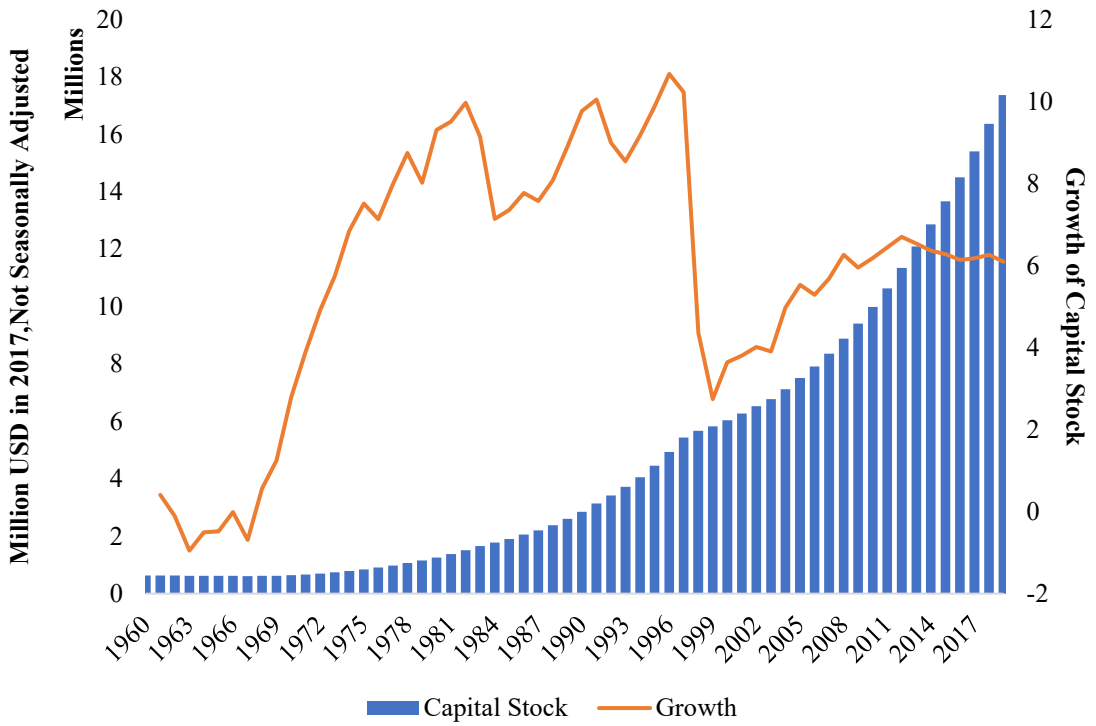
Understanding why North Sumatra's growth lags behind is essential for several reasons. North Sumatra is strategically located on the Strait of Malacca, a vital global trade route, giving it excellent access to Asian and international markets. Its logistical advantages are further boosted by the Port of Belawan, Indonesia's busiest seaport outside of Java. The economic structure is diverse, heavily reliant on plantation commodities like palm oil, alongside agriculture, fisheries, and growing manufacturing industries. Despite its economic significance and diversity, North Sumatra faces considerable socio-economic disparities, with 7.99% of the population (around 1.23 million people) living below the poverty line as of March 2024, indicating unequal development across the region. Major government programs are located in this province namely Danau Toba Tourism and Sei Mangkei Special Economic Zone. These combined factors of economic scale, strategic position, diverse resources, and persistent inequality make North Sumatra a relevant subject for growth analysis.

Most studies on growth focus on what causes divergent economic growth trajectories, rather than on potential constraints to growth in a particular environment (Hausmann et al., 2008). Traditional growth theories, such as the Solow model and endogenous growth models, emphasize factors like capital accumulation, labor force growth, technological progress, and human capital as determinants of long-term growth. In practice, these models often translate into broad, uniform policy prescriptions such as Washington Consensus that emphasize trade liberalization, macroeconomic stabilization, and privatization to be applied universally, irrespective of country-specific contexts. While these theories successfully explain what drives growth in general, they offer little insight into why some economies endowed with similar endowments and policies stagnate, or why identical reforms produce divergent outcomes across regions (Rodrik, 2006).

In response to this, the growth diagnostic framework, pioneered by Hausmann et al. (2005), emerged an alternative approach that offer a more targeted, country-specific approach to identifying the most binding constraints on economic growth. The core idea behind this theory is that while many factors could potentially constrain growth, in any specific context, only a few are "binding constraints"—the most restrictive bottlenecks that, if relaxed, would yield the largest increase in investment and growth. The HRV framework guides policymakers through a logical sequence to distinguish between low returns on investment (due to poor infrastructure, weak institutions, macroeconomic instability) and high costs of financing (due to underdeveloped financial markets or distorted risk perceptions) (Hausmann et al., 2005).

Since its inception, the growth diagnostics toolbox has evolved considerably. Early applications focused on national-level studies in developing economies ranging from El Salvador to South Africa (Hausmann et al., 2006; Ianchovichina & Gooptu, 2007) where practitioners combined qualitative interviews with quantitative indicators to iteratively refine their diagnostic trees. More recent work has extended the framework to subnational or provincial-level analyses to understand regional growth disparities within countries (Goldstein et al., 2023; O'brien et al., 2022).

In Indonesia, growth diagnostic studies have been conducted at the national level (Bappenas, 2020), which identifying that Indonesia's constraints are mainly related to regulations and institutions. Some analyses have also been performed at the provincial level, such as studies on Aceh (The World Bank, 2009) and East Java (Agustiana et al., 2011) by the World Bank and Bank Indonesia studies covering multiple provinces (Bank Indonesia, 2015).



Source: University of Groningen and University of California, Davis, Capital Stock at Constant National Prices for Indonesia [RKNANPIDA666NRUG], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/RKNANPIDA666NRUG, July 16, 2023.

Figure 1. Indonesia's Capital Stock at Constant Prices and Capital Stock Growth 1960 – 2019

These studies have provided valuable insights into regional constraints in different parts of the archipelago and have since been instrumental in policymaking for the past decade. The policy impact of these diagnostics has been significant: regulatory reforms—such as the Online Single Submission system in 2018—and the National Strategic Projects program led to a substantial acceleration of infrastructure rollout nationwide. As a result, Indonesia's accumulation of capital has surged rapidly over the previous decade (Figure 1).

Rapid infrastructure development has bolstered conditions and augmented capital stock, potentially alleviating regional growth constraints in Indonesia. Consequently, this study seeks to enrich the growth literature by conducting a provincial-level growth diagnostics using recent data in North Sumatra Province. Thus, this paper addresses a main question: What is North Sumatra's most binding constraint to growth, based on the provincial's recent infrastructure development and decentralization policies? While previous studies touch upon regional issues, none provides a dedicated, in-depth diagnosis for North Sumatra based on its specific economic structure and current conditions. This research gap forms the fundamental basis for conducting this study, aiming to provide a tailored and current analysis of the binding constraints to investment and growth in North Sumatra.

We applied a benchmarking method utilizing the hierarchical cluster approach to classify regions with similar characteristics across key variables (GRDP per capita, Total Population, Area, and Population Density). The study's outcomes are expected to offer recommendations to policymakers aimed at stimulating economic growth by alleviating the binding constraint to investment.

The rest of the paper proceeds as follows. First, we briefly review the growth diagnostics method. Second, we present our hierarchical-cluster benchmarking methodology result. Third, we report diagnostic tests and identify the key binding constraint; and the last section discusses policy implications and conclusion.

