

FACTORS AFFECTING INCOME INEQUALITY IN VIETNAM FROM 2010 TO 2020: EMPIRICAL EVIDENCE FROM PROVINCIAL LEVELVAN Dinh Tue Thu¹

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Abstract

This paper aims to investigate factors affecting income inequality in Vietnam. The panel random effects model (RE) analyses a balanced (but with gaps) panel dataset collected from 63 provinces from 2010 to 2020. The estimated results reveal that apart from provincial competitiveness index (PCI), all of the rest variables, which are population, average urban population, education (percentage of literate population at 15 years of age and above), employee quality (percentage of trained employed workers at age 15 and above), monthly income per capita and Gross Regional Domestic Product (GRDP) significantly impact income inequality in Vietnam. Especially, percentage of literate population of at least 15 years old and gross regional domestic product are two variables that negatively affect income inequality at the significant level of 1%. Besides, only average urban population and monthly income per capita variables have positive effect on income inequality. Based on the estimated result, there will be policies and recommendation to reduce the income gap and promote sustainable development in Vietnam.

Keywords: Inequality, GINI coefficient, provincial analysis, Panel random effects model.

JEL Codes:

1. Introduction

One of the concerns that nations all around the world consistently worry about is income inequality. It is the disparity in wealth and income between individuals, social groups, or nations. Income inequality occurs in most countries worldwide, encompassing developed and developing countries, including Vietnam.

An indicator of inequality among individuals of a country is the Gini Index. World Bank(2023) show the latest values from many countries of the World. We may notice that the lowest levels of inequality correspond to countries with Gini Index below 30. That group has more than 30 countries, including many developed European countries (Sweden, Denmark, Finland and other ones). A second group with Gini Index between 30 and 40, includes more than 50 countries. This group includes big economies of OECD and non OECD countries. Among OECD countries it includes the United States, the United Kingdom, Japan, South Korea, France, Germany, Spain and other ones. Among non OECD big economies, it includes China, India and Russian Federation. A third group of countries with Gini Index between 40 and 50 includes more than 30 countries,

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many of them in Latin America. A Fourth group with Gini Index higher 50 includes a few countries, less than 20, many of them in Africa.

In China, its current mainly market economy features a high degree of income inequality, and in particular, more than 10% of China's total inequality is attributed to the rural-urban gap. There has been a considerable decline in Latin America and the Caribbean, although levels remain high. In Africa and Asia, trends have been more varied, with more significant similarities between emerging economies or landlocked developing countries, and between rural or urban areas, than within regions.

Vietnam has experienced relatively rapid GDP growth over the years. However, its effect on the poor has been relatively reduced. In fact, the income gap between the poor and non-poor has widened. Vietnam's GINI index, ranging from 34.8 in 2014 to 36.8 in 2020, positions it within the second group with Gini Index between 30 and 40. Specifically, in the period 2016-2020, the income of population groups increased from 3.1 million VND/month/person in 2016 to 4.2 million in 2020, but the income growth rate of the poorest group is always lower than that of the richest group, so the gap between rich and poor increasingly increasing.

The rise of income inequality is a big challenge for Vietnam's sustainable and humane development process. Consequently, studying and analyzing the factors affecting income inequality is necessary. Stemming from the above issues, the authors have chosen the topic: "Factors affecting income inequality in Vietnam from 2010 to 2020: Empirical evidence from provincial level" to analyze and have a more comprehensive view of the income inequality situation in Vietnam at the provincial level and how it is affected by various elements; especially in a period when things have been changing radically from every aspect, this will give a new look onto income inequality and the way it's shaped.

The panel random effects model was used to conduct the study. In 63 Vietnamese provinces, the relationship between population, average urban population, provincial competitiveness index, education (percentage of population with literacy at age 15), employee quality (percentage of trained employed workers at age 15 and above), monthly income per capita and gross regional domestic product on GINI coefficient was examined. The results show that population has different coefficient sign from expectation. Besides, while a negative relationship exists between population and income inequality, average urban population positively impacts income inequality. Moreover, it is worth considering the result of monthly income per capita and GRDP variables as while an increase in monthly income per capita raises income inequality, GRDP negatively impacts income inequality.

The rest of this study is structured as follows. The second section briefly summarizes the key findings of previous research on income inequality, which enables the development of the various hypotheses, and presents the theoretical framework applied in this study. The third section outlines practical situation of income inequality in Vietnam. The fourth section describes empirical results and discussion. The last section providing the conclusion and policy implications to reduce the income gap in Vietnam will close this study.

1. Theoretical background and Literature review

1.1. Theoretical background

1.1.1. Kuznets model

The relationship between income inequality and economic development is often characterized by the Kuznets inverted U-shaped curve (Kuznets, 1955), which states that income inequality tends to increase in the early stages of development and then, as the economy develops, and then decrease as the economy develops, implying that income inequality will fall as income continues to rise in developing countries. In other words, from the beginning of development, countries have to accept the reality of the gap between the richest and the poorest widen over time.

Then, from the turning point, when the GDP per person increases more than the certain level, the richer we become, the lower income inequality. When we surpass the certain level of the income per person, then the income gap goes down. Many developing countries, especially Vietnam is staying in the beginning stage of the inverted U-shape curve and the inverted U-shape curve is among one of the barriers that any countries will meet during the process of development. If a country cannot deal with the barrier, that country will be stuck at the middle-income stage and we call this phenomenon as middle-income trap.

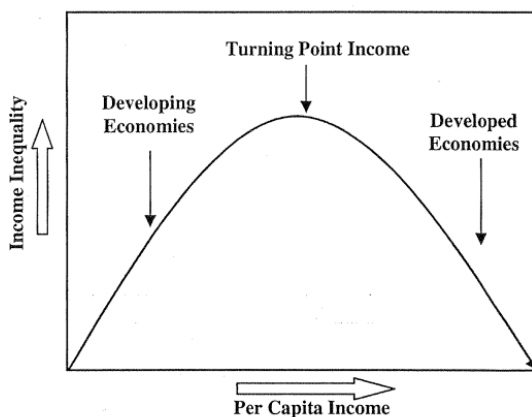


Figure 1: Kuznets inverted U-shape Curve

Source: Adapted from B. Yandle, M. Vijayaraghavan, & M. Bhattarai, The Environmental Kuznets Curve: A Primer, 2002, p. 2, Figure 1.

