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EFFECTS OF HEALTH INSURANCE ELIGIBILITY EXPANSION ON HOUSEHOLD CONSUMPTION IN VIETNAM

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Abstract:

This 2005 pre/post difference provides a natural experiment opportunity that, survey data can be taken advantage of by the quasi-experimental difference-in-differences (DID) method. When combined with propensity score matching (PSM-DID), it is also possible to evaluatepreviously unseen impacts of the greatest NHI reform ever seen in Vietnam. Regression tests were conducted to look for effects on household consumption using four indicators, total household consumption, per capita consumption, medical consumption and non-medical consumption. The results showed that the 2005 reform hada strong and positive impact on total household consumption, per capita consumption and non-medical

expendituresin the treatment group, but no effect was found on household medical consumption. In addition, ethnic minority households, households in rural areas and poor households were likely to decrease spending on goods. Households with spouse(s) in higher education, higher occupational skill levelsand more wealthy households were more likely to increase their consumption.

1.Introduction:

The expansion of national health insurance (NHI) coverage is a valuable policy tool to offset potential downside risks from health shocks, as well as increasing household wealth. NHI is now a popular strategy for many nations, but especially those that are low-middle income. Where parts of a population are ineligible, or NHI is otherwise unavailable, research shows that alternate methods of smoothing consumption costs or dealing with health shocks are used to mitigate financial risks. Factors showing this are an increased incidence rate of loans, asset sales, and depressed household expendituresin areas such as education and food (Nguyen and et al., 2012; Wagstaff and Magnus, 2014; Bratti and Mariapia, 2014; Mitra al et., 2017). Some studies provide a theoretical framework and empirical evidence, showing that health insurance helps households reduce catastrophic health expenditures due to health shocks that leads to a decline in the poverty rate (Wagstaff, 2010; Hamid et al., 2011; Aryeetey et al., 2016; Remler el al., 2017; Alam et al., 2017; Wu et al., 2018; Dou et al., 2018). But health insurance may also have a number of other effects outside health improvements, including labor productivity and household labor supply (Dizioli and Roberto, 2016; Su et al., 2017; Lin, 2018). These downstream effects may also lead to improved household incomes and consumption.

Current literature shows that NHI expansion is associated with reduced household precautionary saving due reduced uncertainty over out-of-pocket health expenditures (Chou et al., 2003). NHI expansion is also associated with higher rates of school enrolment or school attendance (Woode, 2017; Strobl, 2017). This means that households are more able to maintain their educational investment when a household member is enrolled in a national health insurance system. Studies have linkednational health insurance and increases in non-medical consumption (Bai and Wu, 2014; Sheu and Lu, 2014); however, those studies focused on some developed countries only and data from developing countries is either sparse or entirely unavailable.

In Vietnam, NHI was considered an important pillar of social protection. The policy began its roll-out in 1992 and has been reformed three times in 1998, 2005 and 2008. The widest reaching reform was in 2005 (Figure 1) where it increased coverage from around 22% of the population to 43%. Another important aspect of the 2005 change was that it only impacted households in the non-state sector[1], while households in the state sector remained almost unchanged. This 2005 pre/post difference provides a natural experiment opportunity that can be taken advantage of by a difference-in-differences (DID)regression approach.

As mentioned, a number of studies address the direct impacts of NHI, these primarily concern beneficiary groups such as such as children, the elderly or the poor. Measuring such direct outcomes on health, labor supply, health costs or healthcare access is required to ensure the initial impacts are known and quantified, but with more recent statistical techniques it is possible to examine downstream effects. For example, in some cases changes in consumption

[1] For the precise definitions of households in the state sector (control group) and households in the non-state sector (treatment group), please see Section 4.

as a result of NHI implementation can be determined but arepresently unknown. Therefore, this study examines the impact of NHI expansion on household consumption by using differences between households in the state (control) and non-state (treatment) sectors.