METHOD

The primary objective of this study is to identify the reasons behind the sluggish economic growth of North Sumatra, which has been hovering around 5% annually. This section discusses a methodology to address the research question by employing the HRV framework. The growth diagnostic approach is based on the idea that there are many reasons for not growing, but each reason results in a set of symptoms (Hausmann et al., 2008). These symptoms then form the basis for conducting differential diagnostics so as to distinguish between various potential explanations for economic growth.

Growth Diagnostics

Hausmann, Rodrik, and Velasco (hereafter HRV) propose an approach to look at the potential barriers to growth in a situation in order to derive a policy prioritization strategy. The policy prioritization strategy is obtained by focusing on solving the most binding constraint. HRV develops a framework where the main growth problem of an economy stems from low levels of private investment and it is assumed that private investment is the sole source of growth. The HRV analysis uses a systematic approach with a growth diagnostic tree model from the top down to identify potential symptoms that could explain low levels of private investment. The analysis asks whether the cause of binding constraints is due to low rates of return on economic activity or high costs of finance. Then, when binding constraints are caused by low rates of return, it is further explored whether they are caused by social rates of return (such as geographical aspects, human capital or infrastructure) or difficulties for the private sector to ensure a return on investment due to government or market failures. Meanwhile, if the problem lies in the high cost of finance, it needs to be explored whether this is the result of low savings or a poor financial system where the intermediation function is not efficient. To identify the most binding constraints, it is necessary to go through an iterative process: diagnostic of growth itself against all these factors (Agustiana et al. 2011).

Further, Hausmann, Rodrik, and Velasco (2005) explain that no single test or symptom can definitively distinguish between potentially self-binding boundaries. Therefore, diagnostic assessments require the application of multiple tests aggregated and combined within a framework. The outcome of a set of tests will increase the likelihood that a particular boundary or set of boundaries is binding. Duc and Van (2016) outline four key principles for identifying growth constraints in an economy. Firstly, growth constraints have a relatively high shadow price. Secondly, a change in a constraint should result in a significant shift in the objective function, such as private investment. Thirdly, there must be clear indications that economic entities are actively seeking to overcome these constraints on their own. Fourth, economic entities that possess an advantage in relation to constrictions that limit activity will ultimately grow rapidly and outstrip their competitors.

Growth diagnostics can be done through three approaches: cross-country growth regression, growth accounting, and international benchmarks (Hausmann et al., 2008). Cross-country regressions, while useful for identifying average correlations and providing quantitative estimates across diverse variables, are significantly limited by issues such as endogeneity, omitted-variable bias, outliers, and parameter heterogeneity, which can compromise the validity of policy inferences. Growth accounting excels at decomposing growth into factor accumulation and a TFP residual, but its reliance on potentially unrealistic assumptions (constant returns, perfect competition), coupled with challenges in capital measurement and the accumulation of errors in the residual, reduces confidence in its results; moreover, and crucially, it lacks diagnostic power as the decomposition components are interdependent and do not explain the root causes of low accumulation or TFP. International benchmarking offers comparative performance feedback and can be a valuable data source when used cautiously; however, its indicators often oversimplify complex realities, and its application to identifying binding constraints is problematic due to issues like flawed index construction and the difficulty in inferring bottlenecks solely from relative rankings. Given these limitations, this study adopts a benchmarking strategy, arguing it avoids the restrictive assumptions and econometric pitfalls of

regressions, provides clearer, policy-relevant insights than growth accounting, and directly aligns with the Growth Diagnostics framework's objective of identifying binding constraints in a specific context.

Benchmarking economic performance is one way to identify factors inhibiting investment and economic activity. In making comparisons, the comparison group should consist of countries that have similar characteristics to the country being analyzed. This comparison group should also include countries that are performing well in the region (as well as regional averages and income groups) to see in what dimensions they differ from the country under study. However, the comparison group may vary depending on the question that needs to be answered. Benchmarking for growth diagnostics has limitations and should be used with caution alongside other methods to explain growth bottlenecks. For example, comparisons are meaningful only if indicators are constructed following consistent procedures across countries, and changes in the set of comparator countries for an indicator may alter the conclusions of the comparison. Furthermore, evidence that a country ranks low on a particular indicator does not imply that the region is a 'binding' constraint to growth - it is only an indication that this may be the case. There may be worse constraints that are binding, or the economic structure in a particular study country is not sensitive to such potential constraints (Lundstrom and Garrido 2010). Khan (2011) summarize a simple five-step process to do growth diagnostics analysis: formulation of the research inquiry; assemble a relevant set of comparators; employ diverse data gathering method; identify constraints revealed through compare the comparator; and conduct in-depth analyses of constraints to derive policy suggestions.

Regional Benchmarking Selection

The implementation of growth diagnostics at the subnational (or provincial) level requires an adapted methodological framework from the original growth diagnostics framework. To conduct growth diagnostics at the provincial level can be done through a comparative benchmark approach between regions. This study uses a benchmark approach that is conducted with certain criteria. Determination of criteria for regions/countries used as benchmarks has been carried out in various studies related to growth diagnostics (Anderson et al. 2013; Goldstein et al. 2023; Hausmann et al. 2019; O'brien et al. 2022; Sydykova and Rodriguez 2018; Davidson et al. 2014; Oliver et al. 2019).

Anderson et al. (2013) formulated the Indonesia comparator for the inclusive economic growth study using similar levels of development, geography, population and per capita income. Goldstein et al. (2023) also formulated a comparator using similar indicators of geography, agriculture, and climatic characteristics for the Colombia study. Along the same lines, O'brien et al. (2022) selected comparable countries for Jordan based on the similarity of the countries' economic characteristics, namely population size, GDP per capita and export composition. While in the previous study by Hausmann et al. (2019) used middle income countries in the Middle East and North Africa (MENA) as Jordan's comparator. Sydykova and Rodriguez (2018) used countries included in the Commonwealth of Independent States (CIS) countries as Kyrgyztan's comparison countries based on the criteria of (a) similarity in the level of economic development, where all of them are in the group of developing countries; (b) geographical similarity that is landlocked; (c) and similarity of former Soviet Republics that have similar historical, economic and political backgrounds. Meanwhile, for Armenia, which is also a CIS country like Kyrgyzstan, Oliver et al. (2019) formulated comparison countries using historical, political, and geographical balance criteria. In addition, middle-income country averages are included where possible to provide a common benchmark. Sometimes, a selection of specialized comparators is used to run specific tests.

To make a firm standing on peer countries selection of Bangladesh, Davidson et al. (2014) use cluster analysis approach using a criterion of similar socioeconomic characteristics, including geography, per capita income, and trade. Based on previous studies, to select comparable regions in North Sumatra, we can use GRDP per capita data as a proxy for similarity in economic development, Total Population as a proxy for similarity in demographic characteristics, and

Area as a proxy for similarity in geography. Meanwhile, population density is added because it is a reflection of indicators to detect the level of regional development. This study uses secondary data in 2022, covering 34 provinces, and use cluster approach to determine the comparable areas to be used as benchmarks.

The purpose of cluster analysis is to identify and group similar objects according to selected variables Řezanková (2014). In general, cluster analysis is divided into two methods: hierarchical methods and non-hierarchical methods. The cluster analysis used in this study uses the hierarchical method, which is a structured grouping based on the similarity of properties and the number of desired groups is not yet known. The hierarchical method is divided into two, namely the agglomerative or merging method and the diffuse or separation method (Fathia, Rahmawati, and Tarno 2016).