1.1.2. Karl Marx's theory of unequal distribution of income

When Karl Marx began to hypothesize that an economic revolution would take place, one of his main concerns was unequal income distribution. In the middle of the 19th century, when much of Europe, especially England, was well into what is frequently referred to as the Industrial Revolution, he developed his ideas. The central Marxist theory was that those with wealth would reap the benefit of this revolution and become ever more wealthy, while those who lived from their labour alone would be relegated to bare subsistence. In his view, capital accumulation and increases in productivity do not benefit those who work for a living. All the benefits go to those who control the means

of production (wealth) and supposedly do no work. In other words, a small number of people own a large part of all money and income. This led to an expanding underclass of poverty. Marx's theory was that this unequal distribution of wealth would eventually lead to a class revolution. Marx's revolution failed, but his fundamental problem remained.

In addition, his theory has been shown to be incorrect. Workers become more productive as wealth and capital rise and innovations occur, and businesses are compelled to pay higher wages to entice workers away from rival companies. Therefore, innovations and the accumulation of wealth (regardless of who owns that wealth) are not detrimental to the interests of workers but rather increase the demand for labour, raise real wages, and benefit workers.

Stiglitz and Kanbur proposition on income inequality transmission over generations

The Kaldor-Kuznets stylized facts have traditionally been the focus of growth theories. According to Joe Stiglitz and Ravi Kanbur, these are no longer true; a new theory is required. The competitive marginal productivity theories of factor returns must be dropped in favour of rent-generating mechanisms and wealth inequality by concentrating on the "rules of the game" in the new models. They must also simulate how interactions between human, financial, and physical capital affect the degree and development of inequality. Notably, the crucial element will be capturing the transmission mechanisms that pass income inequality from generation to generation.

Consider the disparities in inequality between capital income and labour income concerning the issue of income inequality. The assumption that capital income is more unequally distributed than labour income has traditionally been used to translate factor shares to interpersonal inequality. Inequality in capital ownership then translates into inequality in capital income, assuming that this inequality is much smaller than that of income from labour. In models where capital owners save and workers don't, the assumption is made in its most blatant form. Because of this, these stylized hypotheses can no longer fully account for income inequality.

Sharply increasing inequalities in labour income draw attention to disparities in human capital in its broadest sense, beginning with unequal fetus development and parental investments in early childhood, followed by unequal parental and societal investments in education, and ending with unequal returns on human capital. The disparity in parental resources is reflected in the outcomes of the children at every stage. The next generation's financial and human capital are distributed unequally due to income inequality between parents, which results from inequality of income from physical and financial capital on the one hand and inequality due to inequality of human capital on the other.

1.2. Literature review

1.2.1. Determinants of income inequality

The effects of various factors on income inequality have been examined in depth theoretically. However, empirical works have more comprehensively expanded the range of influencing factors.

Regarding to developed countries, many studies focus on the effects of macroeconomic variables (such as inflation and unemployment levels) on income distribution, like those by Mocan (1999) and Blejer and Guerro (1990). Other time-series studies investigate tax rates and how they affect income inequality, such as those by Carroll and Auten (1999) and Feenberg and Poterba (1993).

Hence, besides some typical macroeconomic factors, tax-related factors are also found to have a relationship with income inequality. Regarding to developing countries, empirical studies rely on multi-country data sets due to the limited number of time series observations, which open up new avenues for potential testing determinants of income distribution.

In studies that examine regions within a country, researchers also find out the status of income inequality; for example, Mushinski (2001) and Thornton (2001) tested Kuznets' hypothesis about inequality as an inverted U. Furthermore, numerous studies have sought to investigate the effects of a wide range of factors, such as public spending, dualism, and level of development on inequality within an international context. Some of these studies include Deininger and Squire (1998), Vanhoudt (2000) and Barro (2000).

Since many factors affect income inequality, this section will concentrate on developing hypotheses about the causes of income inequality in 63 Vietnamese provinces by reviewing the extant literature.

Population

According to Deltas (2003), a small population produced by the same stochastic process would have a lower GINI coefficient than a larger one. The question of what an appropriate level of income inequality as measured by the GINI coefficient for a country given a population size should be has not yet been addressed by the existing literature, despite empirical research looking at the relationship between income inequality and the size of the population as well as other variables. According to more recent studies, population growth increases income inequality and occupational differentiation because more extensive, more diverse economies draw both highly and low-skilled workers, creating a joint migration stream that increases inequality in both of these areas (Moller et al., 2009; Nielsen & Alderson, 1997; Parrado & Kandel, 2010; Rey, 2018; Van Heuvelen, 2018).

Urban population

Higher urbanization increases inequality, according to Nielsen and Alderson (1997) and Litwin (1998).

According to Kanbur and Zhuang's study in 2013 using the Kuznets model and Theil's index, the impact of urbanization and shifting economic structures on income inequality varies by nation. The outcome runs counter to the widely held belief that widening income gaps and rising urban inequality lead to rising income inequality. Urbanization causes inequality to increase by about 300% in the Philippines, over 50% in Indonesia, and almost 15% in India. But it lessens inequality in China. In addition, their findings show how, depending on the level of urbanization in the nation, urbanization will impact inequality in the future.

Provincial competitiveness index (PCI)

According to Liu (2004), PCI is an indicator that helps explain variations in economic performance and job creation in the province, improving that province's performance and then decreasing income inequality. The same conclusion was supported by Hong Minh (2019) and Thuy Giang (2021), which showed that PCI has a positive impact on FDI, which in turn has a positive impact on the performance of that province and can increase people's income by expanding employment opportunities and income (Chen, 2011), thereby narrowing the gap between people in terms of income. In addition, Van Duong's (2022) study shows that higher PCI creates jobs and increases economic growth, provides knowledge and experience for not only that province but also the citizens. As a result, income inequality can decrease.

Employee quality

Suna (2017) stated that by improving the quality of labour, the labor innovations and developments allow countries to make production at lower costs. The increase in factor productivity would enable lower income inequality. In other words, when workers are trained well, they can increase their working efficiency, which reduces income inequality.

