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THE RELATIONSHIP BETWEEN INCOME GROWTH AND INEQUALITY: EVIDENCE FROM AN ASIAN EMERGING ECONOMY

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ABSTRACT. This paper aims to investigate the relationship between income growth and inequality in Vietnam. The study database was collected and calculated from 61 provinces in the period of 2006-2018. The economic equation is estimated with 3 types of data including the full sample, the North and the South regions, and six sub-economic regions. The empirical results present several important scientific contributions. First, the estimated results show the Kuznets curve hypothesis is confirmed in Vietnam when the relationship between income growth and inequality is presented by an inverted U-shaped curve. Second, the Kuznets curve does not occur in the provinces which have a high level of economic liberalization and a large private sector, as evidenced by the analysis of sub-samples. Economic integration is a progressive process provided foreign direct investment decreases inequality in most regions. Educational development helps to reduce inequality but this relationship is only found in the areas populated by ethnic minorities. The labour force has a positive and significant relationship to inequality, especially in regions with labour shortages, although this variable can even help reduce inequality in some sub-economic regions that have an abundance of labour. Tourism development and trade variables are considered to be the sources of inequality in lower development regions. The empirical results suggest that policymakers need to continuously reduce income inequality to support sustainable development in the future.

JEL Classification: F21, E64, R58

Keywords: development strategy, income distribution, Kuznets curve, regional development, social conflict, sustainable development

Introduction

The growth of income per capita and the distribution of income are the spotlight topics in economics, both in theoretical literature (Barro, 1991; Mankiw et al., 1992) and in empirical studies (Knowles, 2005; Lee, 2008; Fanta & Upadhyay, 2009; Yusuf et al., 2014; Włodarczyk et al., 2017; Nugraha et al., 2020; Syahnur et al., 2021; Seven, 2022). Many studies show that economic growth helps to reduce the poverty rate in many developing countries, however, income inequality arises as a social problem (Kumar & Mahadevan, 2011; Jalles, 2011; Yusuf et al., 2014; Tran et al., 2017; Sánchez-López et al., 2019). Income inequality is often reinforced by inequality in the community in terms of the social voice and development opportunities, i.e., the social benefits of the poorest groups being reduced for the priority demands of the rich people. Obviously, income inequality threatens the stability and sustainable development in many developing countries worldwide (Ferreira et al., 2022). When the income gap between the richest and the poorest groups significantly increases, governments need urgent policies to ensure that inequality is decreased.

In the Asian-Pacific region, Vietnam has been popularly recognized as one of the fastest-growing economies in recent years (Barker & Üngör, 2019). Following an international integration strategy, this economy is a successful example of attracting foreign direct investment (FDI), establishing export-oriented manufacturing sectors, and maintaining robust domestic demand (Thanh et al., 2019; Tung, 2019). Based on a booming economic growth, the GDP per capita of the Vietnamese people has also increased many times, from $100 in 1990 to $2740 in 2019. On the other hand, the poverty rate has dramatically decreased from 70% of the population in 1990 to below 6% in 2019 (World Bank, 2021). Obviously, Vietnam is a good development case compared to other developing countries given its successful experiences in promoting economic growth, reducing poverty, and raising the standard of living for people.

Although there were around ten million Vietnamese households that escaped from poverty, a significant number of them also faced high risks of falling into poor groups again (Bui et al., 2018; Nguyen & Pham, 2018). In particular, many households were listed as near-poor households (those having an income level that is just above the extreme poverty line) and were still considered poor according to the multi-dimensional definition (Tuyen, 2016). Vietnam is also gradually forming a "super-rich" social class with assets worth tens of millions of USD. Although there were only 200 super-rich people, the total assets of this very small group were equal to 12% of GDP in 2014 (Oxfam Vietnam, 2018). The statistics show that the high-income class with huge asset values has vastly outpaced the rest, and the number of super-rich people is predicted to significantly increase in the near future (Oxfam Vietnam, 2018).

