Financial Development and Income Inequality in Vietnam: An Empirical Analysis

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Abstract

The pattern of income distribution can be influenced by financial evelopment. Using provincial data, this paper empirically investigates the relationship between financial development and income inequality in Vietnam from 2002 to 2008. The results show that financial development has a positive impact on reducing income inequality, which is consistent with the bulk of theoretical and empirical research. The results also confirms that financial development when it interacts with education has joint-effects on reducing income inequality. We also find no evidence supporting the Greenwood-Jovanovic hypothesis of an inverted U-shaped relationship between the financial sector of development and inequality.

Keywords: Financial development, income inequality, Vietnam

1. Introduction

In the last two decades, Vietnam has implemented a variety of social and economic reforms with regards to promote economic growth and participate deeper into the world economy. Those reforms, involving the transiting from a one-level banking system to a two-level one in 1991, privatizing state-owned enterprises (SOEs), developing capital market by operating a stock market since 2000 as well as increasing the minimum wage level recently and educational reforms have influenced the living standards and the pattern of income distribution in Vietnam.

Furthermore, Vietnam entrance into WTO in 2006 has attracted large foreign capital inflows under foreign direct investments projects. Market-oriented economy and free trade helped release the potentials and capabilities of individuals and enterprises. As a result, the economy gained higher productivity, efficiency, and of course economic growth. However, achievement of high economic growth in the period of transformation to a full market-oriented economy seems to be partnered with a more severe situation of income disparity. According to the General Statistics Office of Vietnam (GSO, hereafter), Gini coefficient has indeed increased from 0.35 in 1993 to 0.43 in 2010. Together with high inflation, income inequality reflexs macro-economic instability which has given policy makers headaches.

On a purpose to have a broader view about the trends of income distribution in Vietnam, many scholars have tried to inspect the evolution of inequality. For example, Houghton and Phong Nguyen (2010) or Van and Akita (2008) identify the urban/rural gap due to location and characteristics like education,

income sources, or gender of household head; Takahashi (2007) directs interest on forces determining regional income inequality like return to human capital or land ownership.

In another issue of interest, the financial and banking sector in Vietnam also experienced fast pace expansion. Phan Nguyen Dinh (2010), Answar and Lan Nguyen Phi (2009) or Tuan Tran Anh (2008) are examples that praise financial development in driving economic growth. Yet, no paper has attempted to investigate the impact of financial development on income inequality to the best of our knowledge. This study, thus, is to fill this gap in literature in Vietnam by analyzing provincial data over the period 2002-2008 and employing panel data model. We expect to obtain evidence that is in line with Galor and Zeira (1993) and Banerjee and Newnam (1993), financial development could reduce income inequality.

The rest of the paper is organized as follows. Section 2 highlights a summary of theoretical and empirical studies on the nexus between financial development and income inequality. Section 3 presents the overview about financial development and income inequality in Vietnam. Model specification and methodology are in section 4. Section 5 describes empirical results and section 6 addresses conclusions.

2. Literature review

2.1. Theoretical studies

The linkage between financial development and income inequality has been given attention lately. To date, two strands of thought, of which one follows non-linear hypothesis and another follows linear hypothesis, are still under investigation for empirical evidence.

Linear hypothesis:

Galor and Zeira (1993) (GZ, hereafter) offer an overlapping generation model, concentrating on the importance of human capital investment. They assume in an economy there are two sectors producing a single good: skill-intensive and unskilled-intensive sector. Individuals live for two periods, endowed with an amount of initial wealth (bequest) from their ancestors. Each individual has two occupational options: to work as unskilled for the whole life (in unskilled-intensive sector), or to invest in human capital in the first period and work as skilled in the second period. The model implies that at starting point of an economy, individuals are identical except the difference in amount of initial wealth they inherited. The ones with large initial wealth tend to invest in human capital in the first periods, work as skilled in the second period, earn more, and bequeath more. The ones with small initial wealth have to borrow if they want to invest in human capital. However, human capital investment is indivisible, and borrowing is costly and restrictive due to the under development of the financial markets, not all people can afford to borrow. Individuals who are unable to borrow remain as unskilled for their entire lives, earning less and bequeathing less. This cycle repeats in every generation. So, initial wealth determines the gap between the rich and the poor, and income inequality is inevitable. After that, the economy starts to grow; leading to gradual development of financial markets, credit services are broadened, making it easier to access, less costly and less restrictive. The poor have more chances to borrow for human capital investment, then to work as skilled workers and earn more. As a result, income inequality

starts to fall. This model is known as linear hypothesis.

The same theoretical framework could be seen from Banerjee and Newman (1993) (BN, hereafter) in which an individual faces three occupational choices instead of two as in GZ. In this three-sector model of BN, bequest is also taken into account. An individual could choose to work as a wage laborer, requiring no indivisible investment, earning less; as a self-employee; or as an entrepreneur requiring indivisible investment, earning higher returns. However, due to the imperfection of the capital markets, only rich people or those who can borrow could afford the indivisible investments. Initial wealth in terms of bequests becomes the key point determining the initial income inequality. The model, therefore, suggests that in a country where the credit market is underdeveloped, that it is harder to raise fund to finance indivisible investment, higher income inequality would be prevalent. They conclude that income inequality should be negative related to financial development.

Non-linear hypothesis:

Motivated by Kuznets (1955), Greenwood and Jovanovic (1990) (GJ, hereafter) construct an intermediation model, explaining a mechanism through which financial development interplays with income inequality. They assume that each agent of the economy could pursue one out of two investment opportunities, of which one is safe but offers a low return, and one is more risky but with a higher return. Intermediary service arises and plays the role of diversifying investment portfolio for any individual who wants to participate in the intermediation projects. Before that, the financial system is poorly developed; the resources are inefficiently allocated, lead-

ing to modest economic growth. Later, with the emerging of financial intermediary, the resources become more productive. However, only rich individuals whose wealth is greater or equal to a determined threshold could join the intermediary projects, and gain more income. The poor have to accumulate their wealth for a certain period of time to meet the threshold mentioned above. So the income difference between rich and poor widens a long with the expansion of a financial structure and fast economic growth. At the mature stages of economic development, the financial sector is entirely modern, most people can access financial services. The economy achieves a stable and steady state, income inequality starts to narrow down. The model covering descriptions above is known as inverted U-shaped theory or non-linear hypothesis.