Education

It is widely acknowledged that one of the best ways to reduce income inequality is through education (Toh, 1984). Education changes the labor force's makeup from unskilled to skilled. Although this process may increase income inequality at first (Chiswick, 1968), it is anticipated that it will decrease income inequality over time (Schultz, 1963). Knight and Sabot (1983) contend that the growth of education has two conflicting effects: a compression effect and a composition effect, based on their research in Tanzania and Kenya. The composition effect, which affects inequality in a way similar to Kuznets' process, is the change in the proportion of the skilled workforce. Initial inequality tends to rise as the number of skilled workers rises. However, the compression effect causes the inequality to fall after crossing a certain point.

Monthly income per capita

The relationship between income per capita and income inequality has been illustrated by Kuznets (1955) in the form of an inverted U-shape. He said that, in the initial stage of development, inequality increases with income; then, when developed to a certain extent, benefits are spread, and inequality will decrease. Lewis' model (1954) also agreed with Kuznets (1955). Lewis (1954) argued that income inequality is not only a result of economic growth but also a necessary growth condition.

Gross domestic product (GDP)

According to Kuznets' (1955) inverted U relationship theory, which predicts that inequality will initially increase as GDP grows before starting to decline, the majority of research on a country's wealth and income inequality is based on this theory. For example, panel data from the 1960s to 1990s were used by Higgins and Williamson (1999), panel data from the 1960s to 1995 were used by Clark, Xu, and Zou (2003), and similar data were used by Barro (1999). The inverted U hypothesis has received support from all of these studies. Ram (1997), on the other hand, looked at panel data for

developed countries from 1951 to 1992 and discovered an uninverted U-curve: as GDP increased, income inequality declined in the 1950s and 1960s but rose starting in the 1970s.

1.2.2. Research gap

Many studies have shown the relationship between these factors and income inequality. Existing literature on income inequality in the Vietnamese context mainly examines factors such as gross domestic product (GDP), foreign direct investment, poverty rate, gender, education level, immigration rate or unemployed population. At the same time, other studies around the world show that in addition to these factors, other determinants are worth considering, such as those relating to population, labor force quality, average income or competing capability of different regions within a country. Besides, data about Vietnam are frequently stored in tables with other countries to create panel form, and there is not much research using data at provincial level.

Therefore, this study aims to fill this research gap by using and analyzing data at provincial level from 2010 to 2020 with the stylized affecting factors such as population, labor force quality, gross regional domestic product (GRDP) and the income of people in each province itself by groups of level. Moreover, as provincial competitiveness index (PCI) can explain why some provinces and cities can outperform others in private economic development, the authors also want to examine the impact of institutional factors to clarify whether different institutional qualities can lead to the difference in income inequality among the provinces of Vietnam.

1.2.3. Comparison of regional inequality in several countries

Guisan(2021) analyses Disposal Income per capita of 372 regions from OECD countries in year 2016, and includes a table with the Coefficient of Variation, as % of Income per capita ($CV\% = \text{Standard Error} \times 100 / \text{Mean of Income per capita}$), among regions in each country. There was a small negative coefficient of correlation between level of development and regional disparity, indicating that regional inequality may diminish with development. Ten countries had CV% below 10 (Austria, Denmark, Finland, France, Japan, South Korea, Netherlands, Norway, Sweden, Switzerland). The value of CV% was 16 in the United States and all OECD countries had, in year 2016, levels of regional inequality below 34%, lower than several less developed countries that show levels of inequality much higher, even over 50%.

2. Practical situation of income inequality in Vietnam

2.1. The current status of income inequality in Vietnam from 2010 to 2020

2.1.1. Income inequality through GINI coefficient in Vietnam

Overall, Vietnam's GINI coefficient in 2010 - 2020 shows that income inequality in Vietnam did not fluctuate much in different years, except for 2020. While the GINI coefficient of the urban area had a falling pattern, the coefficient of the rural area increased and was higher than that in urban areas in most surveyed years. Moreover, the country's two largest economic regions, the Red River Delta and the Southeast are developed economic zones with significant growth rates compared to other areas.

Table 1: GINI coefficient from 2010 to 2020 by urban – rural and region

	2010	2012	2014	2016	2018	2020
Whole country	0.433	0.424	0.430	0.431	0.424	0.375
Urban – Rural						
Urban	0.402	0.385	0.397	0.391	0.372	0.330
Rural	0.395	0.399	0.398	0.408	0.407	0.373
6 regions						
Red River Delta	0.408	0.393	0.407	0.401	0.392	0.327
Northern midland and mountain areas	0.406	0.411	0.416	0.433	0.443	0.420
North Central area and Central coastal area	0.385	0.384	0.385	0.393	0.383	0.354
Central Highlands	0.408	0.397	0.408	0.439	0.440	0.406
South East	0.414	0.391	0.397	0.387	0.373	0.291
Mekong River Delta	0.398	0.403	0.395	0.405	0.399	0.368

Source: The General Statistics Office of Viet Nam

The GINI (by income) coefficient of Vietnam was stable during the survey period from 2010 to 2018. Remarkably, The GINI coefficient for the whole country in 2020 was 0.375, lower than the GINI in the 2010- 2018 period at 0.4, but still at the average level of inequality. According to the GINI coefficient for the years 2016 to 2020, income inequality in Vietnam did not significantly change, falling from 0.431 to 0.375 and remaining within a suitable range for rapid development. Vietnam's GDP increased at an average rate of 6.78% between 2016 and 2020 as a result of the Covid-19 epidemic's impact on the country's economic sectors. However, as the GINI coefficient fell from 0.431 in 2016, then to 0.373 in 2020, there was less income inequality between the various socioeconomic groups in the population. It can be said that Vietnam's income inequality is currently still within a safe range, but if Vietnam does not take adequate action to address this issue, it tends to get worse over time.