However, income inequality has also appeared between the regions across the country. Vietnam currently has 63 provinces in its public administration system and the average income level is much different among the provinces (General Statistics Office of Vietnam, 2020). In addition, the central government divides these provinces into 6 sub-economic regions, which include the Red River Delta, Northern Midlands & Mountain, North Central & Central Coastal, Central Highlands, Southeast, and Mekong River Delta. The statistical indicators have indicated an uneven development phenomenon among provinces and regions (Oxfam Vietnam, 2018; Nguyen & Pham, 2018). For example, in 2018, the GDP per capita in Ho Chi Minh City (in the Southeast region) was eight times higher than in the Ha Giang province (in the Northern Midlands & Mountain region). Furthermore, among the 63 provinces, there were only 16 provinces (as 25.4 of the total number) that had a budget surplus and did not need financial supplements from the central government (Tien Phong, 2020). As a consequence, the government of Vietnam has been faced with a budget deficit for

a long period (Tung, 2018). Obviously, income inequality is growing but it is also different between provinces or regions, hence, the relationship between income growth and inequality is a social problem that has received many concerns in Vietnam. There are some previous results related to the income inequality topic in Vietnam such as ethnic minorities in some poor provinces (Tuyen, 2016; Bui et al., 2017; Nguyen et al., 2017), farmland loss because of urbanization (Tran et al., 2014), older people in rural areas (Tran et al., 2017). To the best of our knowledge, there is no evidence of using the panel provincial database to quantitatively analysis the income growth-inequality nexus in Vietnam. Therefore, this study aims to fill the empirical research gap regarding the Kuznets curve hypothesis between income and inequality in the Vietnamese economy.

The content of this paper includes five sections. Section 1 presents the literature review. Section 2 shows the methodology and data source. The estimation results are reported and discussed in section 3. Finally, section 4 provides some conclusions and implications.

1. Literature review

Economic growth and income growth are the most important topics in the economic literature (Barro, 1991). When a country has a high economic growth rate, it needs to ensure that the development achievements also merge with the benefits of people (Mankiw et al., 1992). The relationship between income and inequality can be performed by an inverted 'U' curve (Kuznets, 1955). There were some empirical studies that applied the Kuznets theory, however, the quantitative results were diverse or opposite. For example, a negative relationship between income growth and inequality was found in some studies (e.g. Kim, 2004; Knowles; 2005; Kumar & Mahadevan, 2011), on the other hand, there were some findings that showed a positive relationship between income growth and inequality such as Yusuf et al. (2014).

In order to study inequality among territories in a country, the Gini index is often used as an effective tool for the investigated analysis process. Kim (2004) employed the factor analysis and the cluster analysis to study the relationship between regional economic growth and income inequality in Florida (USA). The level of income inequality of cities in four regions was calculated by the Gini index. Regression results indicate that the increase in inequality level depended on some main factors including economic growth rate, minimum wage, tax policy, and financially supporting programs. In another empirical study, Knowles (2005) used the comparable approach to examine the relationship between economic growth and inequality with a database from thirty-seven developing countries. The Gini coefficient was sourced from the World Income Inequality Database. The estimated results showed an inverse relationship between economic growth and income equality in these countries.

In Taiwan, Lee (2008) applied dispersion analysis to examine key factors affecting income inequality. The inequality is the dependent variable and some independent variables include the rate of single families, the rate of services in agricultural output, privatization, and the various policies. The results showed the single-family rate positively related to inequality, however, the remaining factors negatively correlated to inequality during the study period. Fanta and Upadhyay (2009) use the panel estimation technique to explore the relationship between poverty, economic growth, and inequality in sixteen African countries. The inequality variable is measured by the Gini index derived from the World Development Indicators database. The results pointed out that the difference in the poverty rate was positively correlated with the fluctuation in income inequality. The evidence suggested that a decline in income inequality could reduce poverty in African countries. Kumar and Mahadevan (2011) identify the factors affecting income inequality in Fiji and reveal a negative relationship between economic growth and income inequality. The study uses the

adult equivalent index to investigate this relationship. Furthermore, Yusuf et al. (2014) employed the statistical comparative approach to analysis the fluctuation of the Gini index and concluded that inequality in Indonesia has increased during the period 1993-2013. Besides, Nugraha et al. (2020) investigated the relationships between infrastructure development, economic growth, and income inequality in Indonesia in 2010-2016. The quantitative results revealed that the infrastructure variable had a positive impact on economic growth, however, economic growth harmed income inequality. The estimated results confirm that infrastructure, especially basic infrastructure and transportation, indirectly reduces income inequality. Therefore, policymakers should encourage investment in infrastructure and transportation to enhance economic performance sustainably and decrease income inequality. In another study in Indonesia, Syahnur et al. (2021) analysis the regional socio-economic inequality with a provincial sample. The empirical result confirms some determinants of the inequality including the economic strengths and weaknesses of provinces, economic capability, environmental factors, and human capital source.