This study uses the Ward Hierarchical Method which is an agglomerative method that minimizes the variation between objects in a cluster. The results of clustering with this method can be presented in the form of a dendrogram. Dendrogram is a visual representation of cluster analysis that shows clusters formed (Cahyoningtyas 2019). There are two assumptions that must be met in conducting cluster analysis, i.e, the sample used represents the population and no multicollinearity. Multicollinearity is a linear relationship between independent variables. To determine the presence or absence of multicollinearity using the VIF (Variance Inflation Factor) value. If the VIF value of a variable has a value of more than 10, it can be concluded that multicollinearity occurs.

RESULT AND DISCUSSION

Regional Benchmarking Results

In order to determine the peer province based on the similarity of GRDP per capita, Total Population, Area, and Population Density, a multicollinearity test is performed to determine the linear relationship between these variables. Based on the results of the multicollinearity test, it is concluded that there is no multicollinearity between the variables. Therefore, these variables can be used in the cluster analysis.

Table 1. Multicollinearity Test Result

	VIF
(Constant)	
Total Population	1.023
Area	1.049
Population Density	1.063

Source: Author's calculation, 2023

Next, cluster analysis was carried out using the Ward Hierarchical Method. Based on the analysis using these 4 (four) variables, 8 (eight) clusters were formed as shown in Table 1. Based on Table 1, it can be concluded that North Sumatra is included in cluster 6, which has characteristics comparable to North Kalimantan, Riau, South Sumatra and West Papua.

North Sumatra Economy

North Sumatra's economy experienced a good recovery after the 1998 crisis, growing at an average rate of 4.8% during 2001-2004. North Sumatra's economy experienced accelerated growth in 2005-2009, with average growth reaching 6.0%. However, in past decade, North Sumatra's economic growth was slower. In 2011-2022, North Sumatra's growth (4.7%) was better than Riau (2.6%) and West Papua (3.5%), but lower than South Sumatra (4.9%) and North Kalimantan (5.6%). On the expenditure side, domestic demand, especially private consumption and investment, contributed to economic growth. The contribution of private consumption to economic growth in North Sumatra was relatively stable in the range of 2.2% - 2.4%, while the contribution of investment showed a declining trend.

Table 2. Clustering of Provinces Using the Ward Hierarchical Method

Cluster	Province
1	Bangka Belitung Island; North Sulawesi; Banten; Bali; DI Yogyakarta; Bengkulu; West Sulawesi; West Nusa Tenggara; Gorontalo; Riau Island
2	West Java; Central Java; East Java
3	Jambi; South Sulawesi; Central Sulawesi; Southeast Sulawesi; South Kalimantan; West Sumatra; North Maluku; Lampung; Maluku; East Nusa Tenggara; Aceh
4	DKI Jakarta
5	Central Kalimantan; West Kalimantan
6	North Kalimantan; Riau; South Sumatra; North Sumatra; West Papua
7	East Kalimantan
8	Papua

Source: Author's calculation, 2023

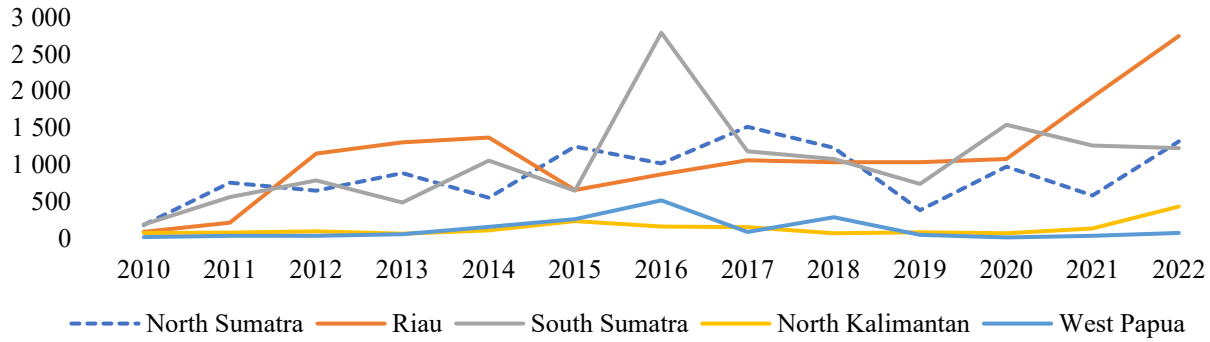
Contrary to the declining contribution of investment, the flow of foreign direct investment (FDI) experienced an increasing trend and is in a relatively good position compared to peer regions. In terms of structure, North Sumatra's FDI flows are concentrated in the primary and utility sectors, namely mining, food crops, plantations and livestock, as well as electricity and gas. Meanwhile, North Sumatra's FDI flows to the industrial sector are relatively low.

The role of external demand (exports, imports and net exports between regions) is relatively volatile. Fluctuations in external demand, especially exports, are closely related to the export structure of North Sumatra. Based on the 1-digit Standard International Trade Classification (SITC) classification, the export structure of North Sumatra is dominated by the vegetable/animal oils and fats export group with CPO as the main product. Fluctuations in CPO prices at the global level have a significant impact on fluctuations in external demand in North Sumatra. Meanwhile, the role of the export group of industrial products in the export of foreign goods has a relatively downward trend, indicating the lack of development of processing industry in North Sumatra Province. In terms of sector, economic growth was driven by agriculture, manufacture, and services, especially trade.

Table 3. Sources of Economic Growth in North Sumatra on the Expenditure Side 2011-2022

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Household Consumption	2.4	2.5	2.6	2.7	2.4	2.5	2.6	3.0	2.2	-1.4	0.8	2.3
NPISHs Consumption	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Government Expenditure	0.4	0.4	0.3	0.2	0.2	0.0	0.4	0.4	0.0	-0.1	0.2	-0.2
Gross Fixed Capital Formation	1.8	2.6	1.6	0.9	1.1	1.4	1.5	1.8	2.4	-0.4	1.0	1.2
Inventory Changes	-2.4	0.8	-0.2	0.8	0.3	-0.7	-0.2	0.3	0.1	0.5	-0.1	0.2
Export of Goods and Services	4.7	-2.1	0.7	-0.3	-0.5	-0.9	3.1	1.2	-1.9	-1.1	4.6	0.6
Import of Goods and Services	-2.2	-0.4	-0.7	-1.0	1.6	0.2	-1.3	-2.8	1.2	1.9	-1.6	-1.3
Inter-Regional Net Exports	2.0	2.7	1.7	1.8	-0.1	2.6	-1.0	1.2	1.2	-0.4	-2.4	2.0
GRDP	**6.7**	**6.4**	**6.1**	**5.2**	**5.1**	**5.2**	**5.1**	**5.2**	**5.2**	**-1.1**	**2.6**	**4.7**