The Gini coefficient shows a significant increase in inequality in rural areas between 2010 and 2020, while inequality in urban areas tended to decline. As a result, inequality appeared to shift from urban to rural areas. In particular, in urban areas in 2016 the GINI coefficient was 0.391. In rural and urban areas, this index was 0.408 and 0.373, respectively, before dropping to 0.325 in 2020. The following is an explanation for this phenomenon: Urban workers (who are typically educated and skilled) have a wider range of employment opportunities and pay options. On the other hand, people's knowledge is still frequently quite basic, they have limited access to information, and the majority of the remaining workers in rural areas are either unskilled or elderly. As a result, they are unable to negotiate for a raise in pay or other benefits, which widens the income disparity.

The two regions with the highest rates of poverty, the Northern midlands and mountain areas and the Central Highlands, had the highest GINI coefficients from a regional standpoint, and the South East had the lowest GINI coefficient. In other words, the Southeast remained the region with the highest level of equality in the nation, while

the Central Highlands and the Northern Midlands and Mountains were the two most unequal regions and stood in stark contrast to the rest of the country.

2.1.2. Income inequality through the gap of monthly income per capita by five income quintiles in Vietnam

Table 2: Monthly income per capita by five income quintiles from 2010 to 2020

Unit: Thousand VND

Year	Average	Group 1	Group 2	Group 3	Group 4	Group 5	(a)	(b)
2010	1387	369	669	1000	1490	3410	3041	9,24
2012	2000	512	984	1500	2222	4784	4272	9,34
2014	2637	660	1314	1972	2830	6413	5753	9,72
2016	3098	771	1516	2301	3356	7547	6776	9,79
2018	3760	931	1808	2774	4110	9175	8244	9,86
2020	4230	1139	2508	3509	4887	9108	7969	7,99

Note: (1) The gap in income between group 5 and group 1; (2) Results when taking income of group 5 divided by income of group 1. Source: The General Statistics Office of Viet Nam

The table above shows that over time, the average monthly income of each of the five groups increased, with the per capita income in 2020 being 3.04 times higher than in 2010. Besides, the number of times the income difference between Group 5 and Group 1 in 2010-2020 was always relatively high, but there was an evident change in 2020 compared to previous years.

Specifically, from 2010-2018, the gap in income between Group 5 and Group 1 tended to increase continuously in the economic environment without any shocks. That refers to the disparity in income between those in the low-income group. The number of people with the highest incomes is rising, indicating that Vietnam is gradually turning into a nation with a wide gap between the rich and the poor, which is causing income inequality to rise quickly.

However, the low-income group experienced a higher rate of income growth by 2020 as a result of the Covid-19 epidemic's negative effects and the success of social security programs for low-income and policy families. With the income gap between these two groups now only being 7.99 times, the income disparity between rich and poor in 2020 had narrowed considerably.

2.1.3. Income inequality through the proportion of poor households in urban and rural areas in Vietnam

According to table 4, the poverty rate had decreased rapidly over the years, regardless of the poverty line being used. In urban areas, the proportion of poor households had decreased faster than in rural areas, showing that income inequality between rural and urban areas is quite large.

Table 3: Proportion of poor households in urban and rural areas in Vietnam from 2010 to 2020

	According to the Government's poverty line for 2011-2015 period				According to the Multi-dimensional poverty line for 2016-2020 period		
	2010	2012	2014	2016	2016	2018	2020
Whole country	14.2	11.1	8.4	5.8	9.2	6.8	4.8
Urban	6.9	4.3	3	2	3.5	1.5	1.1
Rural	17.4	14.1	10.8	7.5	11.8	9.6	7.1

Unit: Percent (%). Source: The General Statistics Office of Viet Nam

2.2. General assessment of income inequality in Vietnam.

2.2.1. Overall trend and exceptional cases

Based on the status of income inequality in Vietnam from 2010 to 2020, it is important to have a over view of income inequality in Vietnam in the surveyed period. Therefore, the table below summarizes top 10 the provinces in Vietnam with the greatest value of GINI coefficient between 2010 and 2020

Table 4: Top 10 provinces in Vietnam with the highest value of GINI coefficient between 2010 and 2020

Rank	2010	2012	2014	2016	2018	2020
1	Cao Bang	Cao Bang	Cao Bang	Cao Bang	Cao Bang	Lai Chau
2	Dak Nong	Lai Chau	Lao Cai	Lai Chau	Dien Bien	Cao Bang
3	Ninh Thuan	Lao Cai	Lai Chau	Dak Nong	Lai Chau	Yen Bai
4	Lao Cai	Ba Ria Vung Tau	Dien Bien	Ba Ria Vung Tau	Dak Nong	Son La
5	Binh Duong	Kien Giang	Ba Ria Vung Tau	Gia Lai	Ba Ria Vung Tau	Lao Cai
6	Ha Noi	Ca Mau	Kien Giang	Dien Bien	Gia Lai	Dien Bien
7	Kien Giang	Dien Bien	Ha Noi	Kien Giang	Kon Tum	Quang Tri
8	Ba Ria Vung Tau	Dong Thap	Son La	Lao Cai	Soc Trang	Gia Lai
9	Lang Son	Bac Kan	Ninh Thuan	Kon Tum	Lao Cai	Bac Kan
10	Gia Lai	Lang Son	Hai Phong	Dak Lak	Son La	Ha Giang

Source: The author's compilation

According to the table below, the top 10 provinces with the highest GINI from 2010 to 2020 were mainly in the Northern midlands, mountain areas, and the Central Highlands. Northern midlands and mountain areas had more provinces with high GINI than Central Highlands.

Cao Bang was the province with the highest GINI in most surveyed years and its GINI coefficient increased over time. Despite being a province from the Southeast region, which was said to be the most equal in Vietnam, Ba Ria Vung Tau appeared in the top 10 provinces with the highest GINI, and its rank was relatively high in different years.

Not only does the top 10 provinces with the highest GINI coefficient have some characteristics in common but the top 10 provinces with the lowest GINI coefficient also has similar points. The table below summarizes top 10 the provinces in Vietnam with the lowest value of GINI coefficient between 2010 and 2020

Even though Southeast, in general, was the region with the smallest value of GINI from 2010 to 2020, the top 10 provinces with the lowest GINI value mainly belong to sections from the Red river delta and North Central area and central coastal area. Binh Thuan and Hung Yen were the two provinces with lowest value of GINI coefficient.