2.2. Empirical studies

To date, a variety of empirical work has been carried out all over the globe to investigate the alternative theories. In China, Jalil and Feridun (2011) uses annual data from 1978 to 2007 to examine the link between financial development and income inequality. They find that financial development has made positive contributions to alleviate income inequality. The result supports linear hypothesis voiced by GZ and BN, but found little evidence to support inverted U-shaped one suggested by GJ. Earlier, Liang (2006a) running regression with data set of 29 urban Chinese provinces over the period 1986-2000, finds that income inequality is lower in provinces that have better organized financial sectors. In a similar research paper covering 21 rural provinces from 1991 to 2000 with a similar methodology, Liang (2006b) comes to

the same conclusion that financial development reduces rural income inequality. He also finds no evidence supporting non-linear hypothesis.

The role of financial development in relation with income distribution has also been given attention in other countries. In Malaysia, Law and Tan (2009) analyze data sets over the period 1980-2000 but find no success of financial market development in fighting income inequality. A number of other indicators as proxies for financial development have been used changeably but could not alter the story. The inefficiency of the financial system is blamed for this result, which is consistent with Ang and McKibbin (2005) in a study about financial liberalization, where they explore that financial expansion is not necessary to foster long term economic growth. Both studies call for more quality-intensive financial planning. In Pakistan, using data from 1971 to 2005, Shahbaz and Islam (2011) show that financial development brings about distribution of income which is more equal, while financial instability does not. In Brazil, to investigate finance–income inequality nexus, Bittencourt (2006) employs data from 1985 to 1999. He finds evidence to call for a broader financial market, which help boost personal credit especially for the poor.

In Africa, Batuo, Guidy and Mlambo (2004) inspect data from 22 countries over the period 1990-2004 and find evidence to support a linear model, and that education matters a lot in reducing income disparity. On the cross country level, Honohan (2007) gathers data from 160 countries using some alternative measures of financial development. The result suggests that the poor who can access financial services are a key factor to help

reduce inequality. Kappel (2010) analyzes cross-country data from 78 developing and developed countries from 1960 to 2006 also finds the importance of financial development on reducing inequality, and that non-education could lead to inequality permanently. Another work by Clarke, Xu and Zou (2003) exploit a panel data of 91 countries over 1960-1995 on the basis of a 5-year period show that low income inequality is associated with the development of the financial sector.

In Vietnam, there have been some papers on financial development and economic growth. For example, Anwar and Phi Lan Nguyen (2009), analyze a panel data of 61 provinces over the period 1997-2006 and discover that economic growth is positively linked with financial development. Tuan Tran Anh (2008) using quarterly time series data from 1995 to 2006 and employing ordinary least square model holds the conclusion that economic growth is positively influenced by financial development. More recently, Phan Nguyen Dinh (2010) studies the impact of financial development at the household level using data from VHLSS 2004 finds improvement of investment and savings on the income levels of households. However, none of those papers concerned itself with the effects of financial development on income inequality. As far as we concern, this is the very first paper in Vietnam studying the nexus between financial development and income inequality.

3. Overview of financial development and inequality in Vietnam

3.1. Financial development

During the last decade, the Vietnamese financial market blossomed. The financial sector has been studied by many authors and institutions with regards to analyzing the impact on it with other economic activities. Statistical data from surveys conducted by GSO since 1993 showed that the number of financial enterprises in the whole country went up from 935 in 2000 to 1,635 in 2008.

From 2005, the number of business ventures in finance increased sharply, it could be subject to the event of Vietnam entering the WTO in 2006, where it peaked with 1,741 enterprises (see figure 2). The figure dropped in 2007 but does not mean that the market shrank at that time. The activity of merger and acquisition could explain this drop, because values of operating capital and revenue and even labor force for the whole market continued to rise.

In the banking sector, Vietnam also saw fast growth in the last decade. Operating under a two-tiered system since 1991 might be considered the first banking reform in Vietnam at the macro level, followed by a number of other reforms including restructuring of the banking system, privatizing state own banks, strengthening the process of capitalization of local banks has revealed that Vietnams banking sector keeps changing step by step to keep pace with the new world economy.

Currently, there are six state-owned banks, 37 joint-stock commercial banks (JSCB), 05 wholly foreign-owned banks and 04 joint-venture banks. The State Bank of Vietnam (SBV) performs the role of managing monetary issues and banking activities, being a money issuer, the bank for credit institutions and performing banking services for the government. The mission of SBV is to aim at stabilizing the financial and banking businesses, control price levels, prevent and fight against

Figure 1: Number of financial companies
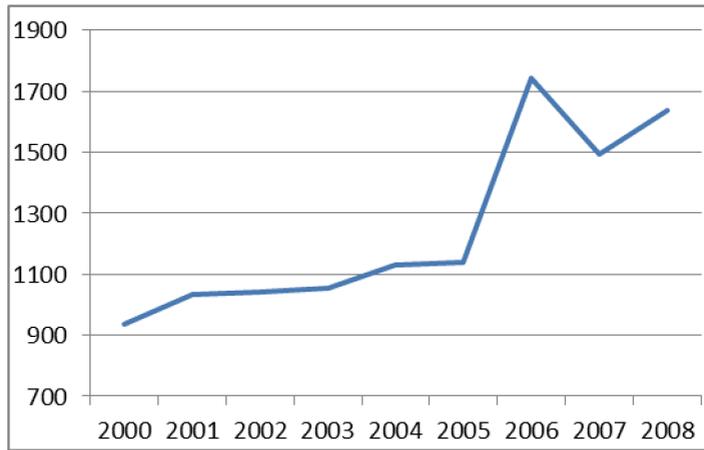
Source: The Enterprises in Vietnam 9 years at the beginning of century 21- GSO, 2010.

money laundering, ensure the safety of the banking and financial systems and promote socio-economic development. In the whole system, total domestic assets rose sharply from 1,097 trillion dong in 2007 to 2,690 trillion dong in 2010, and the figure is estimated to mount to 3,667 trillion dong at the end of 2012.