Source: BPS, Author's calculation, 2023



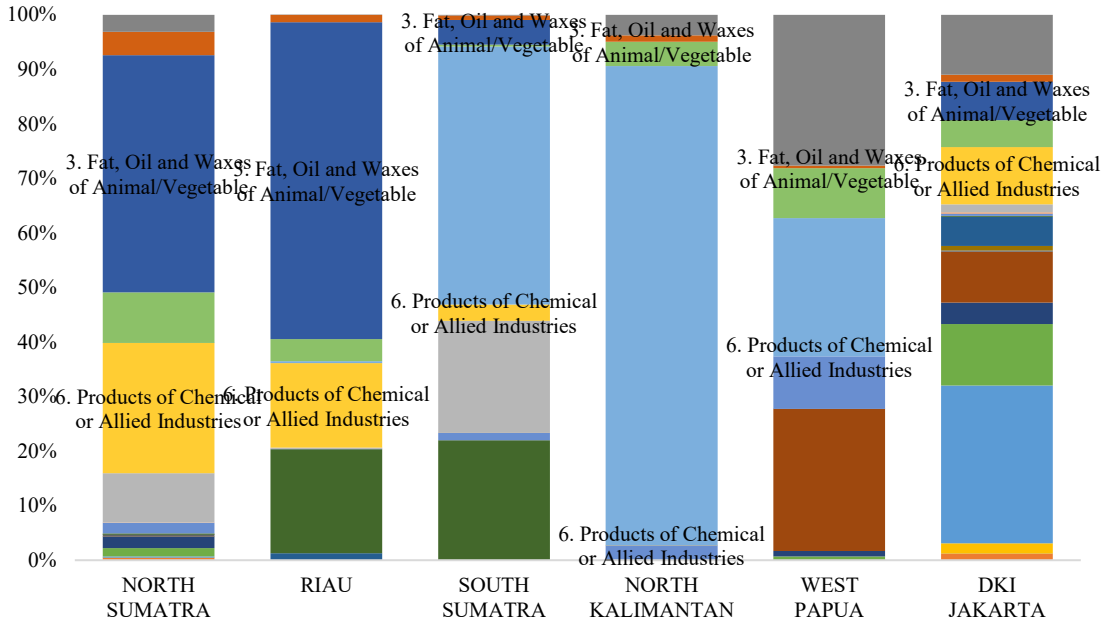
Source: NSWI, BKPM (2023)

Figure 2. Development of Foreign Direct Investment 2010-2022 (in Million USD)

A study by (Hariyanti and Ariesta Utha 2016) also reveals that the trade, hotel, restaurant, and services sectors occupy the leading sector position. The contribution of agriculture and trade to economic growth during 2011-2022 has remained relatively stable, while the contribution of manufacturing has declined, in line with the declining role of exports of industrial products to total exports. However, a countervailing trend emerges in the increasing contribution of tourism-related sectors, such as food and beverage, accommodation, and transportation. This growth signifies a nascent structural shift towards an agricultural-services economy, with economic growth significantly influenced by such structural transformations (Andriansyah, Nurwanda, and Rifai 2023). The critical aspect of this transition lies in the potential for productivity gains within the emerging sectors, ultimately determining its positive impact on overall economic growth.

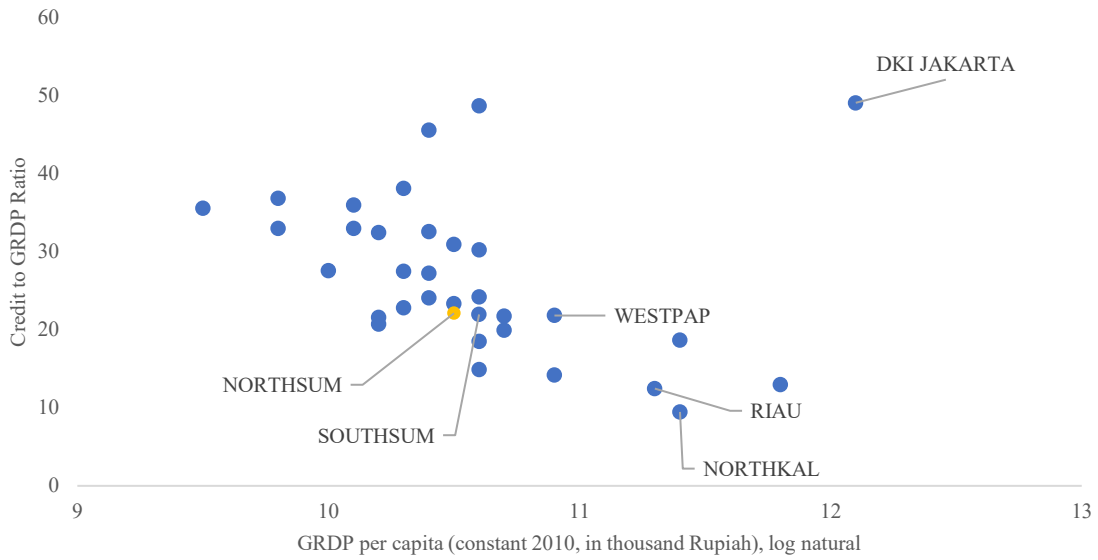
Access to Finance

The diagnostic analysis of HRV growth starts with determining whether there are financing constraints. To check this, one can look at the ratio of credit to GRDP by plotting the variable against GRDP per capita, as done by (The World Bank 2009). The ratio of credit to GRDP in North Sumatra is relatively high compared to the peer regions, but relatively low compared to all provinces in Indonesia.



Source: Statistik Ekonomi dan Keuangan Daerah Bank Indonesia (2023)

Figure 3. Export Structure of North Sumatra and Comparable Regions 2022 by 21 HS Groups



Source: BPS and Bank Indonesia, author's calculation (2023)

Figure 4. Ratio of Credit to GRDP in Indonesian Provinces 2022

During 2019-2022, the ratio of investment loans and working capital loans in North Sumatra province was the highest among peer regions. This reflects the relatively high level of credit demand, especially for investment activities. However, this does not mean that financing is not a constraining factor for growth given that there are other regions that have a higher portion of credit such as DKI Jakarta. Symptoms of a lack of financing can be reflected in high interest rates as in the study of (Duc and Van 2016). However, at the provincial level, the interest rate data refers to the interest rates that apply nationally to various banks. As a proxy, the real interest rate can be calculated by subtracting the interest rate based on the average base rate of corporate, retail, and micro loans obtained from OJK with inflation. Provincial level inflation data is also not available because the cost-of-living survey is not conducted in all cities, but as a proxy for provincial inflation, a weighted average of each city in a province can be used using weights according to the base year of the consumer price index, illustrates the results of data processing where, compared to peer regions, North Sumatra's real interest rates are relatively low reflecting low investment costs. This is due to the stable inflation in North Sumatra. The next test is to find the elasticity of private investment rate to interest rate. (Duc and Van 2016) explained that when private investment is elastic to the interest rate, growth constraints tend to be on the supply side. Furthermore (Loh, Tampubolon, and Sihol Nababan 2021) also found that financial development has important role on North Sumatra's economic growth. Thus, local government should pay attention of financial institutions such as banking network and rural bank.

Conversely, if the constraint is on the demand side, changes in the interest rate have little effect on the level of investment. North Sumatra's investment is elastic in the normal period (2019 and 2022) meaning that there are indications that the problem is on the supply side. The credit supply side can be seen from the Third-Party Funds (DPK) available in banks and access to financing. Hence, North Sumatra's average deposits are the highest among the peer regions at 32.3%, followed by West Papua (20.3%), South Sumatra (19.4%), North Kalimantan (13.2%) and Riau (10.4%). North Sumatra's high average deposits are reinforced by access to finance where the number of bank offices per 1 million population is high at around 97, which is better than Riau (92) and South Sumatra (67). Another finding from the data is there are no credit restrictions on banks in North Sumatra.