First, the 2005 policy change provided an opportunity to exploit a natural experiment. Using the quasi-experimental DIDset-up it was possible to make some comparisons between then treatment and control groups. After this, propensity score matching households and combining this with the DID (PSM-DID) meant that the data could be validated. Finally robustness checks were carried out on the regressions.

The data used came from four waves of cross-sectional data from the National Survey of Vietnam Household Living Standards(VHLSS) between 2002 and 2008. Broadly speaking, the 2005 NHI policy reform promoted both total household consumption and per capita consumption, causing increases of approximately 2% points and 8% points, respectively. Furthermore, the policy increased non-medical consumption by around 8.5% points. No evidence was found that NHI affected household medical consumption. These results were in agreement with studies by Bai and Wu (2012), and Sheu and Lu(2014), however in an emerging market economy such as Vietnam, NHI had a greater impact on household consumption.

The rest of this study is organized as follows: Section 2 reviews the existing literature, Section 3 introduces the NHI changes and gives an overview of the economic status in Vietnam. Section 4 presents data regarding household consumption and establishes the control and treatment groups. Section 5 provides the econometric models used and Section 6 reports the estimation results. Section 7 discusses the findings and concludes the paper.

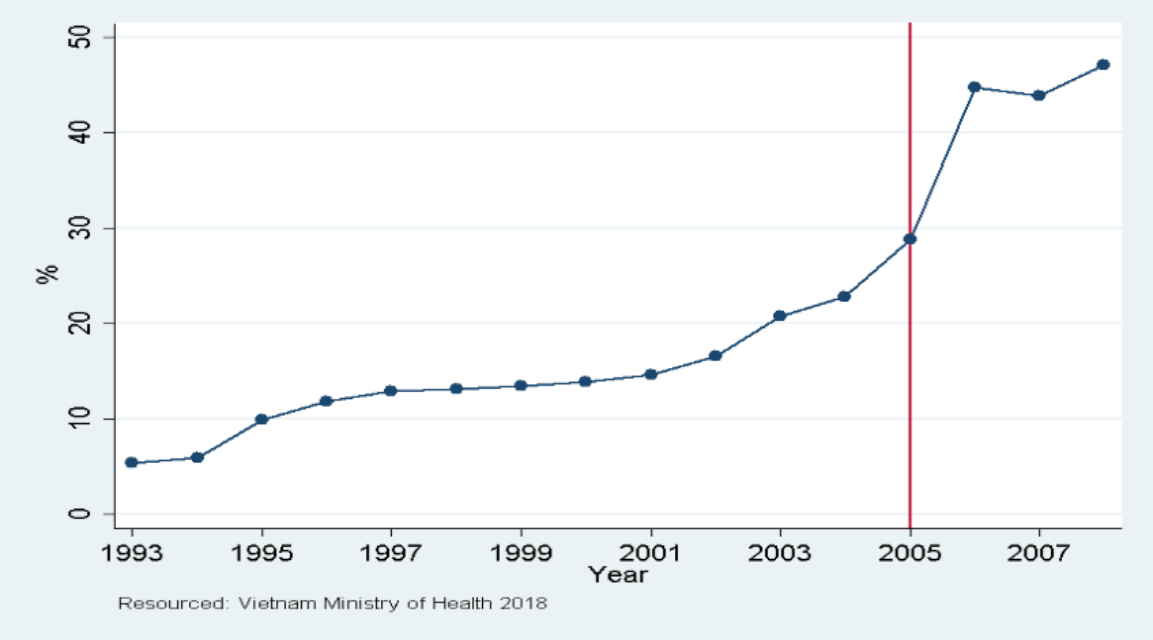

Figure 1. Percentage of Vietnamese population covered by national healthcare 1993-2008

2.Literature Review:

In the absence of health insurance, Wang et al. (2006) investigated the influence of poor health on household consumption in rural China and showed that ill health and medical expenditure reduce household investment in human capital for farm production, it also showed that other consumptions elements considered critical to human well-being reduced. Asfaw et al. (2004) examined the effect of illness on rural household consumption in Ethiopia and concluded that illness had a statistically significant negative impact on household

consumption stability. Moreover, Nguyen et al. (2012) conducted a study concerning poor households in rural Vietnam and how they coped with health care expenditures; these findings suggested that decreased funding and increased healthcare costs left poor households vulnerable to detrimental coping strategies such as debt and food reduction.