The case of Yen Bai was quite extraordinary; in 2010, it was in the top 10 countries with lowest GINI value, then after 10 years, it was the third province with the highest value of GINI. Some provinces from other regions such as Bac Lieu, Vinh Long were also appeared in the table

Table 5: Top 10 provinces in Vietnam with the smallest value of GINI coefficient between 2010 and 2020

Rank	2010	2012	2014	2016	2018	2020
1	Binh Thuan	Binh Thuan	Hung Yen	Binh Thuan	Binh Thuan	Dong Thap
2	Hai Duong	Hung Yen	Binh Thuan	Hung Yen	Thai Binh	TP.HCM
3	Hung Yen	Ha Nam	Quang Ngai	Ha Nam	Bac Lieu	Binh Thuan
4	Thai Binh	Thai Binh	Ha Nam	Hai Duong	Hai Duong	Thai Binh
5	Nam Dinh	Hai Duong	Thai Binh	Thai Binh	Nam Dinh	Dong Nai
6	Ha Nam	Bac Giang	Hai Duong	Bac Giang	TP.HCM	Hai Phong
7	Quang Ngai	Vinh Long	Bac Giang	Nam Dinh	Hung Yen	Hai Duong
8	Yen Bai	Dong Nai	Thanh Hoa	Thua Thien Hue	Ha Nam	Bac Lieu
9	Quang Nam	Long An	Dong Nai	Vinh Long	Quang Nam	Vinh Phuc
10	Thanh Hoa	Quang Nam	Quang Nam	Vinh Phuc	Vinh Phuc	Hung Yen

Source: The author's compilation

2.2.2. Causes and consequences

According to the analysis of General Statistics Office (GSO) on the trend of inequality in income distribution in Vietnam, these characteristics enable development in regions because of the variations in natural conditions, cultural level, production level, infrastructure and educational level, comparative advantage, etc.

Due to regional differences, there are significant variations in income disparities and population group inequalities across regions. Inequality gaps are closing as measured by decreasing GINI coefficients across all economic sectors.

The northern mountainous region has a harsher climate with landslides, fog, etc., hindering the process of cultivation and breeding. Meanwhile, the climate in the southern region is warmer and more convenient, so the per capita income here is also higher. Furthermore, the nation experienced severe marine environmental issues in the central provinces, as well as saltwater intrusion in the Mekong Delta, which negatively impacted production and people's lives.

These issues were in addition to the country's annual natural disasters, which included severe cold and harmful cold in the northern provinces, drought in the Central Highlands and South Central, storms and floods in the central provinces, and drought in the central provinces.

3. Quantitative estimation

3.1. Model specification and hypothesis

Based on previous research, this report finds the relationship between GINI, which is the object for modelling, and each relating factor, including population, average urban population, provincial competitiveness index, percentage of trained employed workers at 15 years of age and above, percentage of literate population of at least 15 years of age, monthly income per capita and gross regional domestic product. From the theoretical basis as well as research and survey, a model is built as follows:

$$\text{GINI} = f(\text{Pop}, \text{AverUrp}, \text{PCI}, \text{Trained15}, \text{Literate15}, \text{Minpercap}, \text{GRDP})$$

In which:

- GINI: GINI coefficient (unit-free).
- Pop: population (in thousand people).
- AverUrp: average urban population (in thousand people).
- PCI: provincial competitiveness index (unit-free)
- Trained15: percentage of trained employed workers of at least 15 years of age (in percentage).
- Literate15: percentage of literate population of at least 15 years of age (in percentage).
- Minpercap: monthly income per capita (in thousand VND).
- GRDP: gross regional domestic product (in trillion VND).

Based on the model above, the following regression model is used to investigate the determinants of GINI coefficient in Vietnam with province i at year t . The two of explanatory variables (population and monthly income per capita) are transformed into logarithms. The model can be expressed as follows:

$$\begin{aligned} \text{GINI}_{it} = & \beta_0 + \beta_1 \ln \text{Pop}_{it} + \beta_2 \text{AvgUrp}_{it} + \beta_3 \text{PCI}_{it} + \beta_4 \text{Trained15}_{it} \\ & + \beta_5 \text{Literate15}_{it} + \beta_6 \ln \text{Minpercap}_{it} + \beta_7 \text{GRDP}_{it} + a_i + u_{it} \end{aligned}$$

According to previous research on determinants of income inequality, based on the model above, several hypotheses are formulated with a summarized table as below:

H1: There is a positive relationship between population and income inequality in Vietnam.

H2: There is a positive relationship between urban population and income inequality in Vietnam.

H3: There is a negative relationship between PCI and income inequality in Vietnam.

H4: There is a negative relationship between employee quality and income inequality in Vietnam.

H5: There is a negative relationship between education and income inequality in Vietnam.

H6: There is a positive relationship between monthly income per capita and income inequality in Vietnam.

H7: There is a negative relationship between GRDP and income inequality in Vietnam.

Table 6. Previous studies on factors affecting income inequality

	Positive relationship (+)	Negative relationship (-)	Hypothesis development
Population	Deltas (2003); Moller et al. (2009); Parrado and Kandel (2010); Rey (2018); Van Heuvelen, 2018		H1 - Positive
Urban population	Nielsen and Alderson (1997); Litwin (1998); Kanbur and Zhuang (2013)	Kanbur and Zhuang (2013)	H2 – Positive
PCI		Liu (2004); Hong Minh (2019) and Thuy Giang (2021); Chen (2011)	H3 – Negative
Employee quality		Suna (2017)	H4 – Negative
Education	Knight and Sabot (1983); Chiswick (1968)	Schultz (1963); Knight and Sabot (1983); Toh (1984)	H5 – Negative
Monthly income per capita	Lewis (1954); Kuznets (1955)	Lewis (1954); Kuznets (1955)	H6 – Positive
GRDP	Ram (1997); Barro (1999); Higgins and Williamson (1999); Clark, Xu ja Zou (2003)	Ram (1997); Barro (1999); Higgins and Williamson (1999); Clark, Xu ja Zou (2003)	H7 – Negative

Source: The author’s compilation

3.2. Data collection and description

3.2.1. Data collection

Based on the research subject and the data collected, the author decided to use the panel data with a combination between time-series (from 2010 to 2020) of cross – sectional observation (63 provinces in Viet Nam) collected the General Statistics Office (GSO) website of Vietnam, the result of the Viet Nam Household Living Standards Survey (VHLSS) conducted by the GSO, the website <https://pcivietnam.vn/> PCI Viet Nam and from the Statistical Yearbook as well. However, as the VHLSS survey has been conducted regularly by the GSO every two years, the data collected for the model will be from the survey conducted in 2010, 2012, 2014, 2016, 2018, and 2020.