Table 4. Ratio of Investment Credit and Working Capital Credit to GRDP and Total Credit

Province	Ratio of Investment Credit and Working Capital Credit to GRDP				Ratio of Investment Credit and Working Capital Credit to Total Kredit			
	2019	2020	2021	2022	2019	2020	2021	2022
North Sumatra	20.7	19.9	19.4	18.6	46.6	45.4	46.8	45.0
Riau	9.8	10.6	9.7	10.3	27.6	30.3	30.0	31.5
South Sumatra	19.4	18.1	17.5	16.6	40.8	38.8	43.3	41.7
North Kalimantan	6.3	6.0	7.3	6.5	38.6	34.8	29.8	32.7
West Papua	15.0	14.7	14.0	12.7	28.4	28.2	26.7	27.8
DKI Jakarta	55.2	51.7	50.1	52.0	53.6	52.7	54.4	54.9

Source: BPS, Bank Indonesia, author's calculation (2023)

The sectoral allocation of investment and working capital loans is skewed towards sectors that contribute highly to North Sumatra's economy such as agriculture and manufacturing. This is an indication that businesses want to make large investments into sectors that have the potential to be developed in the future. (Table 5)

Supply, cost, and access to financial resources are not major constraints to private investment in North Sumatra. The ratio of credit to GDP in North Sumatra is the highest among peer regions, but still quite far from the developed province of DKI Jakarta, which may be due to lack of demand rather than lack of access. In terms of the allocation of investment and working capital loans, conditions are better than in comparable regions. On the other hand, although real interest rates are low, the sensitivity of changes in investment to changes in interest rates is high. Furthermore, the high deposits and availability of banks in North Sumatra suggest that banks are already performing an adequate role as financial intermediaries.

Availability and cost of human resources

The relationship between education and economic growth in Indonesia had been assessed in several studies (Reza and Widodo 2013; Febriaty, Koto, and Rahayu 2019). At the national level, Reza and Widodo (2013) found a statistically significant positive relationship between education per worker and economic growth. Their panel model estimates suggest that a 1% increase in average education per worker is associated with approximately a 1.56% increase in output. Further at provincial level, specifically North Sumatra, Febriaty, Koto, and Rahayu (2019) found that the level of education has a positive and significant impact on the Economy of North Sumatra.

Meanwhile, the availability of labor in North Sumatra is relatively high, especially for low-skilled workers, this is reflected in the unemployment rate (UR) at the junior high school level and below in North Sumatra Province has a relatively higher percentage compared to its comparable regions.

Table 5. Real Interest Rate and Elasticity of Investment to Real Interest Rate

Province	Real Interest Rate				Elasticity of Investment to Real Interest Rate			
	2019	2020	2021	2022	2019	2020	2021	2022
North Sumatra	7.3	9.1	6.0	3.9	1.1	-0.1	0.6	1.0
Riau	7.6	8.6	6.1	3.2	0.3	-0.2	0.6	1.8
South Sumatra	6.7	9.5	5.9	4.1	0.3	0.1	-0.5	-0.6
North Kalimantan	7.7	9.7	5.0	5.3	0.9	-0.3	0.1	0.4
West Papua	6.0	10.3	4.2	6.2	1.0	-0.4	-0.2	-1.4
DKI Jakarta	5.7	9.5	6.2	5.8	0.2	-0.7	0.2	0.8

Source: BPS, Bank Indonesia, author's calculation (2023)

Table 6. Unemployment Rate by Education, Average Wage and Provincial Minimum Wage 2022

	Unemployment Rate (%)				Average Wage and Provincial Minimum Wage (Rupiah)	
	Junior High School and Below	High School	Diploma 1/2/3	University	Average Wages August 2022	Provincial Minimum Wage 2022
North Sumatra	4.86	7.52	5.72	6.37	2 576 442	2 522 610
Riau	2.19	7.03	6.48	5.23	2 889 691	2 938 564
South Sumatra	2.10	8.82	8.41	5.87	2 630 695	3 144 446
North Kalimantan	4.07	5.33	1.50	3.47	3 427 759	3 016 738
West Papua	2.12	8.50	5.96	7.98	3 283 235	3 200 000
DKI Jakarta	5.19	9.17	3.42	5.55	5 255 824	4 641 854
Indonesia	**4.33**	**8.89**	**4.59**	**4.80**	**3 070 756**	**2 729 463**

Source: BPS, author's calculation

Meanwhile, the availability of high-skilled labor is also relatively high as reflected by the UR at the University level in North Sumatra Province has a higher percentage than Riau, South Sumatra, North Kalimantan, and even the National. The cost of employing labor as reflected in the average labor wage in North Sumatra Province is relatively lower than in comparable regions. This low cost is indicated by the Provincial Minimum Wage in 2022 of IDR 2 522 610 and the average monthly labor wage of IDR 2 576 442 (Table 6).

In addition to unemployment and wages, another indicator of labor scarcity can be shown by the rate of return to education. Purnastuti et al. (2015) study on the returns to education in Indonesia reveal a relatively low magnitude compared to other Asian and even less developed countries. To explore this at the provincial level, Agustiana et al. (2011) suggest that return to education could be reflected in the wages enjoyed by those with lower education. A high rate of return means that firms must pay higher wages to employ skilled workers. In 2022, the wages of skilled workers with a bachelor's degree are 65.4 per cent higher than the wages of workers with less education. This rate of return is lower than South Sumatra, DKI Jakarta, and Indonesia suggesting that the skilled labor market in North Sumatra is not yet saturated which means firms can hire skilled workers without making significant wage increases (Table 7).

Infrastructure

Infrastructure development, while generally associated with short-term economic growth, can exhibit diverse impacts on regional economies.

Table 7. Rate of Return to Education 2022

	High school vs Lower education	High school and above vs Lower education	University vs Lower education
North Sumatra	39.9	49.8	65.4
Riau	45.4	52.8	60.7
South Sumatra	54.1	64.6	80.5
North Kalimantan	49.0	49.7	51.6
West Papua	24.5	28.3	28.0
DKI Jakarta	88.3	127.4	188.5
Indonesia	**70.1**	**93.0**	**112.7**

Source: BPS, author's calculation (2023

These variations are observed not only in terms of quantitative measures like economic growth but also in qualitative aspects like human development and regional competitiveness (Frida Sebayang and Karolina Sebayang 2020).Growth diagnosis study conducted by Bappenas (2020) concluded that infrastructure, especially connectivity, remains a major constraint to Indonesia's economic growth. The government's efforts to improve infrastructure have halted the decline in the capital stock but not enough to restore the infrastructure capital stock to a level on par with other countries. Further, Wahyudi et al. (2023) and Sari (2020) conducted investigations highlighting the effect of several infrastructure indicators on economic growth in Sumatran provinces. Specifically, they found that greater variability in the length road in good and average condition, along with increased electricity consumption, airports, irrigation infrastructure, and the availability of school buildings, were all associated with enhanced economic performance. Specifically, Andy et al. (2019) found a positive impact of infrastructure on economic growth in North Sumatra, especially road infrastructure.

The recent data of North Sumatra Recent data show that North Sumatra has a steady road condition that is not much different from the condition of Indonesia and better than its peer regions. Apart from roads, the condition of North Sumatra's infrastructure is generally better than the national infrastructure and comparable regions. This is supported by the findings of Widayanto et al. (2023) who conducted a study on the 2022 Regional Competitiveness Index. Supporting components, especially the infrastructure pillar, which includes data on road connectivity, road infrastructure quality, proportion of the number of railway stations, proportion of the number of airports, proportion of the number of harbors, electrification ratio, electricity energy losses, decent drinking water, and water loss rate, in North Sumatra province is recorded higher than both peer provinces and the national level. In addition, household access to infrastructure, including sources of lighting from electricity, proper sanitation and sources of safe drinking water, was recorded high and above national achievements.

The findings of McCulloch and Zileviciute (2017) underscore the critical role of adequate and reliable electricity access for economic development in many developing nations. Their comprehensive review reveals that over 40% of existing research identifies electricity shortages as a binding constraint to growth. In North Sumatra, electricity quality still needs to be improved. Outages in the distribution network felt by customers, including those caused by disruptions or maintenance on the generation and transmission sides in the North Sumatra Regional Unit (*Unit Induk Wilayah*-UIW) are still high compared to the national level but much better than comparable regions. This is reflected in the System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) which indicate the length of outages and the frequency of outages.

