

Volume 37, Issue 3

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We would like to express our great thanks to an anonymous reviewer for her/his very useful comments on our paper.

Citation: Tho Duc Bui and Cuong Viet Nguyen, (2017) "Spatial Poverty Reduction in Vietnam: An Application of Small Area Estimation", *Economics Bulletin*, Volume 37, Issue 3, pages 1785-1796

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Submitted: July 21, 2016. **Published:** July 29, 2017.

Submission Number: EB-16-00528

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Abstract

This study examines the spatial pattern of poverty reduction in Vietnam during the 2010-2012 period. Although Vietnam has experienced an economic slowdown during this period, the poverty rate still decreased from 20.8 percent to 17.2 percent. Poverty decreased in most provinces and districts. There is an inverse U-shaped relationship between the 2010 poverty and poverty reduction during 2010-2012. Provinces and districts with low or high initial poverty rates were less successful in reducing poverty over the reference period, while provinces and districts with average initial poverty rates were able to reduce poverty most rapidly.

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1. Introduction

Vietnam has achieved high economic growth and fast poverty reduction for the last two decades. Annual growth rate reached 7 percent within the last 20 years. Poverty rate decreased from 57.4 percent in 1993 to 17.2 percent in 2012. However, Vietnam's economy has experienced economic slowdown in the recent years. Annual GDP growth rate in 2009-2015 was about 5 percent, which is considerably lower than the previous period's growth rate at 7 percent.

To reduce poverty, economic growth is a pre-condition. A large number of studies find a very strong relation between economic growth and poverty reduction (e.g., Ravallion and Chen, 1997; Dollar and Kraay, 2000). Low economic growth in Vietnam could slow down the poverty reduction process. Nguyen (2011) finds that low economic growth could depress the poverty reduction progress, which might led to Vietnam's inability to achieve its Millennium Development Goals (MDG) on reduction of overall poverty, especially food poverty reduction goal. Although poverty of the whole country has decreased, there are no guarantees that poverty has also decreased in all areas or localities. Lanjouw et al. (2017) use the small area estimation to predict the poverty at the district and provincial level in Vietnam, and they shows that provinces and districts with high poverty in 1999 were less successful in poverty reduction during the 1999-2009 period.

In this study, we examine whether Vietnam still achieved poverty reduction across localities as provinces and districts during the economic slowdown period, 2010-2012. To estimate the poverty indexes at small areas, we use the method of Elbers *et al.* (2003), which estimates a functional relation between expenditure and household characteristics using a household survey, and then applies this relation into a census to predict expenditure and poverty at small areas. Lanjouw et al. (2017) estimate the poverty indexes at small areas in 2010 using the 2010 Vietnam House Living Standard Survey and the 2009 Vietnam Population and Housing Census. In this study, we update the poverty estimates in the year 2012 and examine the poverty change during the 2010-2012 period.

The results show that most provinces and districts experienced poverty reduction during 2010-2012. Consistent with Lanjouw et al. (2017), we find an inverse U-shaped relationship between the 2010 poverty and poverty reduction during 2010-2012. Provinces

and districts with low or high initial poverty rates were less successful in reducing poverty over the reference period, while provinces and districts with average initial poverty rates were able to reduce poverty most rapidly.

The paper is structured into five sections. The second section introduces the data set used in this study. The third section presents the estimation methods. The fourth section discussed the empirical results. Finally, the fifth section concludes.

2. Data set

This study relies on two data sets. The first is the 15-percent sample of the Vietnam Population and Housing Census (VPHC). The 2009 VPHC was conducted by the General Statistics Office of Vietnam in April 2009. Individual-level data consist of information on demographics, education, employment, disability and migration. There are also household-level data on durable assets and housing conditions. The 15-percent sample is representative at the district level, and is selected on the basis of a cluster sampling technique, covering 3,692,042 households with 14,177,590 individuals.