The development of the banking sector has also received attention from other authors, such as Ho and Baxtor (2011). According to these authors regarding the retail banking, the

Figure 2: Some indicators of financial enterprises over the period 2000-2008
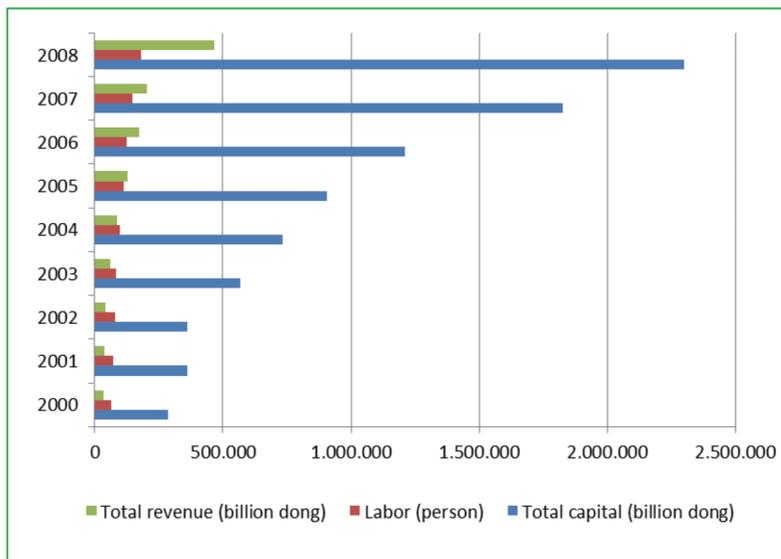
Source: The Enterprises in Vietnam 9 years at the beginning of century 21- GSO, 2010.

number of credit cards and debit cards in 2010 rose two-fold as compared with 2008 to around 28.5 million cards. At the end of 2010, the number of automated teller machines (ATM) was 11,000, while the figure was only 1,800 in 2005. However, retail banking seems just to be starting its cycle; until the end of 2009, just around 20% of country had bank accounts and around 10% of the population held an active account.

Bank lending is another remarkable impression. State-owned commercial banks (SOCBs) initially served the requirement of capital for state owned enterprises (SOEs), and operated as policy banking institutions. However, they are now focusing more on commercial activities, competing fairly with joint stock commercial banks and foreign banks. SOCBs hold the large share of lending, accounting for 49.3% of total loans in December 2010, going down successively from 2007(see Table 1). This reflects that private commercial banks have become more active and play a more important role in the economy.

Privatizing SOCBs: In May 2006, the government announced a plan for equitizing SOCBs and reducing government ownership to 51% by 2010. At that time, the goal of government was to privatize all SOCBs. However, only two out of six SOCBs have succeeded in selling shares to private owners. In 2007, the Vietcombank was the first bank to implement an IPO (initial public offering) selling 6.5% stake worth of 10.5 trillion dong (equivalent to 652 million USD). One year later, the Vietinbank sold 4% stake worth of 1.1 trillion dong (equivalent to 64 million USD) in its IPO. Early in 2011, it exchanged an additional 10% of its share to IFC for 182 million USD (International Finance Corporation) and made this partner the sole strategic foreign investor.

Another action of the government is to concentrate on the strong capitalization of banking system. SBV requested all banks meet two

Table 1: Lending of banking institutions by type

|	Criteria	2007	2008	2009	2010
SOCB	Lending (trillions dong)	623	763	982	1,221
	%	58.4	57.0	52.5	49.3
JSCBs and other banks	Lending (trillions dong)	444	576	887	1254
	%	41.6	43	47.5	50.7
Total	(trillions dong)	1,067	1,339	1,869	2,475

Source: Ho and Baxter (2011)

criteria: they must hold a minimum nominal capital and minimum capital adequacy ratio. Decree 141 of the government in 2006 requested all the banks to increase capital to 03 trillion dong as a minimum by 2010. According to the decree, banks, that could not meet the requirements, could be forced to merge or reduce operating ranges of services, or get its license revoked. Only twenty banks met the requirement, so in 2011 the government extended the deadline to the end of the year. In 2010, SBV also requested all banks to follow the minimum capital adequacy ratio of 9%, a one percentage point higher than previously required (8%). These measurements of the SBV seemed to get the banking sector closer to the standard proposed by the Basel III capital framework. This also showed the effort of authorities in expanding the role of the banking sector as well as responsibility for directing the sector complying with the international standards, building the banking sector strongly and sustainably, being able to compete with foreign bankers and survive in a more and more challenging era.

In terms of monetary development, statistical figures of total liquidity, credit and capital mobilization presents the most outstanding points in the development of the financial sector in Vietnam. General speaking, growth rates of these three financial indicators increased dramatically from 2002 to 2007, then went up and down till 2010. Average growth rates of total liquidity for period the 2003-2010 was 29%, that of credit was approximately 35% and of capital mobilization 31.75%.

Figure 3 shows that growth rates of total liquidity, credit and capital mobilization peak up, at 46.12%, 53.89% and 47.64% respectively. The years committing lower rates show the prudence and flexibility of the government in controlling monetary policy with regards to subsidizing economic growth and controlling price levels. While, the years of higher rates show that the State is following a loose monetary policy, promoting investment, growth is more concerned than inflation. The exceptional high growth rates happen in 2007 could be explained by the motivation of the events with