Table 8. Infrastructure Conditions in North Sumatra and Peer Regions 2022

Province	Percent Good Roads				Lighting Source from Electricity	Access to Adequate Sanitation	Access to Drinking Water
	National	Province	District	Total			
North Sumatra	91.5	76.4	58.4	62.3	99.5	82.3	92.1
Riau	91.5	63.0	60.0	62.1	99.1	84.1	90.1
South Sumatra	94.5	93.9	52.8	59.7	99.6	78.6	86.4
North Kalimantan	91.2	15.0	41.0	42.9	99.3	82.2	90.0
West Papua	77.6	66.0	39.0	48.3	99.3	78.9	79.0
DKI Jakarta	92.2	72.0	60.8	64.7	99.4	80.9	91.1

Source: Open Data PUPR, Kemenpupr (2023) and BPS, author's calculation

Table 9. Comparison of SAIDI and SAIFI of North Sumatra Province and Peer Regions 2022

	SAIDI (Hours/Customer)	SAIFI (Times/Customer)
UIW North Sumatra	9.37	6.89
UIW Riau and Riau Island	9.75	6.29
UIW South Sumatra, Jambi and Bengkulu	13.05	7.47
UIW East Kalimantan dan North Kalimantan	9.57	9.03
UIW Papua dan West Papua	13.46	10.27
***Unit Induk Daerah* (UID) Greater Jakarta**	0.6	0.8
Indonesia	**7.72**	**5.62**

Source: *Statistik* PLN 2022, PT PLN Persero (2023)

Other notable infrastructure, digital connectivity, can be analyzed through the availability of Base Transceiver Station (BTS) towers and the use of internet facilities at village offices in North Sumatra Province is relatively higher than in comparable regions (

Table **10**).

Overall, the condition of infrastructure in North Sumatra is relatively better than in comparable regions and nationally. In addition, digital connectivity on the internet network is not an issue in North Sumatra Province. This suggests that infrastructure is not a major constraint to investment and growth in North Sumatra. However, an increase in infrastructure stock is needed in order to catch up with better economic levels such as in Jakarta.

Geographical Conditions

North Sumatra Province has an area of 72,981.23 km^2 and consists of coastal areas, lowlands, highlands, and the Bukit Barisan Mountain range that runs down the middle from north to south. North Sumatra Province also has a very strategic geo-economic position towards the Strait of Malacca which is an international trade traffic route close to Singapore, Malaysia and Thailand. Hill, Resosudarmo, and Vidyattama (2008) highlight a potential causal relationship between a region's integration into the global economic system and its economic prosperity, suggesting that enhanced global connectedness fosters superior economic outcomes. The inauguration of the Sei Mangkei Special Economic Zone (SEZ) in 2015 is also one of the strategies to strengthen North Sumatra as an international hub, where this SEZ is focused on the development of the palm oil and rubber processing industry connected to the Kuala Tanjung Port. The construction of the Trans Sumatra toll road, which is currently still running, can also facilitate connectivity between regions that can facilitate economic activities, business and investment to run smoothly. Thus, suggests that geographical condition is not a constraint to investment and growth in North Sumatra.

Macroeconomic Risk

The macroeconomic conditions of North Sumatra cannot be separated from the macroeconomic conditions of Indonesia. Indonesia has relatively stable macro conditions. An analysis of Indonesian macroeconomic policy trends from 2000 to 2021 reveals a focus on maintaining economic stability, enhancing competitiveness, and navigating global challenges. This stability is underpinned by diverse policy tools, including fiscal and monetary instruments, each impacting inflation differently. Key variables like interest rates, investment levels, exports, GDP, and inflation serve as crucial indicators of the country's economic health (Siregar et al. 2023). Further, during 2015-2019, the stability of Indonesia's macroeconomic condition marked by an annual average of (a) real GDP growing at 5.0 per cent, (b) debt-to-GDP ratio maintained at 35.4 per cent, and (c) foreign exchange reserves averaging $117.0 billion equivalent to 7.4 months of imports and government external debt payments and balance of payments maintained at -2.3 per cent of GDP.

Table 10. Number of Villages with Base Transceiver Station (BTS) Towers in North Sumatra and Peer Regions 2019-2021.

Province	Urban			Rural			Urban + Rural		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
North Sumatra	774	809	814	1,659	1,758	1,811	2,433	2,567	2,625
Riau	227	233	235	881	987	1,028	1,108	1,220	1,263
South Sumatra	265	276	279	1,133	1,173	1,222	1,398	1,449	1,501
North Kalimantan	30	29	29	167	181	187	197	210	216
West Papua	52	60	58	219	336	374	271	396	432

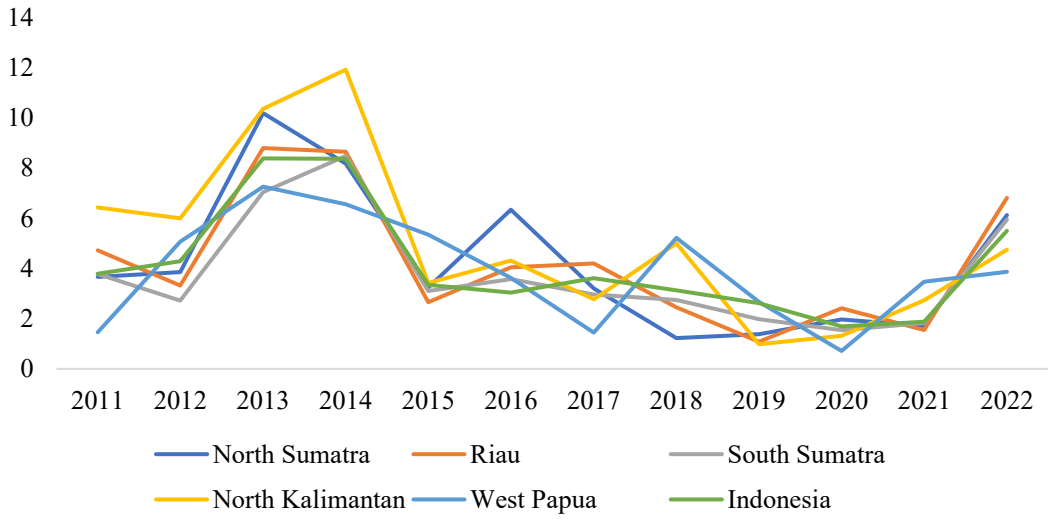
Source: *Pendataan Potensi Desa Mini*, BPS (2022)

Given these conditions, macroeconomic risks are not a drag on growth in Indonesia, which is in line with the findings of Bappenas (2020) that macroeconomic conditions are relatively stable and supportive of business, although there are some risks related to the external balance, especially related to the high current account deficit.

Beyond national macroeconomic stability, sustained inflation at the provincial level plays a crucial role in fostering a conducive environment for economic activity. Inflationary conditions affect business investment decisions because they reflect various levels of implicit taxes, and can affect the real interest rate that the business sector has to pay (Agustiana et al. 2011). Inflation in North Sumatra was higher than in peer regions and Indonesia during the period 2012-2017. A Study by Irawati, Wibowo, and Ayu (2019) identified positive associations between the prices of rice, red chilies, and onions and the inflation rate in North Sumatra Province. Since 2018 until now, this price fluctuation have been relatively controlled and is below that of Indonesia and peer regions. Thus, the inflation differential between North Sumatra and its peer regions and Indonesia is not a constraint to investment and growth (Source: BPS, author's calculation (2023)

Figure 5).