There are some studies regarding the income growth - inequality nexus in Vietnam. However, most of these studies mainly focused on the situations related to the minority ethnic groups (versus main ethnic groups) or identified in a specific province or a small region such as the Northwest of Vietnam. In particular, Kang and Imai (2012) analysed the inequality amongst ethnic groups who lived in the agricultural sector in Vietnam in the period 2002-2006. The empirical results showed that income inequality has significantly increased in ethnic minority groups compared to the main ethnic groups in Vietnam. In another study focusing on a minority ethnic survey, Tuyen (2016) used an analysis of Gini decomposition to investigate the sources of income inequality among ethnic minorities in the Northwest which was considered as the poorest and highest inequality region of Vietnam. The empirical evidence showed that agricultural income (eg., from the production of the crop) considerably decreased inequality, on the other hand, the off-farm income sources (including wage and non-farm self-employment incomes) could raise income inequality levels in the case of the Northwest ethnic minorities.

In a recent study, Nguyen et al. (2017) applied the income decomposing method to study the relationship between some social issues such as employment, income, and poverty among ethnic minorities in the Northern Mountains which had incomes significantly lower than ethnic minorities in other regions in Vietnam. The income of these ethnic minorities was mainly sourced from crops and livestock products. The study results reveal important evidence that the income gap between the main ethnic groups (eg., Kinh or Hoa) and ethnic minority groups mainly comes from the wage and nonfarm incomes. Bui et al. (2017) continuously examined poverty alleviation which was closely related to income redistribution among ethnic minority households. The study concluded that ethnic minority households were persistently poorer compared to other groups. However, the empirical evidence implied that income redistribution played an important role in poverty alleviation in ethnic minority households. The study suggests that policymakers should design flexible policies fitting to alleviate poverty and inequality.

Besides the income inequality topic of ethnic minority groups in Vietnam, there are some empirical studies analyzing the relationship between income growth and inequality in the case of a disadvantaged group (eg., older people) or land-loss households. For example, Tran et al. (2014) investigate the impact of farmland loss on non-farm diversification among households in Hanoi's peri-urban areas. The investigated results confirm that both farmland loss and non-farm diversification have negative effects on the income inequality of households. Furthermore, Tran et al. (2017) focus on the impact of inequality on the quality of older people living in rural regions. The study finds that the people who are located in the villages face a high-income inequality level compared to others. Besides, the results

investigate that older and poor farmers may be more sensitive to income inequality. In another empirical research, Nguyen and Pham (2018) analysis the triangle relationships between economic growth, inequality, and poverty in Vietnam. The empirical evidence implies that ethnic minority groups have a longer-term memory in poverty conditions compared to the main ethnic groups.

In summary, although there are some empirical studies related to the income growth-inequality topic, there is no experimental evidence using the provincial database in Vietnam, especially in the provinces in the Northern, Central, and Southern regions. Hence, this study aims to fill this empirical research gap by employing an advanced database collected from 2006 to 2018. It maybe is the most up-to-date dataset related to this research topic. The study results also provide valuable information for the national leaders to increase the efficiency of the policy-making process in the future.

2. Methodology and data source

To examine the relationship between income growth and inequality at the provincial level in Vietnam, following the Kuznets curve hypothesis (see Kuznets, 1955), this study incorporates both linear and non-linear functions to test the relationship between the variables, which are represented by income and income squared, respectively. The econometric function is presented as follows.

$$Inequality_{it} = \beta_1 + \beta_2 Income_{it} + \beta_3 Income\_square_{it} + \beta_4 Education_{it} +$$

$$+\beta_5 Labour\_force_{it} + \beta_6 FDI_{it} + \beta_7 Tourism_{it} + \beta_8 Trade_{it} + \varepsilon_{it} \quad (1)$$

Where inequality is performed by the Gini index and income is denoted by the real GDP per capita. There are some explanatory variables divided into two groups. The first group includes the specific variables denoted for human resources (labour force and education). The second group is representative of the international integration of the provinces denoted by FDI, tourism, and trade development. In order to identify the inequality index for the Vietnamese provinces, the method of Yao (1997) is applied to calculate the Gini index as the equation below.