Figure 3: Growth rate of money supply, credit and capital mobilization by years (%)
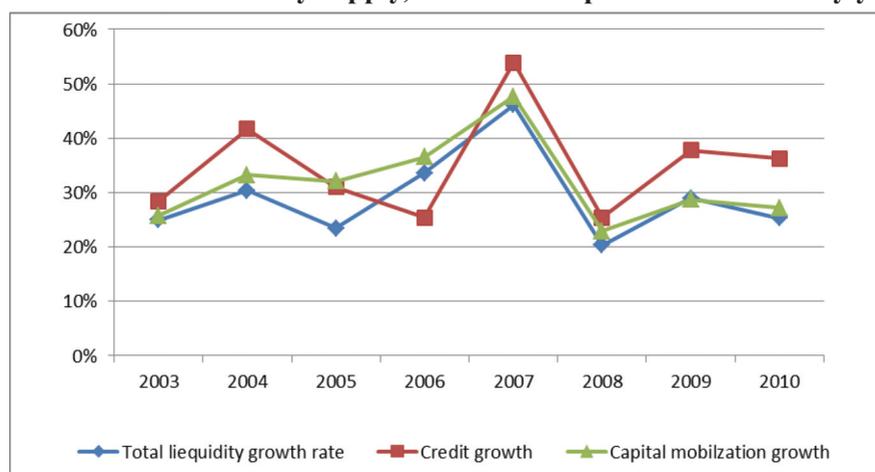
Source: SBV Annual Reports in various years

Vietnam entering WTO in 2006. The effect of the global financial crisis starting in 2008 is blamed for the downward trend afterwards. Besides, the stock market bubble is another reason for the declining trend of financial indicators in later years. VNIndex started to rise from 300 points to 1,150 points early 2007, then stood at 900-1,100 points in the first three quarter of the year. The stock market boom has attracted inflows of high capital from the local population and foreign investors. The last decade also witnessed a very fast and hot period of development in the realty sector, housing prices rose sharply from its true value, investors utilized financial leveraging tools with money from banks. Since mid 2008, the real estate market has fallen, leading to a difficult period not only for the financial sector but for the whole economy.

The development of the financial and banking sector has contributed significantly to the economic growth. GDP by financial enterprises on average account for 1.82% in national GDP since 2000, and tends to increase over time. However, the Vietnamese financial market has proved to be fragile and vulnerable to external factors as well as internal factors. To have a better organized and stable financial environment, further reforms and a better legal framework are required.

3.2. Inequality

The issue of inequality in Vietnam has consumed a lot of papers and time and scholars. Gini coefficient for the whole country, the common indicator specifying degree of inequality, has increased recently. The coefficient is derived from data of Vietnam Living Standard Surveys (VLSS) conducted by GSO since 1993 (Vietnam Household Living Standard Survey – VHLSS from 2002). According to GSO, the gap between the richest and the poorest is in an upward trend. The income different coefficient calculated based on the average income per capita of the 20% richest and that of the 20% poorest has increased quite lot from 7.6 times in 1999 to 9.2 times in 2010. This reinforces the argument that inequality in Vietnam is becoming worse as stated above. In particular, Gini coefficient is in upward trend since 2002, and already over 0.40 – the level some scholars considered as dangerous, the situation could be worse if there was no action to avoid unequal income distribution among the population.

"40%" standard by World Bank looks at the income proportion of the 40% poorest over that of the whole population. There exists a high inequality, or medium inequality, or comparative equality if the calculated proportion is below 12%, falling between 12% and 17%, or higher than 17% respectively. According to this rule, income distribution among the population in Vietnam is rather equal, but the trend is moving toward the medium zone, meaning less equal.

In the recent years, the process of urbanization at high speed (3,4% annually on average, sees more on Figure 4) in Vietnam gives rise to concerns about urban-rural gaps. Urbanization, especially in big cities, contributes a lot to economic growth and the target of eliminating hunger and alleviating poverty in the country. Urbanization leads to waves of people migrating from the countryside to cities. Most of those who migrate normally work as wage laborers, earning more in comparison with their colleagues in rural farmers or self-employed in their home town.

Table 2: Some facts about income distribution and inequality in Vietnam

Year	1999	2002	2004	2006	2008	2010
Different coefficient of income gap	7.6	8.1	8.3	8.4	8.9	9.2
Gini Coefficient	0.39	0.418	0.42	0.42	0.43	0.43
Proportion of wealth held by the 40% poorest population	-	17.9%	17.4%	17.4%	16.4%	15%

Sources: GSO of Vietnam, the result of survey on living standards in various years

Firgure 4: Proportion of population living in urban area (%)
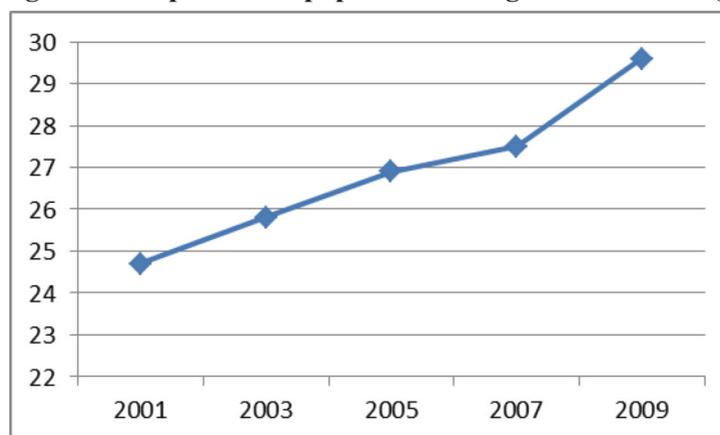
Source: Vietnam population and housing consensus 2009, Migration and urbanization in Vietnam: Patterns, trends and differentials – GSO 2011

Those people could escape from hunger or poverty only, but they could not lighten the level of disparity between rural and urban areas because employers in cities even gain much more returns from hiring those migrants.

Thus, it could be said that the proportion of the population currently is around 30%, given that Vietnam is a developing country, urbanization in Vietnam is relatively low. This promises urbanization will continue and maybe even at a higher speed in the coming years when the economy becomes integrated more fully into the world economy. The industrialization and modernization process takes place faster to build better socio-economic infrastructure. This does also mean that higher levels of inequality between rural and urban area could be present, and there is no way to stop this situation, social policy makers could be put it outside their mind.