3.2.2. Descriptive statistics

Table 7 presents the Statistical Description of the variables. The **above results below** indicate that GINI coefficient is approximately 0.3553 on average. It also has the minimum and maximum values of 0.2308 and 0.4685, respectively. Population variable also has a huge gap between the maximum (9227.6) and the minimum value (300.4). In addition, the mean value of the population is 1461.222, with a large standard deviation of 12996.957.

Table 7: Statistical description (378 observations)

Variable	Obs	Mean	Std.Dev.	Min	Max
GINI	378	0.3552652	0.036751	0.2307864	0.4684816
Pop	378	1461.222	1296.957	300.4	9227.6
AvgUrp	378	497.1095	928.1004	48	7290.9
PCI	378	59.96209	4.48912	45.12	75.09
Trained15	378	17.0545	7.322375	5.1	48.5
Literate15	378	92.76614	6.918055	60.2	98.9
Minpercap	378	2485.796	1224.949	566.8	7033.77
GRDP	378	83.91557	152.438	4.12	1371.565

Source: The author's calculation by Stata 16

The average urban population is 497.1095 on average with a high standard deviation of 928.1004. Moreover, the minimum value of the **poverty rate** AvgUrp is equal to 48 and the maximum one is **7290.9**, which is 150 times higher than the minimum. The percentage of Urban Population on Total Population was 34%, with a minimum of And a maximum of

The most noticeable thing about the PCI variable is its range of values starting from 45.12 to 75.09, which is high and there is no big distinction between these two values. Trained15 variable has a mean of 17.0545 with lowest value of 5.1 and the largest one is 48.5. Literate15 variable has a mean of 92.76614, which is high and all the values of this variable are above 60. Minpercap is 2485.796 on average. It also has the minimum and maximum values of 566.8 and 7033.77, respectively. Besides, there is a huge gap between the largest and the smallest value of GRDP, which has a mean of 83.91557

3.2.3.Data explanation

Table 8 explains variables and expectations in the impact of exogenous variables on an endogenous variable based on the research hypothesis.

Table 8. Description of variables and expected signs

Variables	Meaning	Units	Sign of expectation
GINI (Dependent variable)	GINI coefficient		
Pop	Population	Thousand people	+
AvgUrp	Average urban population	Thousand people	+
PCI	Provincial competitiveness index		-
Trained15	Percentage of trained employed workers at 15 years of age and above	Percent	-
Literate15	Percentage of literate population at 15 years of age and above	Percent	-
Minpercap	Monthly income per capita	Thousand VND	+
GRDP	Gross regional domestic product	Trillion VND	-

Source: The author’s compilation

Table 9. Correlation matrix

Variable	GINI	lnPop	lnAvg Urp	PCI	Train ed15	Liter ate15	lnMin percap	GRDP
GINI	1.0000							
lnPop	-0.3248	1.0000						
AvgUrp	-0.1265	0.6725	1.0000					
PCI	-0.2243	0.2775	0.1916	1.0000				
Trained15	-0.1661	0.3167	0.5106	0.3899	1.0000			
Literate15	-0.4306	0.3918	0.2104	0.2418	0.3050	1.0000		
lnMinpercap	-0.2852	0.4297	0.3720	0.6261	0.5576	0.4339	1.0000	
GRDP	-0.1725	0.6649	0.9113	0.2683	0.5720	0.2302	0.4876	1.0000

Source: The author’s calculation by Stata 16

According to the table above, there is a correlation coefficient between independent variables that is above the allowable level (0.8) Therefore, there is chance that the model is suffered from perfect multicollinearity in the regression.

3.3. Results and discussion

3.3.1. Stationarity testing

In order to run the model, the panel data, or in specific, the GINI series has to be stationary. We use the Fisher Test for panel unit root using an augmented Dickey-Fuller test to test for stationarity of the model. With the result of Prob > chibar2 = 0.000 < 0.05 at 5% of significance level, There is enough evidence to reject null hypothesis of GINI has a unit root. Therefore. the series GINI is stationary at lag = 0 or at Level.

3.3.2. Model Selection

The Breusch Pagan test for the existence of ai is used to test whether to choose RE/FE or POLS model, with the null hypothesis of no significant difference across units. The result is Prob > chibar2 = 0.000 < 0.05 at 5% of significance level, so there is enough evidence to reject null hypothesis and we will consider to choose RE/FE model. Then, to choose between fixed or random effects we run Hausman test where null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. With the result Prob > chibar2 = 0.089 > 0.05 at 5% of significance level, there is not enough evidence to reject null hypothesis, so RE model is chosen.

3.3.3. Diagnosing the model problems

- Collinearity diagnosis

Table 10: Multicollinearity test

Variable	VIF
lnPop	2.29
AvgUrp	6.67
PCI	1.69
Trained15	1.90
Literate15	1.38
lnMinpercap	2.50
GRDP	7.30
Mean VIF	2.57

Source: The author’s calculation by Stata 16

The result as in table 10 shows that all values of VIF < 10 and Mean VIF = 3.39 < 10, so there is no multicollinearity.

- Heteroskedasticity diagnosis

We run White’s test to test the heteroskedasticity. The result is “Prob > chi2 = 0.0039”, which is smaller than 0.05. However, when we applied Breusch-Pagan test to test for heteroskedasticity, we have the result “Prob > chi2 = 0.2305” > 0.05. Therefore, it can concluded that there is heteroskedasticity problem in this model.