$$G = 1 - \sum_{i=1}^{n} p_i (2Q - w_i) \quad (2)$$

Where G denotes the Gini index, the national population is divided into n income groups, m_i presents the average income of the i group (i = 1, 2, ..., n), m denotes the average income of the total population, p_i is the population share of the i group. In addition, w_i ($w_i = p_i m_i / m$) is understood as the income share of the i group in total income. There are some estimated methods, which can be used to estimate the panel database. In this paper, we choose the fixed-effects model for the estimated process because this method helps to solve for unobserved country heterogeneity and the associated omitted variable bias, which can lead to serious afflicts cross-country estimation (see Prasad et al., 2006; Adams, 2009). Furthermore, in the regression process, the explanatory variables will be added step by step in various models. This estimated strategy helps to deeply analyze the relationship among variables in the econometric function.

The empirical data is totally sourced from the database of the General Statistics Office of Vietnam (GSO, 2020). Due to the missing of the national database, the study sample includes only 61/63 provinces for the years ranging from 2006 to 2018. The Gini index is calculated by the method of Yao (1997). Because the national income surveys are conducted in even years, the Gini index is only calculated for these years. In the case of odd years, the Gini value is calculated by taking the arithmetic mean of the two nearest even years. The

income variable is denoted by the real GDP per capita (based on the real GDP divided by the total population), the unit is VND million. The labour force is the ratio of labour force divided by population, the unit is the percentage. Besides, education is measured by the total number of schools, FDI is the total foreign direct investment (VND billion), tourism development is denoted by the revenue of tourism (VND billion), and trade development is the number of commercial centers in the provinces. The database of these variables is directly downloaded and calculated from the GSO's website.

3. Empirical result and discussion

3.1. The full panel sample

In this section, the quantitative strategy described in the previous section is used to estimate the econometric function (1). The estimated technique is run by the fixed-effects model. First, a regression is conducted with the full-panel provincial database in Vietnam for the period of 2006-2018. There are four models done by a different number of explanatory variables. The estimated results are represented in the table below.

Table 1. The estimation results of the full sample including 61 provinces

Variables	Model 1	Model 2	Model 3	Model 4
Income	0.00119***	0.00422***	0.0099***	0.00338***
Income squared		-0.00011***	-0.00009***	-0.00011***
Education			-0.00055*	-0.00062**
Labour force			0.00084***	0.00077***
FDI				-0.00046
Tourism				0.00077
Trade				-0.000061
Constant	0.34552***	0.33042***	0.29239***	0.329495***
R-squared	0.0987	0.2001	0.2201	0.2239
Observations	793	793	793	793
n (provinces)	61	61	61	61
*, **, *** significant at 10%, 5%, 1%				

Source: own compilation

As expected, there is a positive and significant relationship between income growth and inequality in Vietnam with all estimated models. The quantitative results indicate that an increase in real GDP per capita leads to an increase in inequality level in the study period. Hence, the policymakers should note that inequality has risen as same as the improvement in GDP per capita. It is a new finding in the context of Vietnam, because, unlike some previous studies which focus on a small area or a specific province (Tran et al., 2014; Tuyen, 2016; Bui et al., 2017; Nguyen et al., 2017; Tran et al., 2017), our study investigates throughout all of the provinces in the country. Our empirical result confirms that the Vietnamese economy is in a booming period, which is not only leading to an increase in average income but also receiving some social risks, for example, inequality is rising accordingly. Furthermore, based on the estimated results, the coefficients of income squared are negative and statistically significant, which indicates the income growth-inequality nexus in Vietnam followed the theory of Kuznets (1955). This theory can be understood that the relationship between income growth and inequality depended on the development level of the economy. In line with some previous studies in transition economies (eg., Jalles, 2011), our estimated results robustly

confirm the inverted U-shaped curve hypothesis for the relationship between income growth and inequality. This is an empirical contribution because there is no evidence regarding the inverted U-shaped curve that has been found in Vietnam.