With respect to health insurance and household precautionary savings and consumption, Chou et al. (2003) conducted a study examining the impact of NHI on precautionary saving in Taiwan showing that reducing health uncertaintyreduced savings by an average of 8.6%-13.7%. The largest effects were for households with the smallest savings. Chou et al. (2004) also did a follow-up related study with a semi-parametric smooth coefficient model to examine the effect of the 1995 introduction of NHI in Taiwan. This specifically looked at saving and consumption and showed that younger households were more sensitive to risk reduction, and demonstrated a greater response in terms of reductions in precautionary saving. Studies have also provided evidence that the extension of health insurance is associated with promotion of household non-medical consumption (Wagstaff and Menno, 2005; Bai and Wu, 2014; Sheu and Lu, 2014; Zhao, 2019).

Wagstaff and Pradhan (2005) studied Vietnamese health insurance implementation on health outcomes, health care utilization, and non-medical household consumption. Their results showed that the program reduced out-of-pocket health expenses and increasednon-medical consumption; however, this study only used data from two waves of VHLSS in 1992 and 1998, where the percentage of total population covered was very small, around 4% in 1992 and 14% in 1998. Furthermore, this study was limited to households that had participated in the health insurance system, while most of the target group were state sector workers. At that time the income of households in the state sector was higher than that of households in the non-state sector, meaning that state sector households were more likely to purchase non-medical goods than their counterparts. Furthermore, the authors used a double-difference estimator to test for the difference in outcomes of health expenditures and non-medical consumption. This did not capture some important household income and demographic characteristics which may lead to sensitive results.

Bai and Wu (2014) conducted a study in rural China that used an average treatment effect method to evaluate the impact of health insurance on household consumption. On average, health insurance coverage increased non-medical-related consumption by more than 5%, but there was no detectable gross effect on consumption, so health insurance implementation does not increase consumption per se. Zhao (2019) used DID to examine the effects of critical illness insurance (CII) on rural household consumption and discovered that the CII increased daily, per capita household consumption by > 15%, and also that CII was mainly adopted by more affluent families in rural areas, but there was little incentive effect observable for poor families. Both studies used rural areas where residents had agricultural jobs, an inefficient goods market, or were otherwise lower income which may also have led to some distortion of the results.

Sheu and Lu (2014) have also used DID to study Taiwanese NHI spillover effects on household consumption. Spending was clearly related to improvements in housing conditions where rental and water bills saw a significant increase, 1.87% (in the share). As Taiwan is a developed economy, however, comparisons with developing economies may not be as beneficial when developing inferences.

3. Background of Vietnam:

3.1. National health insurance scheme:

HI has become a fundamental social protection policy of the Vietnamese central government. Initially established in 1992, NHI was intended to ensure sustainable development and equal healthcare for all citizens. The initial 1992 (non-universal) NHI was organized and administered by the state and covered approximately 4% of the population: civil servants, state enterprise employees, non-state enterprises with more than 10 employees, pensioners and people on subsistence allowances. The first reform in 1998 expanded the target demographic to include, National Assembly Representatives, People's Council members and preschool teachers, covering around 14% of the population. The next reform in 2005 led to a massive enlargement of scope, covering workers in non-state enterprises with more than one employee, cooperatives, various other organizations, war veterans and individuals below a certain poverty threshold. Citizens were required to participate and the 2005 amendments resulted in the greatest change in number of people enrolled. The pre-2005 scheme covered 22% of the population, and post 2005, covered 43%. In 2008 the government made another amendment (25/2008/QH12, November 14, 2008) that took effect in 2009. This gradual rolling out process required various specific groups to enroll in the now compulsory NHI system. In 2009, children under age six and households near the poverty line had to enroll, in 2010, university students had to enroll, followed by farmers in 2012, and then dependents of laborers and cooperative members in 2014. According to the Vietnamese Ministry of Health (2018), in this period the rate of NHI enrollment increased gradually, from 56% in 2009, to 60% in 2010, 67% in 2012, and then 70% in 2014. Because the largest shift happened in 2005 this paper uses that legislative change to determine control and treatment group effects.