The second dataset is the 2010 and 2012 Vietnam Household Living Standard Surveys (VHLSS), which were conducted by GSO in 2010 and 2012, respective. This data set contains detailed data on demography and living standards of individuals, households and communes. There are 9,402 households with 37,012 individuals covered in the 2010 VHLSS, while there are 9,399 households with 36,655 individuals covered in the 2012 VHLSS. Interestingly, the 2010 and 2012 VHLSSs contain panel data of 4,157 households.

3. Estimation method

To estimate the poverty indexes of provinces and districts, we used the small area estimation method developed by Elbers et al. (2002, 2003). The method involves three broad steps. In the first step, we select a set of variables that are common to both the household survey and the population census. The common variables include household and community characteristics. The variables common to the survey and census are comparable in terms of their means and distribution as well as in terms of the framing of the question.

In the second step, we regress the observed expenditure in the 2012 VHLSS on the selected common variables of the 2010 VHLSS using the panel data VHLSSs 2010-2012.

This updating poverty map technique is proposed by Emwanu et al. (2006) and Nguyen (2012). More specifically, we estimate the following model:

$$\ln(y_{ch}^{2012}) = X_{ch}^{2010} \beta + \eta_c + \varepsilon_{ch}, \quad (1)$$

where $\ln(y_{ch})$ is log of per capita expenditure of household h in cluster c , X_{ch} the vector of the common variables, β the vector of regression coefficients, η_c the cluster-specific random effect and ε_{ch} the household-specific random effect. The subscript ch refers to household h living in cluster c .

In the third step, we predict expenditure of a household in the census as follows:

$$\ln(\hat{y}_{ch}) = x_{ch} \hat{\beta} + \hat{\eta}_c + \hat{\varepsilon}_{ch}, \quad (2)$$

where $\hat{\beta}$, $\hat{\eta}_c$ and $\hat{\varepsilon}_{ch}$ denote the estimates for β , η_c and ε_{ch} . The predicted expenditure is used to calculate the poverty rate of provinces and districts. We apply the GSO-World Bank expenditure poverty line of 10,456 thousand VND/person/year. The standard errors are estimated using the Monte-Carlo simulation methods proposed by Elbers et al. (2002, 2003).

In addition to the poverty rate, we also estimate the poverty gap index which measures not only the proportion of the poor but also how poor they are. The poverty gap index is proposed by Foster *et al.* (1984).

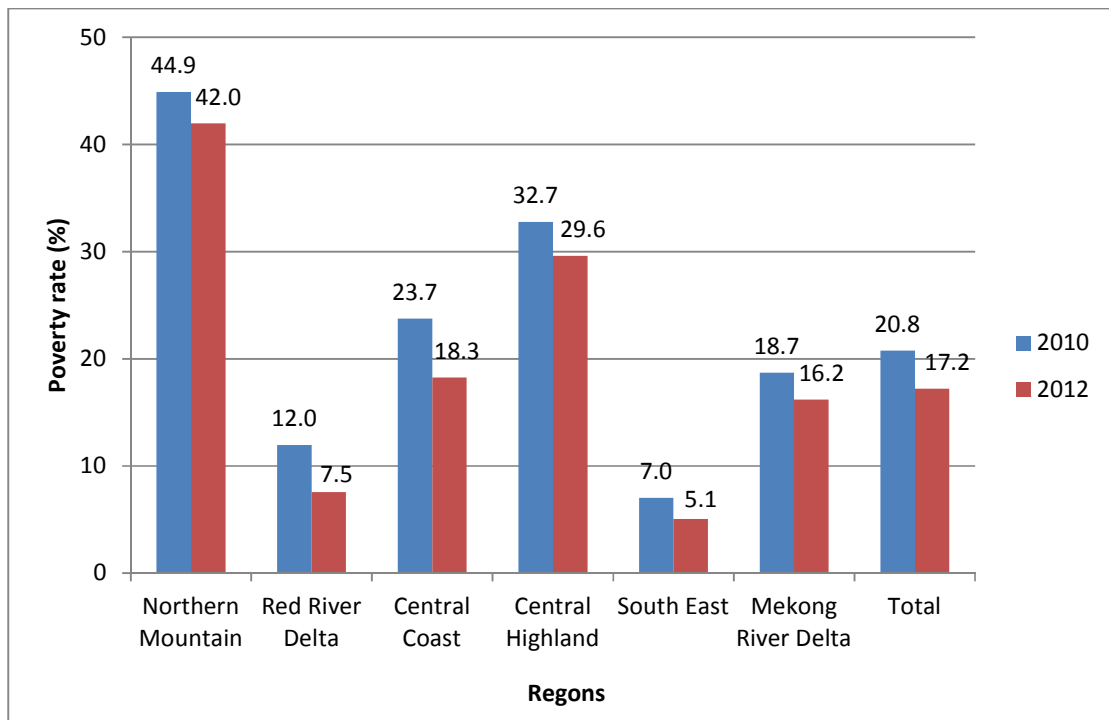
It should be noted that we examine the poverty change in provinces and districts during 2010-2012. The poverty indexes in 2010 are estimated in Lanjouw et al. (2017), and we obtain the results from Lanjouw et al. (2017). In this study, we only estimate the poverty indexes in 2012.