3.3.4. Results discussion

Even though there is no multicollinearity, the model still suffers from heteroskedasticity. In order to fix the model, we use robust standard errors. Then, we have the final result as the Table 11 as bellow:

Table 11: RE model with robust standard errors

Variables	Model - RE
lnPop	-0.0203658** (0.0086533)
AvgUrp	0.000023*** (5.81e-06)
PCI	-0.0005493 (0.0004546)
Trained15	-0.000949* (0.0005332)
Literate15	-0.0007205*** (0.0002736)
lnMinpercap	0.0117305** (0.0051383)
GRDP	-0.0000503*** (0.0000343)
cons	0.5239979 (0.052704)

Source: The author’s calculation by Stata 16. **Note:** *, ** and *** show statistical significance at the %10, %5 and %1 levels, respectively. Values in parentheses are standard errors.

According to Table 11, population, average urban population, percentage of literate population at 15 years of age and GRDP are variables that significant impact income inequality.

It is found that population has a significant negative effect on income inequality, at 10% level of significance. Even though the coefficient's sign is different from expectation, it can be explained by some reasons, with conditions if needed. For example, the increasing in population will lead to the reduction in income inequality when education and health care services are ensure properly. When more people can go to school and have chance to study, when more people are able to receive good medical treatment, social welfare will be distributed more equally and the income inequality can be reduced. Moreover, the population is both a producer and a consumer.

Therefore, the number and structure of the population have a great influence on the scale and structure of production, consumption and accumulation, affecting the general development of society. As a result, more population means more demand for production, which means more contribution to the economy and lower income gap.

Average urban population has a positive and significant effect on income inequality. This finding supported H2. First, under the same conditions, increasing the share of the urban population can reduce economic growth. Some evidence indicates that change may be more significant because urban per capita productivity increased faster in agriculture. If this is true, inequality in income distribution increases. Bourguignon, Morrisson (1998) highlighted this idea and clarified this idea. Moreover, industrialization and urbanization are closely related to economic development. The process of industrialization and urbanization affects income distribution, causing income inequality. Urbanization can increase income inequality in the short term because wages are higher for urban jobs than for pastoral work. However, in the long time, when urbanization is highly developed, the difference in income distribution in the two regions may decrease, and income inequality will decrease.

The regression result shows that while a negative relationship exists between population and income inequality, average urban population positively impacts income inequality.

Explaining this in the context of provinces in Vietnam, as the urbanization rate in the country had increased rapidly from 30.5% to about 40% from 2010 to 2020, the process of urbanization brings about changes in economic structure, with people and resources being reallocated from agricultural activities to industrial activities. This process is associated with increased inequality, with higher incomes in urban areas than in rural areas in each province.

The increasing urban development can also seriously impact rural areas due to the urban expansion and the exploitation of agricultural land without adequate planning and regularization, which generates an increase in rural poverty. Moreover, nowadays, many people have incentives to move from rural to urban areas to seek jobs and enhance their quality of life, which increases the urban population and cause income inequality. Regarding population, provinces in Vietnam that have larger populations tend to attract more Foreign Direct Investment (FDI), which in turn generates many employment

opportunities. This results in a reduction of income inequality between low-income and high-income individuals in these provinces. Therefore, regions with significant populations can have lower income inequality due to the jobs created by FDI.

The percentage of trained employed workers from 15 years old has negatively significant effect on income inequality at 10% of significant level. If we hold other factors fixed, when percentage of trained employed workers at 15 years of age and above increases, the income inequality capita will decrease. Suna (2017) supported this result by stating that by improving the quality of labor, the labor innovations and developments allow the countries to make production at lower costs. The increase in factor productivities would enable higher levels of income in the economy, then income inequality will reduce.

The percentage of literate population at 15 years of age and above has statistically significant effect on income inequality. This result can be support by Blanden & Machin (2004), who provided evidence that education provides more significant economic opportunities, especially for the poor (Blanden & Machin, 2004). Education shifts the composition of the unskilled to the skilled labor force.

Although this process may initially increase income inequality (Chiswick, 1968), it is expected to reduce income inequality in the long run (Schultz, 1963). Moreover, based on the research of Tanzania and Kenya, Knight and Sabot (1983), the expansion of education has two conflicting effects: a compression effect and a composition effect. The composition effect is the change in the proportion of the skilled workforce; this affects inequality similar to the process postulated by Kuznets. An increase in the number of skilled workers initially tends to increase inequality. However, the inequality decreases after reaching a certain threshold due to the compression effect. The compression effect refers to competition in the labor market.

Therefore, based on the result above, it can be implied that Vietnam has reached a certain threshold due to the compression effect. Therefore, a more excellent supply of skilled labor lowers the wage premium towards higher skill levels and thus reduces income inequality.

Monthly income per capita is a factor that has statistically significant effect on income inequality at 5% of significant level. Taking into account its coefficient, if we hold other factors fixed, when monthly income per capita increases, the income inequality will increases. Kuznets inverted U-shaped curve can be used to explained for this result.

Many developing countries, especially Vietnam is staying in the beginning stage of the inverted U-shape curve. Therefore, income inequality tends to increase in the early stages of development. The inverted U-shape curve is among one of the barriers that any countries will meet during the process of development. If a country cannot deal with the barrier, that country will be stuck at the middle-income stage and we call this phenomenon as middle-income trap.

The regression results indicate a negative impact of gross regional domestic product on income inequality at 1% of significant level, which means if we hold other factors fixed, when GRDP increases, GINI coefficient will decrease, which means income

inequality will decline. This result can be explained based on Kuznets' inverted U relationship theory, which states that as GRDP grows, inequality will initially rise before beginning to decline.

The result of monthly income per capita and GRDP variables should be considered as while increase in monthly income per capita raises income inequality, GRDP negatively impacts income inequality. Monthly income per capita measures the amount of money earned per person in a nation or geographic region. It is used by businesses to help select a region for starting a new business. If the area's per capita income is higher, the firm can earn more in that region. Since the people in such areas won't hesitate to spend money, the business or company has a higher chance of generating more revenues. This is not possible in areas with low per capita income. Moreover, increase in investment causes a rise in output; therefore, people living in areas with high monthly income per capita can gain more income compared to those with lower monthly income per capita.

However, regarding GRDP, in broad terms, an increase in GRDP is interpreted as a sign that the economy of that province is doing well. When GRDP is growing strongly, employment is likely to increase. Everyone can have more chances to increase their salaries as companies hire more workers for their factories and people have more money in their pockets, which can reduce income inequality.