The development of education has a significant negative relationship with inequality in the Vietnamese provinces, therefore, this variable helps to reduce inequality. This empirical result is quite understandable because the development of the education system improves the quality of human resources in the country and many employees have new opportunities to join advanced jobs with higher incomes, then, income inequality can decrease (Bui et al., 2017). Hence, the policymakers should support the investment in education in the context of financial investment demands for other infrastructures often flourishes during the rapid economic growth period. In the case of the labour force, this variable has a positive and significant relationship to inequality in all estimated models. In fact, there are different levels in the number of labourers between the provinces in Vietnam. There are some provinces that have a huge number of people in the labour working age range, while other provinces face a serious shortage of employees. Normally, in developing countries, the abundant labour force is an important factor to attract foreign companies, which helps to improve average income rapidly and enhance inequality in the regions. In Vietnam, the labour force is probably a reason for inequality in the provinces. From our evidence, the policymakers need concern and solve the different levels in the labour force among provinces. Our evidence is suitable to previous results found in other emerging economies such as Indonesia (see Nugraha et al., 2020) or other developed and developing countries (Seven, 2022). For other variables representing the level of international integration of the provinces, the coefficients of FDI and trade variables are negative and insignificant, on the other hand, the coefficient of tourism is positive and insignificant in the estimated result. Although it is not possible to clearly conclude in the case of the full-panel sample of the provinces, we hope to furtherly explore with a variety of sub-samples in the next section. Because the international integration process has become faster and stronger in Vietnam (World Bank, 2021), policymakers should carefully monitor the effect of integration variables on income inequality in the future. However, based on the estimated results, the values of R-squared are not high. This phenomenon can be explained by the cross-sectional data (provinces) having many diverse observations (Gujarati, 2011).

3.2. Estimated result of the North and South region

The regional characteristic of Vietnam's territory stretches along the coast, from the North to the South. In order to further explore the relationship between income growth and inequality in the provinces in Vietnam, unlike previous studies, this study proceeds to divide the provinces into 2 sub-panel samples including the North and the South regions. Where the North region includes 28 provinces and the South region has 33 provinces. The econometric model (1) is continuously used with the fixed-effects model to furtherly clarify the income growth-inequality nexus in the sub-panel samples. Some interesting findings are found by the comparison of the estimated results. Table 2 shows the quantitative results for the Northern and Southern territories.

In line with the estimated result of the full-panel sample, income has a positive and significant relationship with inequality in both the Northern and Southern territories with all estimated models. Based on the investigated results, it can be concluded that there is no different evidence between the 2 sub-panel samples and the full-panel sample. Because of the negative and significance of the coefficients of the income square variables, the inverted U-shaped curve for the income-inequality nexus is continuously confirmed in both Northern and

Southern territories in Vietnam. Hence, income inequality is also predicted to continue increasing in the context of the robust economic growth in this country in the coming period.

There is a new finding with the education variable, in detail, this variable negatively and significantly relates to inequality in the North region. This evidence can be explained that the education system in the Northern region has been invested more strongly than in the South region. In the North, there is a large number of academic institutions and universities. Thus, the policymakers should promote education development in the South to reduce inequality in this region.

The labour force variable has a positive and significant relationship with inequality in the North, on other hand, this variable has a negative relationship with inequality in the South but the coefficients are not significant. This finding shows a social problem is that workers from the North often move to the South to find employment because the South region has more jobs as well as higher wages. The shortage of labour occurs in the North region, which leads to a rapid increase in the salary level for attracting more workers to businesses in this region and thereby raising inequality. This social phenomenon has appeared in previous years, hence, the policymakers need to address reducing the inequality in Vietnam.

Table 2. The estimated results in the North and the South region

North region				
Variables	Model 5	Model 6	Model 7	Model 8
Income	0.00117***	0.00564***	0.00295***	0.00315***
Income squared		-0.00018***	-0.00010***	-0.00011***
Education			-0.0006	-0.00072*
Labour force			0.00158***	0.00156***
FDI				-0.00132*
Tourism				0.00175*
Trade				-0.00013
Constant	0.34897***	0.32888***	0.25266	0.36704***
R-squared	0.0732	0.2265	0.2881	0.2991
Observations	364	364	364	364
n (provinces)	28	28	28	28
South region				
Variables	Model 9	Model 10	Model 11	Model 12
Income	0.00120***	0.00356***	0.00393***	0.00427***
Income squared		-0.00009***	-0.00010***	-0.00011***
Education			-0.00050	-0.00056
Labour force			-0.00028	-0.00032
FDI				0.00028
Tourism				0.00037
Trade				-0.00013
Constant	0.34259***	0.32982***	0.34505***	0.23459***
R-squared	0.1253	0.2050	0.2102	0.5766
Observations	429	429	429	429
n (provinces)	33	33	33	33
*, **, *** significant at 10%, 5%, 1%				