4. Estimation results

Figure 1 presents the expenditure poverty rate of Vietnam during 2010-2012, which are computed directly using per capita expenditure data from the 2010 and 2012 VHLSSs. It shows that the poverty rate decreased from 20.8% in 2010 to 17.2% in 2012. Thus,

Vietnam was still successful in poverty reduction even under the economic slowdown. The poverty was reduced in all the regions during 2010-2012.

Figure 1: Poverty rate (in percent) during the 2010-2012 period



Source: Estimation from VHLSSs 2010 and 2012.

As mentioned, VHLSSs cannot be used to estimate the poverty indexes at areas smaller than regions. We use the small area estimation method to estimate the expenditure and poverty at the province and district level. The first step is to estimate the expenditure model. In this study, we estimate six separate regressions of log of per capita expenditure in 2012 for six regions. To account for the difference in coefficients between urban and rural areas, we include interactions between the urban variable and other explanatory variables. In the final models, we include explanatory variables that are robust in the regressions. It means that these variables have consistent signs and are significant at the conventional level when then models are changing. We tried different models with different sets of explanatory variables, and found that the poverty estimates at the province and regional level are quite similar. The regression results are lengthy and not presented in this paper. The R-squared is high, ranging from 0.41 (South East) to 0.74 (Central Highlands).

In the second step, we apply the expenditure models to the 2009 VPHC to estimate per capita expenditure for all the households in this census. The predicted expenditure data are used to estimate the mean expenditure and poverty indexes of all the provinces and districts.

To verify the estimates from the small area estimation, we compare per capita expenditure and poverty indexes estimated directly from the 2012 VHLSS and those based on small area estimation using the 2010-2012 VHLSSs and the 2009 VPHC (in Table 1). Since the VHLSS is representative at the regional level, mean expenditure and poverty measures that are computed directly using expenditure data from the VHLSS can be considered as the benchmark. Table 1 shows that the small area estimation produces the estimates of regional poverty that are quite close to those based on the 2012 VHLSS. The poverty rate of Northern Mountain estimated by the small area estimation is lower than the poverty rate estimated directly from the 2012 VHLSS. However, the difference is not statistically significant at the 5% level.

Table 1: Per capita expenditure (nominal price) and poverty indexes using small area estimation method