3.2. Vietnamese economy

Vietnam is a developing country. The economy opened significantly in 1986 and economic growth since then has been strongly driven by investments and exports. In the 2000s, GDP per capita increased rapidly from around 390 USD dollar to approximately 1,317 USD dollar (World bank 2019). Figure 2 shows how growth in household per capita final consumption expenditure grew between 2000 and 2008; even with some large swings, the trend remained generally upward. This rate dramatically increased from around 2% in 2000, to 6% in 2003, remained stable in the period 2004 to 2006 and rose in the final period. The downturn at the end being due to influence from the 2007 financial crisis.

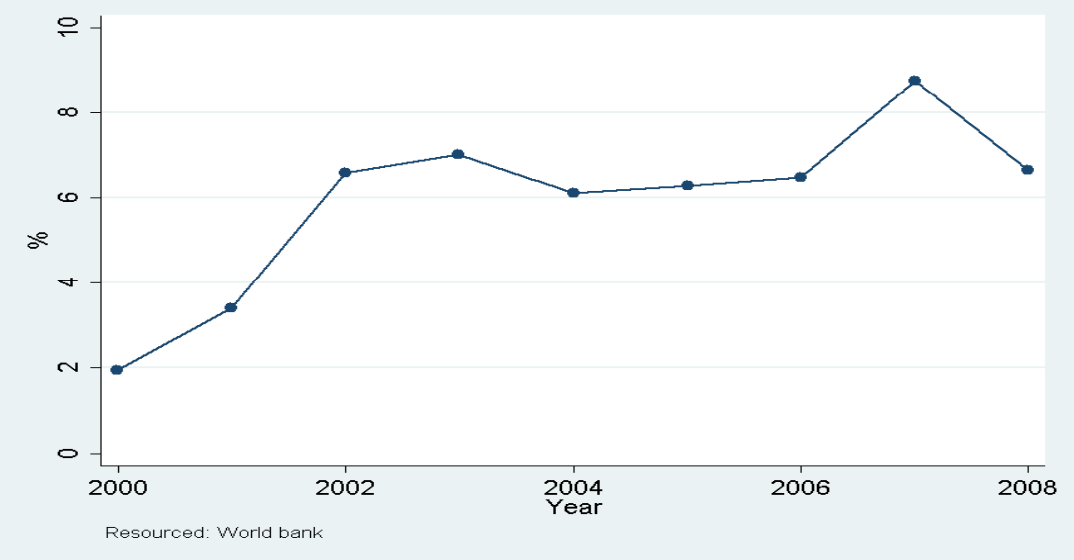

Figure 2. Growth in household per capita final consumption expenditure (annual %)

4. Data:

Data was drawn from Vietnam Household Living Standards Survey (VHLSS). This database is a high quality survey conducted by the Vietnamese General Statistical Office (GSO) using techniques supported by the World Bank. Data waves occurred in 1992, 1998, and for every two years from 2002 onward. VHLSS includes detailed information regarding the characteristics of individuals, households and communities, such household member demographics, ethnicity, area of residence, educational background, employment status, income, expenditure, housing, household assets, utilities, etc.

This studyuseddata from four waves 2002, 2004, 2006 and 2008. The sample size for expenditure in 2002 covered 30,000 householdscontaining 132,376 individuals; 2004 covered 9,000 households and 40,439 individuals; 2006 covered 9189 households with 39,071 individuals, and 2008 covered 9,189 households with 38,249 individuals, all answered questions regarding income and expenditure.