Provincial Competitiveness Index (PCI) is the only variable that does not significantly affect income inequality. Regarding to PCI, because Vietnam's institutions follow a common pattern, even though each province has its own way of organizing in the economic field, administering and orienting the development, the difference is not big enough to significantly impact income inequality. Therefore, PCI cannot have an evident influence on income inequality.

4. Conclusion and policy recommendation

This study examines the determinants of income inequality in Viet Nam from 2010 to 2020 with empirical evidence at provincial level.

The fluctuation of income inequality is explained by the model which includes: Population, Average urban population, Provincial competitiveness index, Percentage of trained employed workers of at least 15 years old, Percentage of literate population at 15 years of age and above, Monthly income per capita and Gross regional domestic product.

The model is suitable with all theories and most of the variables meet the expectation of the Random-effect model (RE) with the final result being statistically significant. From this result, we can see that apart from provincial competitiveness index, all of the rest factors impacts income inequality significantly. Based on the estimation result, some policies are recommended for Vietnam:

First, provinces need to maintain population growth at a consistent pace because rapid population increase can exacerbate the challenge of ensuring sustainable and inclusive development in the future. Therefore, population growth should be controlled to reduce income inequality phenomenon and not cause negative impacts on other issues in each province. Besides maintaining consistent population growth, equal distribution of urban and rural populations is vital as more people tend to move to urban areas nowadays due

to job seeking and better living conditions. Several policies could be implemented to balance income between urban and rural areas in each province as follows. Attracting people from urban areas or reducing the amount of migration from rural to urban areas needs to be considered.

Provinces can think about creating dynamic, growing job markets to draw new people to rural communities in search of employment as local economic conditions significantly attract new residents. Another strategy is to attract retirees. Like many potential movers to rural communities, retirees are pulled by a pleasing climate. Unlike for other movers, though, local labor market conditions are less likely to be a factor since retirees no longer need to find work. Retirees are also attracted by factors relating to healthcare access, such as the availability of doctors and hospital beds. Therefore, by figuring out how to increase both access to and the caliber of healthcare, rural communities can position themselves well.

Second, education is essential in enhancing the quality of human resources; therefore, provinces need to focus on improving educational quality. According to a 2017 McKinsey study on the driving force behind student achievement, Vietnam is one of the Asian countries with high academic achievement. Therefore, Vietnam can exploit its outstanding strengths by implementing suitable policies.

Each province must invest in education facilities and improve their quality. Building more schools, repairing or replacing infrastructure, and using technology to increase access will make schools more accessible for everyone. In addition, each province should focus on expanding private investment in education. When properly channeled, private capital can spur innovation in providing quality education outcomes and democratizing access to education products and services. Furthermore, since there are a lot of occupations nowadays and people are likely to do trending jobs even if they have little or no knowledge of them, it is crucial to provide career orientation in both vocational and university settings as well as high schools, so that everyone can determine and comprehend their future career path.

Moreover, to increase gross regional domestic product, continuing to consistently implement the goal of strengthening macroeconomic stability is crucial for all provinces. Because of the variations in natural conditions, cultural level, production level, infrastructure and educational level, comparative advantage, etc., each province needs to identify and leverage its strengths by implementing GRDP development policies that are appropriate for the current situation of each province and in line with the trend of greening and digitizing the economy.

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Annex. Average income per capita and Salary in the Provinces of Viet Nam.

Annex.

Table A1. Average Income per capita and average Salary in Vietnman, 2018

Provincial code	Province_EN	Average Income per capita	Salary
89	An Giang	3559	1232
77	Ba Ria - Vung Tau	4881	2444
24	Bac Giang	3450	1673
6	Bac Kan	1945	967
95	Bac Lieu	2699	805
27	Bac Ninh	5445	2498
83	Ben Tre	3408	1122
74	Binh Duong	6823	3704
52	Binh Dinh	3024	1326
70	Binh Phuoc	3603	1579
60	Binh Thuan	3444	1537
96	Ca Mau	2986	798
92	Can Tho	4371	1964
4	Cao Bang	1856	1058
48	Da Nang	5506	3006
66	Dak Lak	2747	1070
67	Dak Nong	3029	726
11	Dien Bien	1477	572
75	Dong Nai	5299	2701
87	Dong Thap	3499	1274
64	Gia Lai	2586	1141
2	Ha Giang	1725	667
35	Ha Nam	3608	1814
1	Ha Noi	6054	3960
42	Ha Tinh	2844	1174
30	Hai Duong	3693	2094
31	Hai Phong	5116	2811
93	Hau Giang	3548	1074
17	Hoa Binh	2295	1173
33	Hung Yen	3843	2057
56	Khanh Hoa	3455	2135
91	Kien Giang	3779	1279
62	Kon Tum	2007	879
12	Lai Chau	1492	619
68	Lam Dong	3640	1296
20	Lang Son	2047	908

10	Lao Cai	2324	1001
80	Long An	4215	1911
36	Nam Dinh	3383	1582
40	Nghe An	2542	1190
58	Ninh Thuan	2631	1191
37	Ninh Binh	3777	1800
25	Phu Tho	2892	1605
54	Phu Yen	2837	1307
49	Quang Nam	2905	1524
51	Quang Ngai	2899	1383
44	Quang Binh	2666	1253
22	Quang Ninh	4777	2649
45	Quang Tri	2542	1177
94	Soc Trang	3652	1235
14	Son La	1483	511
72	Tay Ninh	4258	2140
19	Thai Nguyen	4014	2239
34	Thai Binh	3547	1678
38	Thanh Hoa	3014	1529
46	Thua Thien-Hue	3084	1489
82	Tien Giang	3983	1783
79	TP. Ho Chi Minh	6177	3919
84	Tra Vinh	2869	936
8	Tuyen Quang	2261	1052
86	Vinh Long	3089	1159
26	Vinh Phuc	3698	1914
15	Yen Bai	2289	1068

Source: Open Development Mekong at;

<https://data.opendevlopmentmekong.net/en/dataset/per-capita-income-by-province-in-2018-in-vietnam>

The coefficient of variation, CV%, of Income per capita, has taken a value of 34.36% in the provinces included in table A1. And 48.78% in the case of salary.

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