REGIONS	Estimates from the 2012 VHLSS			Estimates from small area estimation		
	Per capita exp. (thousand VND)	Poverty rate (P0)	Poverty gap index (P1)	Per capita exp. (thousand VND)	Poverty rate (P0)	Poverty gap index (P1)
Northern Mountain	15873.67 (351.96)	41.95 (1.61)	0.1259 (0.0065)	16537.22 (459.94)	36.71 (1.56)	0.1102 (0.0063)
Red River Delta	28848.59 (638.53)	7.54 (0.72)	0.0141 (0.0016)	28090.79 (719.47)	5.39 (0.73)	0.0092 (0.0016)
Central Coast	20828.93 (376.46)	18.26 (1.28)	0.0467 (0.0044)	20588.88 (490.04)	16.12 (1.13)	0.0343 (0.0031)
Central Highland	20107.04 (855.29)	29.61 (2.57)	0.1002 (0.0106)	19810.22 (739.48)	26.51 (1.35)	0.0779 (0.0055)
South East	30002.85 (933.76)	5.05 (0.82)	0.0094 (0.0020)	29877.52 (1000.45)	4.99 (0.73)	0.0098 (0.0018)
Mekong River Delta	19692.48 (366.23)	16.19 (0.98)	0.0335 (0.0027)	19930.38 (204.46)	15.73 (0.70)	0.0316 (0.0023)

Note: standard errors are in parentheses.

Source: estimations from VHLSSs 2010-2012 and the 2009 VPHC

Table 2 presents by provinces, the predicted per capita expenditure, poverty rate, number of poor, and share in the total number of poor of the whole country. Lai Chau, Ha Giang and Dien Bien are three poorest provinces with the poverty rate of more than 60%. Hanoi capita city and Ho Chi Minh city are the richest cities, followed by Da Nang, Hai Phong, Quang Ninh, Binh Duong, Ba Ria-Vung Tau.

Table 2: Provincial estimates in 2012 from the small area estimation

Province name	Population	Per capita expenditure (thousand VND/year/person)	Std. Err. of Per capita expenditure	Poverty rate (P0)	Std. Err. of Poverty rate (P0)	Poverty gap index (P1)	Std. Err. of Poverty gap index (P1)
Northern Mountain							
Ha Giang	724352	11272.2	678.1	0.6643	0.0350	0.2449	0.0241
Cao Bang	510884	14754.4	739.3	0.4703	0.0296	0.1555	0.0169
Bac Kan	294660	15565.5	1021.9	0.3734	0.0458	0.0986	0.0172
Tuyen Quang	725467	17469.3	1171.8	0.3037	0.0503	0.0738	0.0175
Lao Cai	613074	14906.9	1061.0	0.5154	0.0346	0.1763	0.0200
Dien Bien	491046	12046.7	833.1	0.6386	0.0436	0.2346	0.0280
Lai Chau	370134	9901.0	764.0	0.7435	0.0420	0.2979	0.0379
Son La	1080641	13815.4	802.5	0.5004	0.0412	0.1492	0.0187
Yen Bai	740904	15566.7	931.1	0.4008	0.0389	0.1218	0.0156
Hoa Binh	786963	16116.0	932.7	0.3844	0.0440	0.1021	0.0186
Thai Nguyen	1124785	21398.0	1669.3	0.1559	0.0346	0.0313	0.0093
Lang Son	731886	16278.2	1007.3	0.3701	0.0400	0.0952	0.0154
Bac Giang	1555720	18979.1	1145.2	0.1710	0.0360	0.0345	0.0100
Phu Tho	1313926	20274.7	1004.3	0.1925	0.0291	0.0431	0.0089
Red River Delta							
Ha Noi	6448837	37627.0	1699.8	0.0283	0.0064	0.0047	0.0013
Quang Ninh	1144381	26021.9	1825.6	0.0635	0.0150	0.0146	0.0039
Vinh Phuc	1000838	22990.6	1263.4	0.0598	0.0182	0.0099	0.0037
Bac Ninh	1024151	25614.6	1461.8	0.0476	0.0146	0.0076	0.0028
Hai Duong	1703492	21979.6	1172.2	0.0798	0.0190	0.0134	0.0040
Hai Phong	1837302	27659.8	1564.0	0.0394	0.0138	0.0063	0.0027
Hung Yen	1128702	23505.5	1355.3	0.0587	0.0180	0.0094	0.0036
Thai Binh	1780953	20520.0	1213.0	0.0905	0.0254	0.0152	0.0055
Ha Nam	785057	21279.2	1575.4	0.0799	0.0329	0.0132	0.0068
Nam Dinh	1825770	22072.4	1228.4	0.0660	0.0196	0.0107	0.0042
Ninh Binh	898458	22200.0	1312.9	0.0798	0.0240	0.0138	0.0051
Central Coast							
Thanh Hoa	3400238	18210.1	713.9	0.2182	0.0240	0.0473	0.0070
Nghe An	2913054	18291.2	953.8	0.2337	0.0322	0.0511	0.0093
Ha Tinh	1227554	18864.6	959.7	0.1323	0.0319	0.0202	0.0064
Quang Binh	846924	19563.7	1313.9	0.1578	0.0364	0.0304	0.0086
Quang Tri	597984	19134.4	1113.1	0.1870	0.0312	0.0439	0.0101
Thua Thiên Hue	1087578	23937.2	1920.4	0.0862	0.0192	0.0158	0.0039
Da Nang	887068	38533.4	2727.6	0.0046	0.0036	0.0005	0.0005
Quang Nam	1419502	19832.8	1016.0	0.1344	0.0202	0.0281	0.0048
Quang Ngãi	1217159	18522.1	1137.1	0.1919	0.0291	0.0507	0.0077
Binh Dinh	1485943	20625.7	1341.7	0.1158	0.0277	0.0210	0.0055
Phú Yên	861993	18081.4	1113.3	0.1870	0.0337	0.0380	0.0086
Khanh Hoa	1156902	24967.6	2265.8	0.0995	0.0218	0.0215	0.0057
Ninh Thuan	564128	18931.3	1543.9	0.2070	0.0425	0.0507	0.0126