To assess the impact of NHI on household consumption, this study follows a similar approach to Mitra et al. (2016), and Bai and Wu (2014). Four dependent variables were used:

(i) Total household consumption (real thousands VND), drawn from VHLSS.

(ii) Per capita expenditures (real thousands VND) drawn from VHLSS.

(iii) Non-medical consumption, drawn from VHLSS, but composed of: total household non-medical expenditure, total household food, non-food[2], education,total cost of buying or building a house, water and electricity utility payments, purchase of fixed assets, durable good payments,and repairs to large assets.

(iv) Total household medical expenditures: drawn from VHLSS but comprised of: total out-patient treatment costs, in-patient treatment costs, total spending on access to healthcare services, total spending on medicines for self-treatment.

To compare and analyze the impact of the 2005 NHI reform, a treatment groupand control group were defined. Households in the state sector were defined as the control group, where either a head of household or spouse worked in the state sector, and the treatment group were households in the non-state sector, where either households had both a head of household and a spouse (where families had both parents) or a single parent (in the case of single parent families) worked in the private sector. The treatment group also contained those working in family owned companies, economic collectives, foreign investment companies and the self-employed.

The full list of dependent and independent variables used in this study are shown in Table 1 with the descriptive statistics for the household sectors and NHI eligibility. Pre/post 2005 policy data shows that although all indicators in both groups increased after the change, households in the non-state sector observed a larger increase when compared to households in the state sector. Particularly, non-medical consumption increased over time with a high degree of statistical significance.

Table1 also displays household characteristics, including certain parental features and household control variables such as household size, number of children, number of seniors, log of total household income, and type of house. To correct the nominal values, total net household income was adjusted by inflation using World Bank CPI data for the respective years. The overall rates of economic growth for those years were: 5.662 % in 2002; 6.321 % in 2004; 6.978 % in 2006 and 7.536 % in 2008. Unsurprisingly, family expenditure for

[2] According to the Vietnamese National household Survey, the definition of non-food household expenditures was daily expenses such as lottery tickets, cigarettes, soap, personal care products, cooking fuel, matches and candles, and gasoline, etc.

households in the state sector were higher than that of households in non-state sector, due to the higher education level of spouses in the state sector compared to those in the non-state sector. This is similar to other countries, where higher education produces better employment opportunities.

Table 1. Descriptive Statistics

Household sector	State sector			Non-state sector		
	Pre-HI (2002-2004)	Post-HI (2006-2008)	DIFF[a]	Pre-HI (2002-2004)	Post-HI (2006-2008)	DIFF[a]
Dependent Variables						
Log of total household's consumption (Thousand VND)	9.929	10.569	.640*** (44.66)	9.390	10.042	.651*** (100.95)
Log of per capita consumption (Thousand VND)	6.284	6.731	.446*** (25.70)	5.608	6.133	.525*** (70.01)
Log of total household's nonmedical consumption (Thousand VND)	9.677	10.221	.544*** (30.39)	9.164	9.770	.606*** (78.12)
Log of household's medical expenditure (Thousand VND)	6.114	6.750	.635*** (19.67)	5.794	6.424	.630*** (42.33)
Independent Variables						
Ethnic minority	.098	.146		.174	.177	
Live in Rural	.457	.485		.851	.839	
Head's Age	43.82	45.047		44.526	46.243	
Head's years of schooling	10.137	10.455		6.641	6.875	
Spouse's Age	41.811	43.184		41.497	43.454	
Spouse's year of schooling	8.745	8.978		5.471	5.789	
Unskilled professionals	.242	.200		.724	.699	
Elementary professionals	.239	.204		.176	.217	
Medium professionals	.251	.243		.005	.008	
High professionals	.266	.351		.093	.074	
Log of total household's income (Thousand VND)	10.115	10.849		9.563	10.237	
Type of house (Permanent house=1)	.891	.924		.730	.826	
Household size	4.138	4.079		4.699	4.406	
Kids <15 years old (%)	25.142	20.289		29.891	23.801	
Elderly >60 years old (%)	3.472	4.107		7.028	7.510	
Poor Household	.016	.018		.122	.143	
Red River Delta	.226	.203		.217	.216	
North West	.192	.179		.164	.151	
North East	.043	.053		.041	.053	
North Central Coast	.101	.096		.121	.112	
South Central Coast	.093	.094		.088	.091	
Central Highlands	.056	.084		.064	.073	