Source: own compilation

Furthermore, FDI has a negative and significant relationship to inequality in the North. This empirical result shows that FDI in the North might have robust spillovers effects on a larger number of provinces than in the South. There are many provinces in the Northern region that have a significant increase in the number of FDI projects, otherwise, in the South,

FDI is mostly concentrated in a narrow area around Ho Chi Minh City. Hence, this finding shows an important role of FDI in helping to reduce inequality in Vietnam. The estimated coefficient of the tourism variable is only positive and statistically significant in the North region. In fact, the North has many beautiful natural heritages compared to the South. However, the results demonstrate that tourism seems to spread only in a few provinces that have an advantage development in tourism, as a consequence, tourism growth leads to an increase in inequality in the north of Vietnam. The evidence confirms a challenge for policymakers to have a more connected and advantaged tourism development strategy among provinces. Then tourism will reduce inequality rather than blooming this social problem. Finally, the trade development variable has a negative relationship with inequality in both the North and South regions but the coefficients are not significant. So the policymakers should strongly step up higher connectivity between the two regions in order to spread trade development between the North and the South. Trade growth will help reduce inequality across the vast territory of Vietnam.

3.3. Estimated result of six sub-economic regions

The Vietnamese government divided the provinces into six sub-economic regions stretching from the North to the South regions.

Table 3.The estimated results in the Red River Delta and Northern Midlands & Mountain

Red River Delta				
Variables	Model 13	Model 14	Model 15	Model 16
Income	0.0001	0.00078	0.00093	0.00027
Income squared		-0.00003	-0.0002	-0.00001
Education			0.00089*	0.00008
Labour force			-0.00039	-0.00078
FDI				-0.00251*
Tourism				0.00052
Trade				0.00463**
Constant	0.3429***	0.3384***	0.3545***	0.3817***
R-squared	0.0010	0.0101	0.0427	0.1490
Observations	130	130	130	130
n (provinces)	10	10	10	10
Northern Midlands & Mountain				
Variables	Model 17	Model 18	Model 19	Model 20
Income	0.00435***	0.01708***	0.01337***	0.01839***
Income squared		-0.00093***	-0.00080***	-0.00106***
Education			-0.00260***	-0.00242***
Labour force			0.00114**	0.00113**
FDI				-0.00594**
Tourism				-0.07420
Trade				-0.00758***
Constant	0.3454***	0.3079***	0.2645***	0.2534***
R-squared	0.2901	0.4439	0.4805	0.5310
Observations	182	182	182	182
n (provinces)	14	14	14	14
*, **, *** significant at 10%, 5%, 1%				

Source: own compilation

This decision has been explained by the national leaders as a strong solution to develop a group of provinces based on the same characteristics in each economic region. The six sub-economic regions are the Red River Delta (10 provinces), Northern Midlands & Mountain (14 provinces), North Central & Central Coastal (14 provinces), Central Highlands (6 provinces), Southeast (5 provinces), and Mekong River Delta (14 provinces). Following the decision of the government, we divide the database (61/63 provinces) into six groups representing six sub-economic regions. Nextly, the econometric is used in equation (1) with the sub-samples. The empirical results will be furtherly analysed to find new evidence of the income growth-inequality nexus in six sub-economic regions. The estimation results are presented in the following three tables.

Firstly, we will focus on the estimated coefficients that reflect the relationship between income growth and inequality in six sub-economic regions of Vietnam. There is a positive and significant relationship between income growth and inequality in 3 sub-economic regions including Northern Midlands & Mountain, North Central & Central Coastal, and Central Highlands. As a consequence, the inverted U-shaped curve for the income growth-inequality nexus is continuously demonstrated in these sub-economic regions. Hence, policymakers need to have urgent solutions to reduce inequality in these sub-economic regions.

Table 4. The estimated results in the North Central & Central Coastal and Central Highlands