Province name	Population	Per capita expenditure (thousand VND/year/person)	Std. Err. of Per capita expenditure	Poverty rate (P0)	Std. Err. of Poverty rate (P0)	Poverty gap index (P1)	Std. Err. of Poverty gap index (P1)
Binh Thuan	1169450	21137.6	1338.6	0.1016	0.0220	0.0198	0.0053
Central Highlands							
Kon Tum	430036	15163.5	1029.9	0.4411	0.0272	0.1641	0.0138
Gia Lai	1272791	16547.3	876.6	0.3717	0.0227	0.1161	0.0114
Dak Lak	1728380	20835.2	1321.1	0.2280	0.0224	0.0605	0.0078
Dak Nong	489441	19397.8	1192.4	0.2524	0.0307	0.0670	0.0114
Lâm Dong	1186786	23670.7	1336.5	0.1462	0.0197	0.0356	0.0061
South East							
Binh Phuoc	874961	21904.8	1546.6	0.1585	0.0294	0.0397	0.0101
Tay Ninh	1066402	21798.7	1264.3	0.1054	0.0257	0.0188	0.0058
Binh Duong	1482635	24124.0	1656.6	0.0791	0.0285	0.0146	0.0069
Dong Nai	2483210	25730.4	1673.1	0.0743	0.0141	0.0155	0.0036
Ba Ria - Vung Tau	994836	28625.1	1714.8	0.0416	0.0133	0.0073	0.0030
Ho Chí Minh	7123340	34884.4	1405.0	0.0148	0.0048	0.0021	0.0009
Mekong River Delta							
Long An	1436913	21885.9	543.0	0.0943	0.0101	0.0169	0.0024
Tien Giang	1670215	21402.4	605.0	0.1040	0.0133	0.0189	0.0033
Ben Tre	1254588	19747.6	580.5	0.1340	0.0153	0.0246	0.0035
Tra Vinh	1000932	18621.2	563.0	0.1869	0.0182	0.0380	0.0051
Vinh Long	1028365	20784.6	664.5	0.1312	0.0179	0.0250	0.0045
Dong Thap	1665420	19439.6	466.4	0.1434	0.0144	0.0266	0.0036
An Giang	2144772	18964.4	546.8	0.1795	0.0158	0.0370	0.0044
Kiên Giang	1683149	18821.5	562.5	0.2050	0.0174	0.0442	0.0054
Can Tho	1187088	25393.9	822.0	0.0928	0.0116	0.0174	0.0028
Hau Giang	756625	18409.3	547.9	0.1879	0.0201	0.0382	0.0058
Soc Trang	1289441	18367.2	575.9	0.2052	0.0188	0.0434	0.0055
Bac Liêu	856249	19070.5	573.4	0.1751	0.0170	0.0355	0.0050
Ca Mau	1205107	17910.1	491.1	0.2220	0.0194	0.0480	0.0059