South East	.157	.150		.098	.098	
Mekong River Delta	.126	.137		.204	.203	
No of observations (households)	**4,951**	**2,590**	**7,541**	**23,222**	**12,812**	**36,034**

Note: Mean difference (DIFF) test was performed on pre/post NHI period by household sector, t-statistics are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

5. Estimation Model:

The 2005 policy change was intended to benefit the non-state sector households as public sector households had cover prior to this period. Hence, DID can be used across the target groups to identify the effects of HI implementation. To investigate the impact of health insurance policy implementation on household consumption, the following linear model was used:

$$\mathrm{LnY}_{it} = \beta_0 + \beta_1 NHI_{it} + \beta_2 Treat_{it} + \beta_3 NHI_{it} \times Treat_{it} + \gamma X_{it} + \lambda Region_{it} + u_i \quad (1)$$

where LnY_{it} represents the log of household consumption items (total household consumption; per capita household consumption; total household medical expenditure; total household non-medical consumption for household *i* at time *t*). NHI_{it} is a binary variable that identifies pre/post periods, where *NHI* = 0 is pre-2005, *NHI* = 1 is post 2005. $Treat_{it}$ represents the household's status as a household in the non-state sector, or not. $NHI_{it} \times Treat_{it}$ is the interaction term between *NHI* and *Treat*, which yields the DID estimator. Based on Equation (1), the simple DID estimator can be obtained by:

$$\begin{aligned} \Delta^{HI} &= \{E(\mathrm{Y} \mid \mathrm{Treat}=1, \mathrm{NHI}=1, \mathrm{X}) - \mathrm{E}(\mathrm{Y} \mid \mathrm{Treat}=1, \mathrm{NHI}=0, \mathrm{X})\} \\ &-\{E(\mathrm{Y} \mid \mathrm{Treat}=0, \mathrm{NHI}=1, \mathrm{X}) - \mathrm{E}(\mathrm{Y} \mid \mathrm{Treat}=0, \mathrm{NHI}=0, \mathrm{X})\} \\ &= [(\beta_1 + \beta_2 + \beta_3) - \beta_2] - [\beta_1 - 0] = \beta_3 \end{aligned} \quad (2)$$

In this model, β_3 is the DID estimator of the impact of the 2005 policy change on household consumption. $Region_{it}$ represents the characteristics of the household's location which includes either urban or rural and geographic regions. Household characteristics (*X*) covers ethnic minority (where head of household), spouse(s) age, spouse(s) years of schooling, head of household's occupation status; log of total household income, type of house, household size, poverty (yes/no), percentage of children under 15 years old and percentage of elderly above 60 years old and the inflation index.

6. Results and Discussion:

Using DID estimation with this type of policy change and dataset,it is possible to determine the policy change effects on two indicators of consumption: total household consumption and per capita household consumption. Furthermore, it is possible to explore the impact of the change on some specific household consumption items such as medical/non-medical consumption. To do this the following adjustments were made to the regression model.

6.1. Total household consumption and per capita consumption:

For household consumption (Table 2), two indicators (total household consumption and per capita consumption) were used to estimate results. In the first two model results are shown in columns 1 and 2 and show the effects on total household consumption. Table 2 columns (3) and (4)show the effects on per capita household consumption. Models (1) and (3) use

independent variables to control for spouse(s) characteristics and household characteristics, including ethnic status; location (for example rural areas); spouse(s) age, spouse(s) years of education; head of household occupation status; log of total household income and type of house (permanent house), all of which capture household wealth status. The household demographic characteristics were accounted for using household size, percentage of children under 15 years old, percentage of seniors over 60 years old (both categories being particularly vulnerable to health shocks), and poverty status. To control for market prices over time and improve the robustness of the results, the World Bank CPI index for the respective years andthe rate of economic growth were also included. Models (2)and (4)included a regional location variable to test for those effects.