More specifically, Nguyen Binh et al. 2006, on paying attention to urban-rural gap in Vietnam, discovered the real upward trend in

Figure 5: Estimated coefficient of urban-rural gap at mean
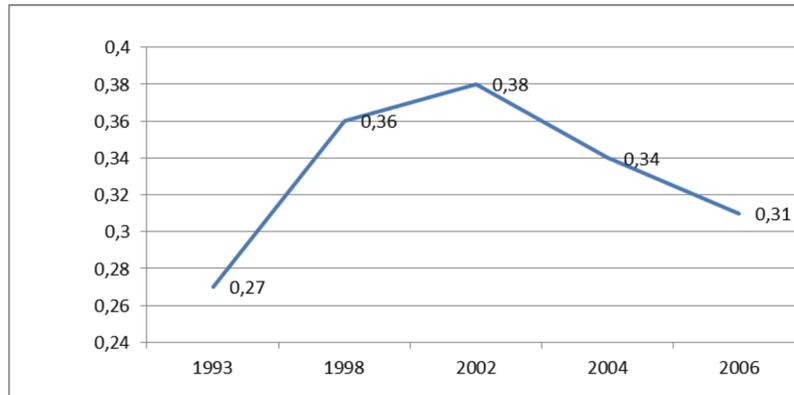
Note: The coefficient is of dummy urban, ln(RPCEP) is dependent variable.
Source: Le and Booth (2010)

Table 3: Income per capita on average in urban and rural areas (1000 VND)

	1999	2002	2004	2006	2008
Rural	225	257	387	506	762
Urban	519	622	815	1,058	1,605
Gap	2.31	2.42	2.11	2.09	2.11

Source: GSO

income gap, especially from 1993 to 1998. They showed that the estimated urban-rural income difference in terms of mean log of real per capita expenditures increased sharply from 0.56 in 1993 to 0.74 in 1998. In addition, Houghton and Phong Nguyen (2010) show that this coefficient increased slightly to 0.80 in 2002 and complement the argument that inequality in rural areas is less severe than in urban areas in the period 1993 -2002. This argument is then reinforced by results estimated by McCain, Benjamin and Brandt (2009). Thu Huong Le and Booth (2010) studying the urban-rural living standard in Vietnam also reveal one assessment just stated that rural-urban gap rose remarkably from 1993 to 1998,

climbed up slightly in 2002, it went down a bit in 2004 and had a big fall in 2006.

The income gap between urban and rural areas could also be viewed in a more visual way when looking at level income per capita on average over years (see Table 3 for detail). It is supporting empirical findings from Le and Booth (2010), the gap goes up from 1999, drops largely in 2006, and then starts to rise.

3.3. Descriptive assessment about the finance-inequality nexus

Vietnam has achieved fast growth of the financial and banking sector in the last decade. Paralled with it, the situation of inequality in the country as a whole seems to be worse . However, if only based on what we

Figure 6: Negative relation between Gini coefficient and financial development at provincial level

yhat = 34.983 + -.05*fd1   r = -.108
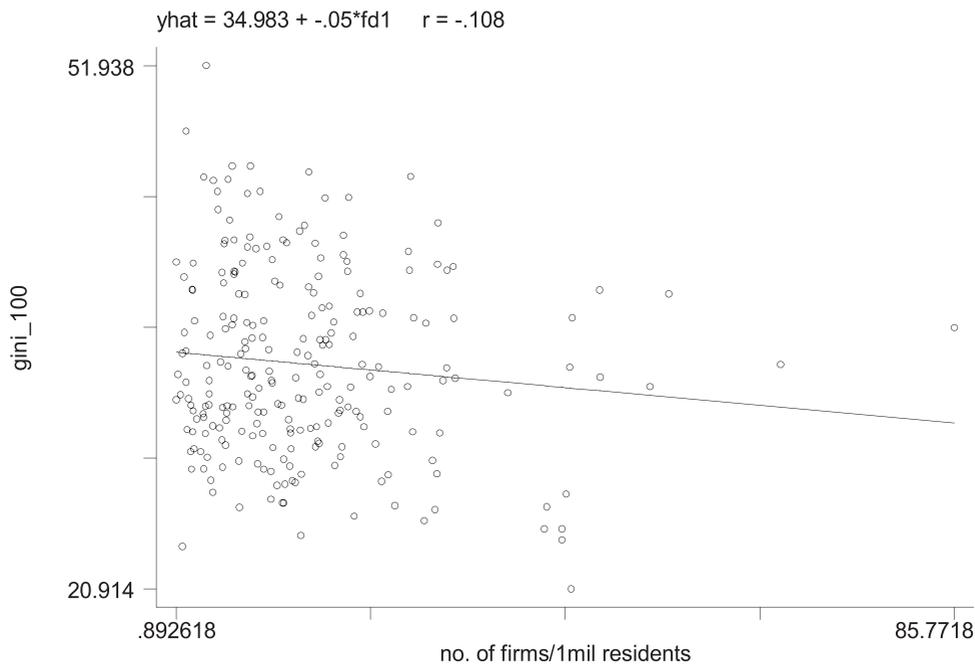
Note: FD1 is the number of financial firms per 01 million population in every province or city, Gini_100 is Gini coefficient multiplied by 100.

discussed above, it is difficult to understand if there was a positive or negative relation between financial development and income inequality. For instance, Gini coefficients of 2008 and 2010 are of no difference; whereas, some major indicators of finance such as credit, total liquidity still go up quite lot and are stable in the same period. The method of scattering also records uncertain conclusions. We define FD1, FD2, FD3 by three indicators of financial development used changeably in running regression (described in the next section in detail), and scatter them in relation with the Gini coefficient (all observations are on the provincial level) one by one to produce

scatter graphs as shown in figures 6, 7a and 7b. Accordingly, figure 6 predicts a negative relation between financial development and inequality; provinces having greater financial development tend to commit a lower level of inequality. By contrast, figures 7a and 7b suggest opposite trends, presence of higher Gini coefficients are more found in provinces where the financial sector is more developed.

To deliver precise conclusions on the impact of financial development on income inequality, more comprehensive methods of analysis are required, which we present in the next section.