Source: estimations from VHLSSs 2010-2012 and the 2009 VPHC

Figure 2 presents the provincial poverty map in 2012. Provinces in Northern Mountain had the highest poverty, followed by provinces in Central Highland and North Central Coast of Vietnam. Provinces in delta regions had the lowest poverty.

Figure 3 presents poverty reduction during 2010-2012 (which is equal to the 2010 poverty rate minus the 2012 poverty rate – measured in percentage points). Most provinces experienced poverty reduction. There are three provinces, An Giang, Vinh Long and Tien Giang, which experienced a slight increase in poverty rate.

Figure 2: Estimated poverty rate 2012 (in percent)

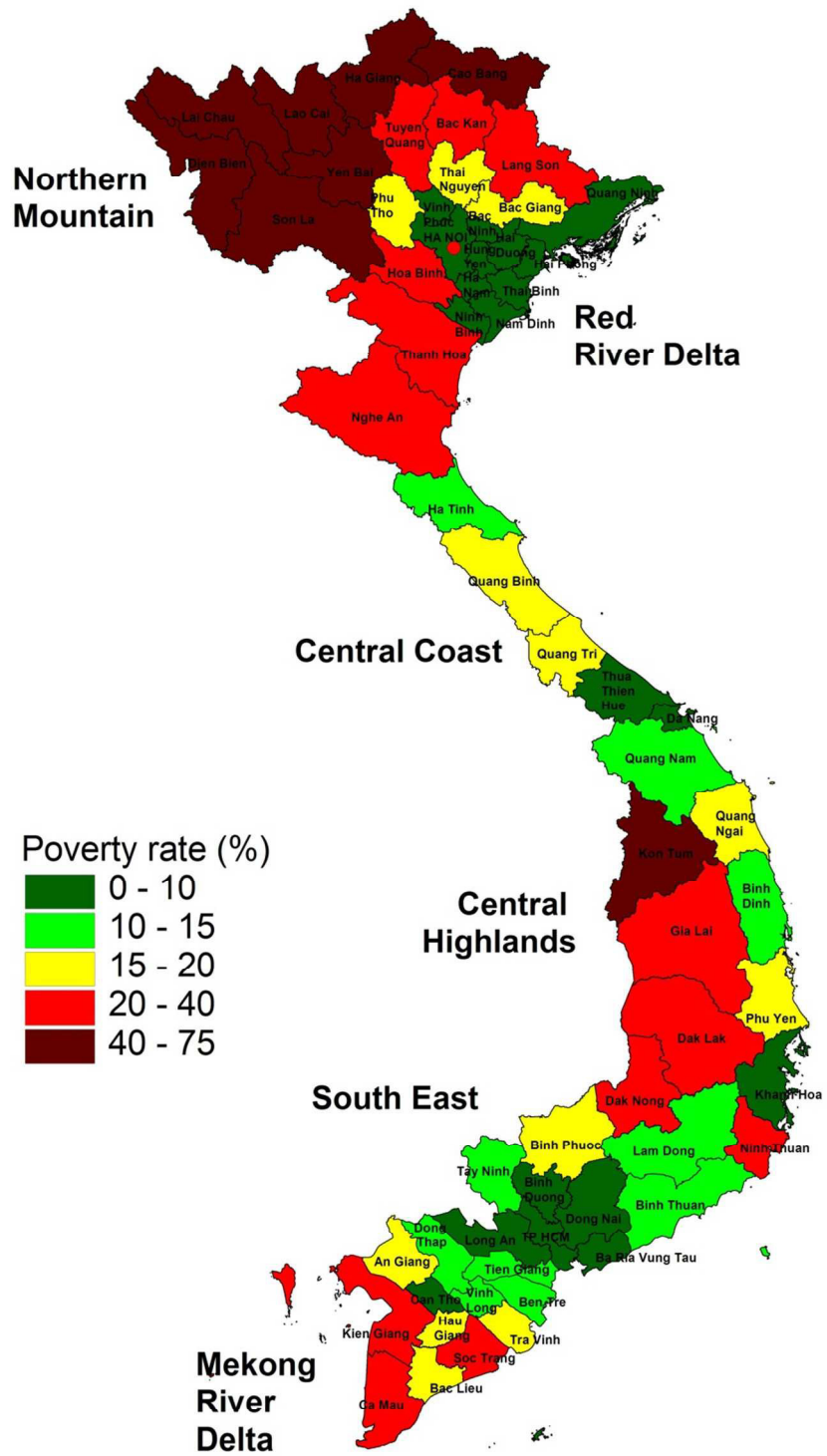
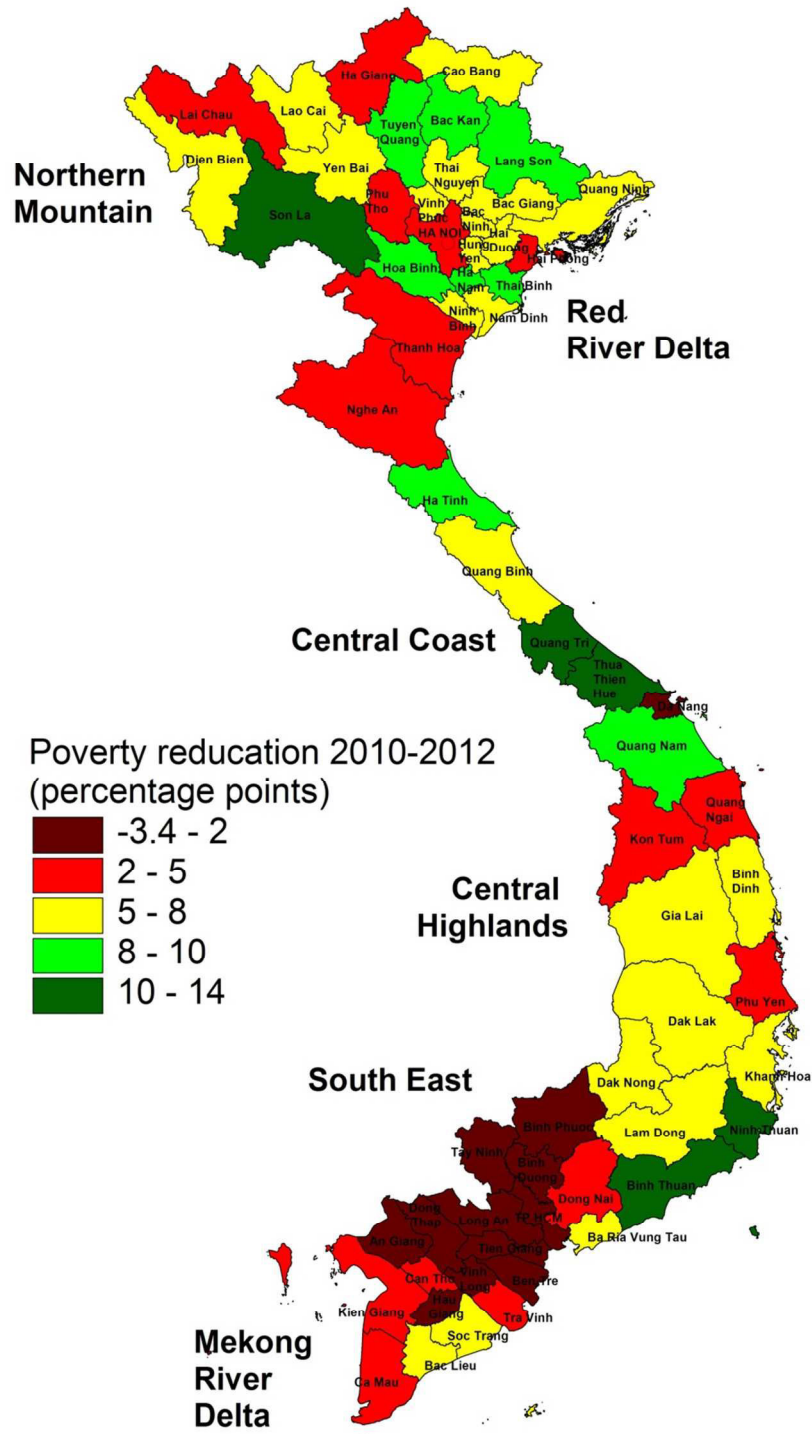