In addition to inflation, government spending plays a crucial role in North Sumatra's economic growth, significantly impacting both short- and long-term performance (Rohimah, Tanjung, and Pulungan 2020). This finding highlights the need for policy shifts towards increased capital expenditure for development. Data in Table 11 indicates that currently, personnel and operational costs dominate regional budgets in North Sumatra and similar regions. To maximize economic stimulation, policymakers should consider strategies to re-allocate resources towards crucial capital investments.



Source: BPS, author's calculation (2023)

Figure 5. Inflation in North Sumatra, Indonesia, and Comparable Regions 2011-2022 (%)

Table 11. Regional Revenue and Expenditure Structure of North Sumatra and Peer Regions 2022

Province	Percent Regional Revenue			Percent Regional Expenditure			
	Local Revenue	Transfers to Regions and Village Funds	Other Revenue	Employee Expenditure	Goods & Services Expenditure	Capital Expenditure	Other Expenditure
North Sumatra	24.1	69.5	6.4	35.3	26.6	16.6	21.5
Riau	25.1	69.0	5.9	32.9	32.6	16.1	18.4
South Sumatra	19.9	70.6	9.5	30.5	26.3	22.0	21.2
North Kalimantan	14.1	81.1	4.8	33.4	28.7	17.8	20.2
West Papua	5.1	91.3	3.6	19.9	28.8	25.6	25.7
DKI Jakarta	72.5	27.2	0.3	28.1	37.7	13.3	20.9

Source: Portal SIKD, DJPK, Kemenkeu (2023), author's calculation

On the other hand, government had another role (i.e. the ability of government to generate revenue). Azizah, Sirojuzilam, and Amalia Fachrudin (2022) identified a statistically significant joint effect of all government revenue (Local Revenue (*Pendapatan Asli Daerah* – PAD), Transfers to Regions and Village Funds (i.e. *Dana Alokasi Umum* – DAU, *Dana Alokasi Khusus* – DAK, and *Dana Bagi Hasil* – DBH) on economic growth. Meanwhile, although all regions in Indonesia have a high dependence on transfer funds from the government (except DKI Jakarta), North Sumatra's dependence is relatively low compared to peer regions. This condition makes North Sumatra have a higher opportunity to support regional development through the receipt of local revenue (PAD) (Table 11).

Overall, macroeconomic conditions in North Sumatra are relatively stable, characterized by a stable national economy followed by a manageable inflation rate in North Sumatra and fiscal dependence on the central government that is relatively better than peer regions. This suggests that macroeconomic risks are not a major constraint to investment and growth in North Sumatra. However, it is necessary to increase the role of local government, especially through increased capital expenditure.

Microeconomic Risk

Aspects of the business environment can result in barriers to higher investment and economic growth. In the last decade, Indonesia has continued to make efforts to organize the acceleration of business services, which since 2018 has been issued PP No. 24 of 2018 concerning the Electronic-Based Integrated Licensing Service System (Online Single Submission (OSS) System). Study from Komite Pemantauan Pelaksanaan Otonomi Daerah–KPPOD (2019) on the implementation of OSS in the Regions found that there is still regulatory disharmony regarding the authority to issue businesses, system constraints related to business locations that are not yet synchronized with the Regional Spatial Plan (RTRW) and the lack of integration of OSS with the licensing service system of sector and regional Ministries/Institutions, as well as aspects of governance including differences in understanding between the Regional Government and Vertical Agencies. Furthermore, the findings in the North Sumatra Province area (covering Deli Serdang Regency and Samosir Regency) are that for Deli Serdang Regency, the SRIDELI system has not been integrated with OSS; the management of business licenses and operational/commercial licenses has not been effectively carried out through the OSS system. Meanwhile, for Toba Samosir Regency, the SIPATUPA system has not been integrated with OSS due to human resources and budget constraints to carry out the integration process, and user understanding in using OSS is still limited due to the lack of socialization from the local government.

In addition to business licenses, access to and legal certainty over land are important issues for companies to conduct business. Bachtiar (2018) study unveils a multitude of challenges plaguing

the land use system in North Sumatra. These include insecure land tenure, fragmentation and shrinking farm sizes, corruption linked to land accumulation by politically connected individuals and corporations, the displacement of farmers and underprivileged urban residents, and concerns regarding expropriation and inadequate compensation for land acquisition. Other evidence on the land issues (KPPOD 2016), specifically the aspect of access and legal certainty over land, which includes the time to obtain land certificates, the level of ease of obtaining land certificates, the level of ease of obtaining business land, the frequency and possibility of eviction of business locations, and the frequency of land allocation conflicts, places Medan in 17th place among the 32 Provincial Capitals surveyed with a score of 71.56 better than the national average (69.76), Manokwari (45.82) and Pekanbaru (40.33), but not better than Palembang (85.70). Transaction costs were also a problem in North Sumatra, in the same study, KPPOD calculated transaction costs through measuring the level of retribution objections, the existence of donations to the local government, the level of barriers to donations to the local government, and the level of barriers to security costs to the police. Medan ranked 22nd with a score of 65.45, lower than the national average (73.79), and Manokwari (75.06) but higher than Palembang (62.57) and Pekanbaru (57.36).

The high transaction costs in Indonesia are also reflected in the Corruption Perception Index released by Transparency International. Indonesia ranked 110 out of 180 in 2022. A decrease of 4 points from a score of 38/100 (2021) to 34/100 (2022) means that the government's response to corrupt practices in Indonesia tends to be slow and corruption eradication strategies and programs tend to be ineffective. Meanwhile, at the regional level, the findings of Transparency International Indonesia, (2017) related to the results of the 2017 Corruption Perception Index (CPI) conducted in 12 cities reinforces the findings of KPPOD (2017). Medan is in the lowest position with a score of 37.4 points, while North Jakarta (73.9 points); Pontianak (66.5 points); Pekanbaru (65.5 points); Balikpapan (64.3 points); Banjarmasin (63.7 points); Padang (63.1 points); Manado (62.8 points); Surabaya (61.4 points); Semarang (58.9 points); Bandung (57.9 points); and Makassar (53.4 points). It is concluded that business actors in North Jakarta assess the commitment of the local government in eradicating corruption as very good, while business actors in Medan City assess that there is still a lot of corruption.

Utilizing Transparency International Indonesia data, Nairobi (2021) found a seemingly counterintuitive positive relationship between the Corruption Perception Index (CPI) and economic growth in 16 Indonesian provinces (including North Sumatra) during the 2014-2018 period. This implies that lower perceived corruption could potentially lead to economic gains in these regions. However, this finding requires further scrutiny. Data from the Indonesian Corruption Eradication Commission (*Komisi Pemberantasan Korupsi*–KPK) in 2022 paints a different picture. North Sumatra, for instance, exhibits a corruption rate exceeding that of comparable regions, suggesting persistent corrupt practices within the province. This discrepancy highlights the complexities and potential limitations of using the CPI as a sole indicator of corruption's impact on economic performance.

Another aspect that can disrupt the business environment is the level of crime and conflict. North Sumatra Province has a high number of crimes compared to its peer regions. North Sumatra also faces a surge in agrarian conflicts fueled by privatized violence, driven by both global capitalist demands and the lingering extractive predatory state. This uncertainty benefits elite land consolidation while hindering land redistribution, pushing landless peasants towards violent land reclamation (Mudhoffir 2022).

Nairobi, Firdaus, and Afif (2021) established a negative association between crime rates and economic growth in Indonesian provinces. This finding aligns with a widely recognized principle in public policy discussions: crime negatively impacts economic performance. Its deleterious effects stem from undermining the rule of law, eroding confidence in property rights, and deterring potential investment, ultimately leading to economic decline. The adverse impact of crime is particularly pronounced in developing countries, including Indonesia, where violent crimes are more prevalent.