Figure 7: Positive relation between financial development and income inequality at the provincial level

a)

yhat = 33.85 + .746*fd2   r = .203

b)

yhat = 33.892 + 3.056*fd3   r = .203
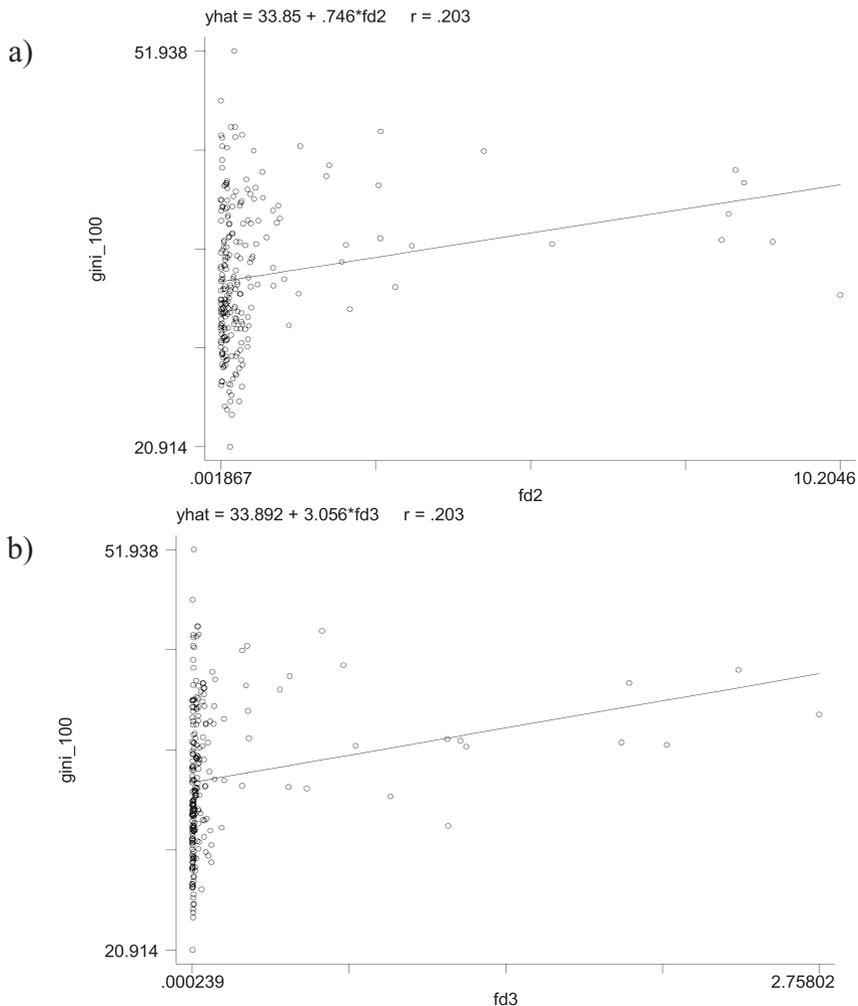
Note: FD2 and FD3, in turn, represents capital and fixed assets of financial firms per head in every province or city (more detail in the next chapter). Some outliners are dropped out in order to make the scatter more imaginable.

4. Empirical model, data and methodology

4.1. Empirical model

In this section, we present an econometric model to estimate the impact of financial development on income inequality in Vietnam. We care both linear and non-linear hypothesis and intend to test whether both hypotheses exist. As to test linear hypothesis introduced by GZ and BN, an econometric model is as follow:

$$Gini_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 GDPH_{it} + \alpha_3 EDU_{it}$$
$$+ \alpha_4 TRO_{it} + \alpha_5 PVRT_{it} + \beta_i + \varepsilon_{it} \quad (1)$$

Where: Gini is Gini coefficient, FD is financial development, GDPH is GDP per head, EDU is educational level, TRO is trade openness and PVRT is poverty rate. t is year and i is province.

Gini coefficient is one popular indicator used to measure the degree of inequality in income distribution among population. Values of Gini drops within [0,1], is determined by the ratio of area above Lorenz curve and absolute equality line (45 degree line). Gini coefficient can be computed as follows:

$$Gini = 2\sum_{i=1}^{n}\left\{\left[\frac{1}{2}\left(P_j + P_{j+1}\right) - \frac{1}{2}\left(X_j + X_{j+1}\right)\right]\left(P_{j+1} - P_j\right)\right\}$$

Where: P_j is the percentage of population cumulative up to interval j, and X_j is the percentage of their expenditure or income cumulative up to interval j. Gini=0 means income is distributed equally between every people, Gini =1 indicates situation of the absolute inequality, that is only one person holds all income of society. In this study, we multiply Gini coefficient by 100 to make it easier to report.

Financial development is measured by a number of financial variables. Initially, we intended to exploit credit and total liquidity or deposit as alternative measures for financial development. However, that data at the provincial level is sparse, so three other measurements have been used as proxies for financial development instead. Those are FD1 – the ratio of number of financial firms over one million populations in every province or city, FD2 – average operating capital of financial firms per head (million dong), and FD3 – average fixed assets of financial firms per head (million dong). FD1 represents the density of financial firms, higher FD1 implies a heavier competition among financial firms to capture market share. Therefore, the financial

enterprises have motivation to improve their service quality, network, initiate advanced technology, management and consolidate financial capacity so as to survive and capture the market share. This results in a better organized financial market in places where higher FD1 prevails. However, FD1 could not tell how big a financial market is, FD2 and FD3 are used to come over this drawback. FD2 shows capability of financial market in exploiting and mobilizing capital for financial business, while FD3 shows the expansion of financial system in terms of assets.

GDP per head or average income per head is of current price, representing economic development. In general, GDP per head for the whole country has increased along with the increase in Gini coefficient. It implies that the rich gain bigger proportions of income from economic growth than the poor, the average income of the poorest group increases, but that of the richest group increases even at higher speeds. So visually, one argument is that economic growth in Vietnam spurs inequality. This is in line with Kuznets (1955) if Vietnam economy is in the early stages of growth. Again, both linear and non-linear theories show that finance and economic growth move in the same direction, so whether economic growth in Vietnam at the provincial level is parallel to financial development or not is still in question.

The level of education is defined as average completed grade of household head in each province or city. This measure is only one among other measures that could be used as proxy for education variable. Different measures could be used like literacy rates of adults in each province, or the proportion of the population with at least a college degree, or the average tuition fee in each province. The literature shows that education is a very important element reducing income dispar-

ity. Gregorio and Lee (1999) investigating 49 countries from 1960 to 1990 conclude that the country having higher education attainment should have more equal income distribution; Chintrakarn (2011) looking at US states since 1988 to 2003 also finds significant roles of education (measured by proportion of population holding at least a college degree) in distributing income more equally.