North Central & Central Coastal				
Variables	Model 21	Model 22	Model 23	Model 24
Income	0.00169***	0.00356***	0.00441***	0.00822***
Income squared		-0.00010***	-0.00012***	-0.00040***
Education			-0.00010	-0.00028
Labour force			-0.00045	-0.00114***
FDI				0.0030
Tourism				0.03798***
Trade				0.00155*
Constant	0.3314***	0.3240***	0.3448***	0.3679***
R-squared	0.2195	0.2554	0.2637	0.3686
Observations	182	182	182	182
n (provinces)	14	14	14	14
Central Highland				
Variables	Model 25	Model 26	Model 27	Model 28
Income	0.0038***	0.0057**	0.01302***	0.01572***
Income squared		-0.0001	-0.00032**	-0.0004***
Education			-0.00188	-0.00193
Labour force			-0.00286**	-0.00291**
FDI				-0.02397
Tourism				-0.08481
Trade				-0.0009
Constant	0.3405***	0.3325***	0.4588***	0.2534***
R-squared	0.3872	0.3930	0.4754	0.5008
Observations	78	78	78	78
n (provinces)	6	6	6	6
*, **, *** significant at 10%, 5%, 1%				

Source: own compilation

Although the Red River Delta and Southeast region have the highest GDP per capita level in Vietnam, the estimated coefficients are not statistically significant in these sub-

economic regions. This evidence helps to explore that income growth has not got a significant relationship with inequality in these regions. It confirms a strong spillover effect of economic growth on the income of households in the regions. The provinces in the Red River Delta (such as Hanoi capital) and the Southeast region (such as Ho Chi Minh City) are considered to be the most characteristic of a free market economy with a high level of business liberalization. Besides, the Red River Delta and Southeast region also have the least ratio of state companies compared to other regions. Furthermore, the Red River Delta and Southeast region account for nearly 70% of private enterprises in Vietnam. Therefore, the policymakers should promote the private sector as well as narrow the state economic sector in these regions.

Table 5. The estimated results in the Southeast and Mekong River Delta regions

Southeast				
Variables	Model 29	Model 30	Model 31	Model 32
Income	-0.0003	0.00193*	0.00136	0.00135
Income squared		-0.00006*	-0.00004	-0.0005
Education			0.00015	0.0007
Labour force			0.00045	0.0005
FDI				-0.00005
Tourism				-0.00004
Trade				0.00082
Constant	0.3524***	0.3334***	0.3077***	0.3679***
R-squared	0.0265	0.1339	0.1552	0.1579
Observations	52	52	52	52
n (provinces)	4	4	4	4
Mekong River Delta				
Variables	Model 33	Model 34	Model 35	Model 36
Income	0.00144***	0.00140	0.00174	-0.00015
Income squared		0.00001	0.00002	0.0006
Education			0.0002	0.0004
Labour force			-0.0001	-0.00291**
FDI				-0.0049
Tourism				-0.0175
Trade				0.0039**
Constant	0.3440***	0.3342***	0.3493***	0.3648***
R-squared	0.2005	0.2005	0.2012	0.2204
Observations	169	169	169	169
n (provinces)	13	13	13	13
*, **, *** significant at 10%, 5%, 1%				

Source: own compilation

In the Northern Midlands & Mountain region, the education development variable has a negative and significant relationship to inequality, while the coefficients of the education variable are not statistically significant for the other regions. These results indicate education has an important role in reducing income inequality in the Northern Midlands & Mountain region which is the main living land of the ethnic minority communities in Vietnam. This finding is consistent with the previous result of Bui et al. (2017) in this region. Recognized as a successful country in the universalization of education in the Asia-Pacific region, Vietnam has developed a large public education system (World Bank, 2021). The private education sector has also expanded rapidly in recent years. In general, people can easily join the education system in this country. However, in some areas where ethnic minorities concentrate, such as the Northern Midlands & Mountain, the access to the education system may be limited because of cultural barriers in this area (Nguyen et al., 2017), conflict in the

language with main ethnic groups such as the Kinh ethnic (Kang & Imai, 2012; Nguyen et al., 2017). This finding provides valuable information for the policymakers to develop the education system in Vietnam. The role of educational development is enormous in addressing social issues in a developing country such as Vietnam (Bui et al, 2017). The estimated results conclude that education is an effective tool to reduce income inequality in regions, which has education development outperforms other regions.

Because of the variation in labour force levels between regions, there are different points in the estimated results. The estimated result shows a negative and significant relationship between the labour force and inequality in three regions including the North Central & Central Coastal, Central Highlands, and Mekong River Delta regions. Based on this evidence, in these three regions, the labour force is an important factor to reduce inequality. The practical implication is a province that has a larger labour force leading to a lower inequality level. However, in the case of the Northern Midlands & Mountain region, the estimated coefficients are positive and indicate a larger labour force province can have higher inequality. Hence, the improvement of key socio-economic indicators in social welfare for ethnic minorities will help to reduce inequality not only in a specific region such as the Northern Midlands & Mountains but also in Vietnam (see Syahnur et al., 2021). It can be explained that this region is the homeland of the largest ethnic groups of people who have low labour skills, low educational levels as well as the poorest group in Vietnamese society.