Table 12. Corruption Crime and Number of Villages with the Most Frequent Thefts North Sumatra and Peer Regions 2019-2021

Province	Corruption Crime by Region				Number of Villages with the Most Frequent Thefts	
	2019	2020	2021	2022	2018	2021
North Sumatra	4	9	5	6	1,790	960
Riau	4	3	30	1	920	522
South Sumatra	11	13	2	3	1,743	915
North Kalimantan					172	67
West Papua				2	100	145
DKI Jakarta	147	91	108	120	172	138

Source: KPK and *Pendataan Potensi Desa Mini*, BPS (2022)

This reinforces the notion that higher crime rates suppress economic growth, while increased investment and labor contribute to its expansion. However, initial growth patterns can be divergent, with lagging provinces experiencing slower economic progress compared to more developed counterparts.

Statistically, in 2021, the number of crimes for the Polda/Province level reported was 36,543 incidents. This figure is the highest in Indonesia and even higher than Polda Metro Jaya (DKI Jakarta and surrounding areas) with the highest type of crime being drug-related crimes (5,949 incidents) followed by crimes against property/goods in the form of theft with aggravation (4,738 incidents). (BPS 2022). In line with this, at the village level, the most prevalent crime is theft. Although the number of this crime decreased from 2018 to 2021, it still needs to be a concern because the theft rate in North Sumatra is quite high.

Market Failure

Sen and Kirkpatrick (2011) posit that market failures can arise from two key sources: information externalities that constrain firms' ability to diversify and export, and coordination failures that hinder collaboration between various economic actors. These factors can manifest in the case of North Sumatra, despite its demonstrably well-established comparative advantage in non-oil exports over the 2010-2019 period (Hardi et al., 2021).

Table 12. Regional Competitiveness Index 2022

Component	Pillar	Indonesia	North Sumatra	Riau	South Sumatra	North Kalimantan	West Papua
Supporting Environment	Institutions	4.14	3.57	4.12	4.04	4.46	3.72
	Infrastructure	2.91	3.42	2.88	2.77	2.95	3.37
	ICT Adoption	3.57	3.28	3.54	3.53	3.89	3.04
	Macroeconomic Stability	3.05	3.44	4.12	3.47	3.22	2.29
Human Resource	Health	3.76	3.67	3.92	3.75	4.00	3.42
	Skills	3.73	3.99	3.85	3.42	3.90	3.83
Market	Product Market	2.68	2.04	1.04	2.02	1.81	1.57
	Labour Market	3.73	2.98	3.26	2.76	4.71	4.63
	Financial System	2.66	2.01	2.29	2.05	2.74	1.71
	Market Size	1.31	2.13	1.73	1.18	0.30	0.21
Innovation Ecosystem	Business dynamism	5.00	5.00	5.00	5.00	5.00	5.00
	Innovation Capability	2.62	3.37	2.17	2.71	1.25	2.26
Total Score IDSD		3.26	3.24	3.16	3.06	3.19	2.92

Source: Widayanto et al., (2023)

North Sumatra's economic performance remains hampered by a limited ability to diversify its export basket. This overreliance on a single commodity, Crude Palm Oil (CPO), exposes the regional economy to significant vulnerabilities associated with CPO market fluctuations, consequently raising concerns about long-term economic stability. As Agustiana et al. (2011) further argue, the diversity of a region's export portfolio serves as a critical indicator of its capacity for innovation and adaptability. A wider range of exported commodities signifies the ability of local businesses to identify and capitalize on favorable production opportunities beyond established staples, fostering a more dynamic and resilient regional economy. While CPO dominates North Sumatra's export structure, it exhibits relative diversification compared to peer regions. This observation aligns with the findings of Widayanto et al. (2023), who found North Sumatra's innovation capability exceeding both regional and national averages (

Table **12**). This suggests a dynamic regional economy despite the challenges posed by limited product diversification.

CONCLUSION

This study focuses on analyzing barriers to investment and growth in North Sumatra Province using the growth diagnostic framework of (Hausmann, Rodrik, and Velasco 2005). The application of the HRV growth diagnostic framework in this study uses the benchmark method with the selection of comparable regions using the cluster method based on the characteristics of GRDP per capita, Total Population, Area, and Population Density so that North Sumatra becomes a cluster with North Kalimantan, Riau, South Sumatra, and West Papua. The initial assessment of the North Sumatra economy found that economic growth was relatively good compared to peer regions, the economy was driven by domestic demand, especially household consumption and investment, but the contribution of investment to the economy experienced a downward trend. For external demand, it fluctuates relatively in line with fluctuations in exports of vegetable/animal oils and fats, which are the main exports of North Sumatra. In terms of sectors, the contribution of the industrial sector to growth continues to decline while the contribution of the agricultural and service sectors, especially trade, to growth is stable. In addition, tourism-related sectors are growing. In terms of investment, FDI flows are better than peer regions but are concentrated in the primary and utilities sectors while FDI flows to the industrial sector are relatively low. The benchmark results found that government failures, especially micro risks including ease of doing business, low land access and security, high transaction costs, and high levels of corruption and crime, are the main binding constraint to investment and economic growth in South Sumatra. Meanwhile, while the sensitivity of changes in investment to changes in interest rates is high, the local finance aspect does not have enough supporting evidence to make it a constraining factor given the high demand for investment and working capital credit compared to peer regions and relatively low real interest rates.

While the growth diagnostics approach offers a valuable framework for analyzing economic constraints, its limitations regarding scientific rigor, subjectivity, oversimplified assumptions, narrow focus, and lack of context-specificity necessitate critical evaluation and potential refinement before its wider application (Merghit 2023). This study has the limitation that not all tests in the HRV growth diagnostic framework are available at the provincial level. It is possible that the results are just symptoms of growth constraints rather than the main growth constraints given that the process of finding the main growth constraints is an iterative process that fulfils the principles of the existence of shadow prices, if changes in the constraints will significantly change economic growth or investment, evidence that economic entities are trying to overcome self-binding constraints, and the existence of advantages in economic entities that can face constraints.

Based on the findings of the diagnostic analysis of North Sumatra's growth, to increase investment and economic growth, the following policy priorities can be formulated by the government: (1) Fixing government failures by lowering micro risks through: (a) Improvement and optimization of OSS implementation through harmonization of regulations related to business issuance authority,

system improvement and synchronization of business location with spatial plan, coordination of OSS system with licensing service system of sector and regional ministries/agencies, and strengthening coordination and understanding between local government and vertical agencies. (b) Improving access and certainty of land ownership includes accelerating the time to obtain land certificates, facilitating the processing of land certificates, making it easier to obtain business land, and ensuring that there is no possibility of eviction of business locations and conflicts over land allocation. (c) Re-assessing local government retribution, eliminating donations and security fees to lower transaction costs. (d) Implementation of national policy related to Integrity Zone (*Zona Integritas* - ZI) towards Corruption Free Zone (*Wilayah Bebas Korupsi* - WBK)/ Clean and Serving Bureaucracy Zone (*Wilayah Birokrasi Bersih dan* Melayani - WBBM) to reduce corruption. (e) Maintain and improve public safety especially in relation to property crime. (2) Increased lending to sectors that are the main and growing sectors in North Sumatra. (3) Improved infrastructure conditions including national roads, district/city roads, and improved electricity quality so that the length and frequency of blackouts decreased. (4) Increasing innovation and export diversity through the industrialization/downstream process of North Sumatra's main export products including the export group of vegetable / animal oils and fats.

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