Trade openness is derived by taking values of imports and exports divided by GDP, at the provincial level and in current price. Stolper-Samuelson theorem, which is one focal results of international trade theory developed by Heskcher and Olin, suggests that trade liberalization would generate more jobs for labor-intensive sectors implying that more unskilled labor would benefit from open trade. However, many empirical works have different conclusions. Meschi and Vivarelli (2007) for example, found that when trade volume is disaggregated by origin or destination, trading with developed countries would lead to high levels of inequality in developing countries. Duamal (2010) finds that inequality between states in Brazil is negative related with trade openness, while in India, regional inequality may partially be caused by greater trade liberalization.

The poverty rate represents the proportion of population living below poverty line. Logically, the province or city with a higher poverty rate means that the people living in that province or city have less chance to go to school, the educational level is low, and then inequality could be worse than those provinces or cities with lower poverty rates. We are concerned whether the rate is linked with inequality; the effort of Vietnam to eliminate poverty does not only solve the issues of hunger and poverty, but does help reduce inequality as well.

On taking interaction effect between financial development and one of other explanatory variables into consideration, we add interaction variables in to the model (INTER) by letting FD multiplied by variables GDPH or TRO or PVRT or EDU. The econometric model is as follows:

$$Gini_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 GDPH_{it} + \alpha_3 EDU_{it} + \alpha_4 TRO_{it} + \alpha_5 PVRT_{it} + \alpha_6 INTER_{it} + \beta_i + \varepsilon_{it} \quad (2)$$

To test the existence of GJ's hypothesis, the squared term of financial development is put into the model, econometric equation is as follows:

$$Gini_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 GDPH_{it} + \alpha_3 EDU_{it} + \alpha_4 TRO_{it} + \alpha_5 PVRT_{it} + \alpha_6 sqFD_{it} + \beta_i + \varepsilon_{it} \quad (3)$$

We also add the squared term of GDP per head into the model and test if there is a parabolic relation between economic growth and income inequality. The reason is that economic growth is normally associated with financial expansion. If inequality and economics growth are non-linear linked, then the financial development might be non-linear related with inequality.

4.2. Data

Our quantitative analysis is carried out with a panel data of 59 provinces and cities for four years 2002, 2004, 2006 and 2008. Data about financial firms are from the situation of Enterprise in Vietnam through surveys conducted by GSO in years from 2003 to 2009, while Gini coefficient was calculated from VHLSS. We also calculated average completed grade of household head from VHLSS. The published version of VHLSS 2002 contains surveyed data of 29,530 households, while VHLSS 2004, 2006 and 2008 contain that of 9,189 households. All these four surveys were designed for the provin-

Table 4: Summary of main variables over 2002-2008 at provincial level

	Year	2002	2004	2006	2008
	Lowest	20.914	24.458	29.542	30.142
Gini coefficient	Highest	43.396	39.424	48.036	51.938
	Average	30.143	30.745	36.659	39.419
	Lowest	.93	1.09	1.80	.89
FD1	Highest	43.98	43.47	66.79	85.77
	Average	12.21	13.46	16.2	18.03
	Lowest	.001867	.003083	.004282	.004463
FD2	Highest	10.20465	41.30846	48.9492	152.5789
	Average	.440944	1.718898	2.138909	3.501998
	Lowest	.000311	.000239	.000635	.002678
FD3	Highest	1.18089	7.631858	12.3458	57.54833
	Average	.044958	.360189	.471023	1.5818

cial level. Poverty rates and GDP per head was looked up from the Statistics Yearbook made by GSO in various years. Value of imports and exports to compute the level of trade openness, and financial development are be extracted from a number of sources such as: Statistics Yearbooks of 64 provinces and cities, Socio-economic Statistical Data of 63 Provinces and Cities, Vietnam (2009 and other years).

4.3. Methodology

A fixed effect and random effect model is applied to generate econometric result. Fixed effect model has an advantage of being able to solve the problem of unobserved variables over time that could affect dependent variable. With random effects model, we can include time-invariant variables into the model, and it allows us to infer econometric results of a larger population from a small sample of data. The Hausman test is then used to specify which model is more appropriate.

The primary goal of the econometric model is to estimate the effect of financial development variables on income inequality represented by Gini coefficient. Initially, is expected to be negative. Coefficients of education, trade openness are also expected to be negative, while that of the poverty rate is expected to be positive. We leave the sign of coefficient of GDPH unspecified at the first sight. If (equation 3) is large enough and statistically significant at level 5%, non-linear relation might be present.

5. Empirical results

Based on the method of fixed effects and random effects model, and employing Vietnamese province data, we tested the existence of linear and non-linear hypotheses in relation to financial development and inequality. The Hauman specification test is then used to determine which model is more relevant. The results of testing linear hypothesis are shown in table 5 (without poverty rate in the model). Accordingly, fixed

Table 5: Regression results for the effects of financial development on income inequality

	Regression 1		Regression 2		Regression 3	
	FE	RE	FE	RE	FE	RE
Cons	39.08 (.00)	32.35 (.00)	38.16 (.00)	32.73 (.00)	37.61 (.00)	32.44 (.00)
FD1	-.091 (.03)	-.096 (.00)				
FD2			-.096 (.00)	-.076 (.00)		
FD3					-.27 (.00)	-.23 (.00)
GDP per head	.02 (.00)	.016 (.00)	.0188 (.00)	.016 (.00)	.019 (.00)	.017 (.00)
Education	-1.84 (.00)	-.64 (.03)	-1.85 (.00)	-.91 (.00)	-1.80 (.00)	-.90 (.00)
Trade openness	-2.98 (.01)	-2.15 (.00)	-3.00 (.01)	-1.95 (.00)	-3.25 (.00)	-2.07 (.00)
R^2-within	0.60	0.60	0.62	0.61	0.63	0.62
Corr (u_i, Xb)	-0.49		-0.46		-0.9	
Hausman test - Chi2	212.35		-410.77		-112.40	
Pro>Chi2	0.00		N/A		N/A	
No. Of obs	236	236	236	236	236	236

Note: (.) presents p-value

effects should be selected to explain the result in regression 1, while it is unclear which is better in regression 2 and 3; however, the estimated correlation between repressors and error term is not small enough (-0.4625 in regression 2 and -0.4585 in regression 3) to reject fixed effects model, so we retain to use fixed effects to read the empirical results. Accordingly, all coefficients of financial development are negative and statistically significant at either level 1% or 5%, which suggest that the province with higher financial development commits lower inequality.