Regarding the international integration variables, firstly, FDI has a negative and significant relationship to inequality in two sub-economic regions including the Red River Delta and Northern Midlands & Mountain. Our findings show that FDI has a more positive spillover effect in the Northern provinces than others. Hence, in the coming period, the policymakers need to increase the connectivity of this region to others (eg., by investing in infrastructure system) to raise the positive spread of this resource for reducing inequality (see Nugraha et al., 2020). Secondly, the tourism-inequality nexus is a positive and significant relationship in the North Central & Central Coastal. Therefore, an increase in tourism revenue leads to an increase in income inequality in this region. The provinces in this region are characterized by narrow plains, long shorelines, and tropical climates. This area has received a booming demand from tourists in Vietnam in recent years. This region has major urban areas and high urbanization with many kinds of services for tourists to spend their money. In large urban areas which have high numbers of visitors, tourism development can raise inequality. When tourists go to urban areas, they often stay in the central and households located in these areas would have a sudden increase in their income compared to others. Obviously, the households involved in tourism services may have a higher income compared to others. If tourism is well employed in the development strategy of provinces, the revenue in tourism might reduce inequality because this financial flow will help spread income to many families. Our evidence is a good reference for policymakers in the context that Vietnam is a rising star of the Asian tourism market.

Finally, the trade development variable has a negative and significant relationship to inequality in the Northern Midlands & Mountains region. According to the Vietnamese geographical features, this region borders China and has many border gates connecting Vietnam and China. In recent years, China has been one of the three largest trading partners of the Vietnamese economy. Trade development in this region is really widespread, as a result, trade has a negative and significant effect on inequality in the provinces in this region. In other regions, trade development variables have a positive and significant relationship with inequality such as in the Red River Delta, North Central & Central Coastal, and the Mekong River Delta. This evidence is mean that in these regions, trade development is not really widespread and this variable has increased inequality in previous years. In the other regions,

the estimated coefficients are not significant, indicating a disparity in trade development in Vietnam.

Conclusion

This paper aims to examine the relationship between income growth and inequality in 61 provinces of Vietnam in the period of 2006-2018. There are a variety of econometric equations done with three types of statistical samples: full-panel, North and South regions, and 6 sub-economic regions. The estimated results reveal that income growth positively and significantly relates to inequality in Vietnam. The regression results are not significant in the Red River Delta and Southeast region which have the highest GDP per capita, the highest level of market freedom as well as the largest private business sector. Besides, the results indicate the labour force has a positive impact on reducing inequality in most territories. In addition, our investigated results also indicate that education can help to reduce inequality, however, the significant negative effect of education on inequality has appeared only in the Northern Midlands & Mountain which has ethnic minorities concentrated in Vietnam. If education develops and expands at high levels, this factor can reduce inequality. FDI has a negative and significant relationship with inequality in the North region, which shows a good impact of this foreign capital source on social problems such as inequality. Tourism has a positive impact on inequality in the North region. In this region, urban areas always have a huge number of tourists who live and spend money, hence, tourism growth may raise inequality. It is the reason for inequality affected by tourism. Finally, trade development has an unclear role in the relationship with inequality in Vietnam.

There are some policy implications that can help the policymakers to reduce inequality, meanwhile, promote income growth for people. Firstly, the provinces need to robustly attract FDI and promote tourism in the coming time. FDI can bring employment opportunities with higher wages, on the other hand, tourism can help reduce inequality through increased opportunities for improving the income of households. It should be noted that education is being developed in Vietnam but it is only concentrated in a few large cities such as Hanoi, Ho Chi Minh City, and neighboring provinces. Therefore, in the coming period, policymakers need to widely invest in education development and create links the educational activities in the provinces. Education raises human capital and helps reduce inequality. In addition, trade development is a good tool to help decrease inequality, especially in provinces that are adjacent to major trading partners. The development of trade is associated with a higher quality of infrastructure which can help reduce inequality in a large territory. Finally, policymakers should also prioritize creating jobs and attracting investment for inclusive development in localities. These policies will take advantage of the young and abundant human resources in Vietnam to improve the socio-economic indicators in the coming time.

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