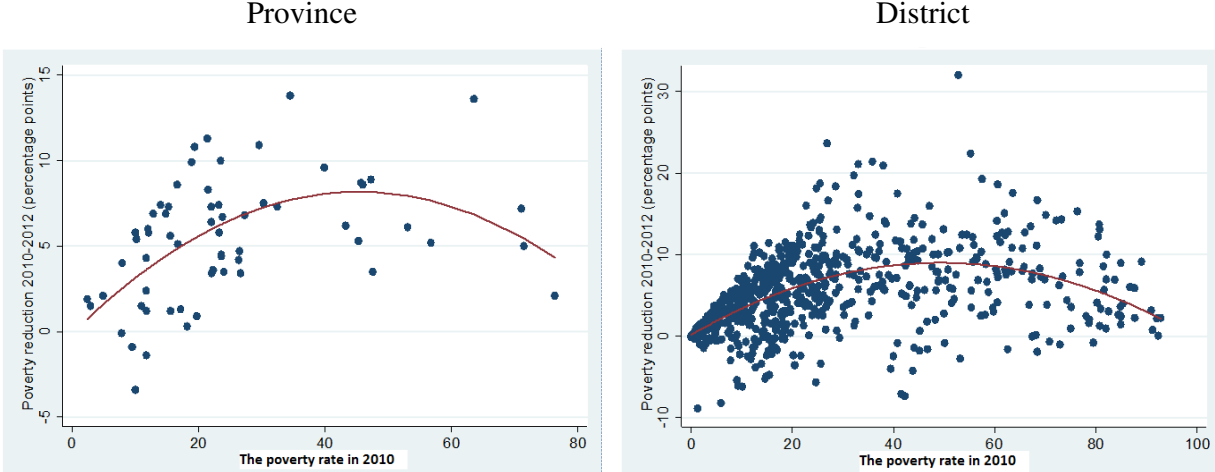
Figure 3: Poverty reduction 2010-2012 (equal to the 2010 poverty rate minus the 2012 poverty rate – measured in percentage points)



Finally, Figure 4 shows an inverse U-shaped relationship between the 2010 poverty and poverty reduction during 2010-2012. Provinces and districts with low initial poverty

rates, and those with high initial poverty rates, were less successful in reducing poverty over the reference period. Provinces and districts with average initial poverty rates were more able to reduce poverty most rapidly.

Figure 4: Poverty reduction during 2010-2012



5. Conclusions

This study examines the poverty reduction in Vietnam during the 2010-2012 period. To estimate the poverty indexes of provinces and districts, we use the small area estimation method developed by Elbers et al. (2002, 2003). Overall, we find the poverty indexes decreased during 2010-2012 in most provinces and districts. There is an inverse U-shaped relationship between the 2010 poverty and poverty reduction during 2010-2012. Provinces and districts with low or high initial poverty rates were less successful in reducing poverty over the reference period, while provinces and districts with average initial poverty rates were able to reduce poverty most rapidly. There are few provinces in Southeast region in which the poverty rate increased slightly. These provinces should be paid more attention in terms of verification of poverty measurement and poverty reduction programs.

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