A Random effects model is chosen to explain empirical results when adding the poverty rate into the model (table 6). Accordingly, coefficients of financial development are also negative and

statistically significant at either level 5% or 10%, implying that financial development really has a positive impact on income distribution. Furthermore, these results provide the answer for the concern about the link between poverty and inequality, province having a higher poverty rate would follow by having worse inequality.

All regressions 1 to 6 reveal that education is very important in reducing inequality; openness plays the same role. In contrast, GDP per head rising fails to lower income inequality.

Concerning the joint effect of variables between FD and other variables, we run across some interesting results shown in table 7. The coefficients of interaction between financial development and the level of education are neg-

Table 6: Regression results (poverty rate included)

	Regression 4		Regression 5		Regression 6	
	FE	RE	FE	RE	FE	RE
Cons	26.11 (.00)	24.80 (.00)	25.70 (.00)	24.86 (.00)	25.77 (.00)	24.72 (.00)
FD1	-.08 (.03)	-.08 (.02)				
FD2			-.08 (.02)	-.07 (.03)		
FD3					-.21 (.002)	-.19 (.000)
GDP per head	.015 (.51)	.014 (.00)	.015 (.00)	.014 (.00)	.015 (.00)	.015 (.00)
Education	-.35 (.00)	-.14 (.57)	-.40 (.49)	-.32 (.20)	-.42 (.47)	-.32 (.19)
Trade openness	-1.81 (.09)	-.90 (.01)	-1.86 (.07)	-.68 (.07)	-2.07 (.05)	-.79 (.04)
Poverty rate	.35 (.00)	.31 (.00)	.33 (.00)	.31 (.00)	.32 (.00)	.31 (.00)
R^2-within	0.68	0.68	0.69	0.68	0.69	0.68
Corr (u_i, Xb)	-0.24		-0.21		-0.19	
Hausman test Chi2	3.45		3.06		2.08	
Pro>Chi2	0.63		0.69		0.83	
No. of Obs	236	236	236	236	236	236

Note: (.) presents p-value

ative (regression 7 with random effects and regression 8 with fixed effects) and statistically significant at either level 5% or 10%, suggesting that the province having both higher financial development and a higher level of education would have lower income inequality. Whereas, regression 9 shows income inequality would be higher in a province that has both higher financial development and a higher poverty rate.

To test inverted U-shaped hypothesis predicted by GJ, squared FD1, FD2 and FD3 are gradually added into the empirical model. However, we didn't find any supporting results, thus we don't report regression results in this study (detail regression results could be provided upon request). We move to test if there is parabolic relation between inequality and economic growth by adding squared term of GDP per head into the model; coefficients in all regressions turn out to be negative and significant at level of 1%. However, these coefficients are very small in absolute value (round -5.15e-06 to 6.96e-06), so they provide little economic meaning, and the hypothesis of non-linear relation between economic growth and inequality could be put aside (detail regression results could be provided upon

Table 7: Regression results – joint effects of financial development and education, financial development and poverty

	Regression 7		Regression 8		Regression 9	
	FE	RE	FE	RE	FE	RE
Cons	22.12 (.00)	21.71 (.00)	34.00 (.00)	30.91 (.00)	26.81 (.00)	25.31 (.00)
FD1	.22 (.18)	.162 (.21)	.27 (.14)	.022 (.88)	-.12 (.00)	-.11 (.00)
FD1*Edu	-.03 (.06)	-.03 (.06)	-.04 (.04)	-.01 (.43)		
FD1*pvrt					.008 (.03)	.004 (.14)
GDP per head	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)
Education	.18 (.76)	.25 (.44)	-1.18 (.08)	-.455 (.23)	-.36 (.54)	-.18 (.48)
Trade openness	-1.84 (.08)	-.86 (.02)	-2.99 (.01)	-2.14 (.00)	-1.57 (.133)	-.80 (.03)
Poverty rate	.34 (.00)	.32 (.00)			.25 (.00)	.27 (.00)
R^2-within	0.68	0.68	0.61	0.60	0.69	0.68
Hausman test – Chi2	3,35		18.10		8.47	
Pro>Chi2	0.76		0.00		0.20	
No. of Obs	236	236	236	236	236	236

request).

To sum up, there is evidence to conclude financial development is linked with income inequality. Our empirical findings support linear hypothesis voiced by GZ and BN, but no strong evidence to support hypothesis predicted by GJ.

6. Conclusion

Before this study, two main different predictions about the linkage between finance and income inequality are available in theoretical studies. Empirical studies tends to support linear hypothesis modeled by GZ and BN, however, it is required to carried out further studies to affirm about the non-linear relation between income inequality and financial development, which is modeled by GJ.

Our study exploits panel data of 59 provinces and cities in Vietnam in four years (2002-2008) with a purpose to investigate the relation between financial development and income inequality. Our results support linear hypothesis, and we find that financial development can help to alleviate the degree of inequality. So as to driving the importance of the financial sector in reducing income disparity, effective regulations and conditions for developing, strengthening and stabilizing the financial market are demanded. Our

results also emphasize the role of education and openness in reducing inequality; while an increase in GDP per head would lead to an increase in the Gini coefficient.

Our estimation could not avoid errors due to the limitation of data. Part of data used in this study is originally derived from samples of larger dataset such as Gini coefficient, level of education; this data itself bears certain errors. So, further studies with richer sets of data in longer period of time should be implemented to get more convinced explanation about the finance-inequality nexus, especially academic works using micro-level data. More precise empirical estimations of the impacts of financial development on income inequality does not only helps us better understand relation between financial development and income inequality, but implies relevant financial policies for macroeconomists and policy makers in Vietnam as well.

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