Results indicated that the coefficients of the interaction terms (DID effect) for both total household consumption and per capita consumption were statistically significant. This implies that the 2005 NHI reform had a strong and positive impact on both the household consumption and per capita household consumption indicators. In addition, the ethnic households, households living in rural areas, or poor households were less likely to consume goods than Kinh households, households in urban areas, or richer households. Households with spouse(s) in the higher education level or with higher occupational skillsconsumed more goods when compared to households with lower education level spouse(s) or occupational skills. Moreover, richer households spent more than their poorer counterparts. Households with a greater percentage of children under 15 years old saw negative effects on household consumption.

Table 2. DID results for total household consumption and per capita consumption

	Log of total household's consumption		Log of per capita consumption	
	(1)	(2)	(3)	(4)
HI*Household in non-state sector (DID)	.021**(.009)	.018* (.009)	.085***(.011)	.082***(.011)
Health insurance policy implemented	.063***(.010)	.072***(.010)	-.153***(.011)	-.141***(.011)
Household in non-state sector	-.063***(.007)	-.058***(.007)	-.046***(.008)	-.046***(.008)
Ethnic minority	-.043***(.004)	-.029***(.005)	-.031***(.005)	.004 (.006)
Live in Rural	-.151***(.005)	-.141***(.005)	-.097***(.006)	-.095***(.006)
Head's Age	.0005 (.0004)	.0007*(.0004)	.0001 (.0005)	.0004 (.0005)
Head's years of schooling	.006***(.0006)	.008***(.0006)	.001**(.0008)	.004***(.0008)
Spouse's Age	.0008**(.0004)	.0009**(.0004)	.0004 (.0005)	.0005 (.0005)
Spouse's year of schooling	.007***(.0006)	.010***(.0007)	.001*(.0008)	.005***(.0008)
Unskilled professionals (head)	-.032***(.006)	-.033***(.006)	-.044***(.007)	-.044***(.007)
Elementary professionals (head)	-.0006 (.007)	-.001 (.007)	-.008 (.008)	-.014*(.008)
Medium professionals (head)	.023**(.010)	.013 (.010)	.031**(.014)	.021 (.013)
Log of total household's income	.592***(.004)	.566***(.004)	.785***(.005)	.750***(.005)
Type of house (Permanent house=1)	.026***(.004)	.051***(.004)	.008*(.005)	.037***(.005)
Household size	.056***(.001)	.059***(.001)	-.176***(.001)	-.171***(.001)
Kids <15 years old (%)	-.001***(.0001)	-.001***(.0001)	-.001***(.0001)	-.001***(.0001)
Elderly >60 years old (%)	-.001***(.0001)	-.001***(.0001)	.0006***(.0001)	.0008***(.0001)
Poor Household	-.057***(.005)	-.056***(.005)	-.047***(.006)	-.043***(.006)
Red River Delta		-.090***(.006)		-.060***(.007)
North West		-.068***(.006)		-.117***(.007)
North East		-.048***(.009)		-.085***(.009)
North Central Coast		-.088***(.006)		-.143***(.007)
South Central Coast		-.044***(.006)		-.107***(.007)
Central Highlands		-.050***(.007)		-.082***(.008)
South East		.056***(.006)		.074***(.010)
GDP growth (%)	.005 (.004)	.007 (.004)	-.178***(.005)	-.173***(.005)
CPI growth (%)	.015***(.0004	.016***(.0004	-.003***(.0005)	-.002***(.0005)

	)	)		
No of observations (households)	37,492	37,492	37,492	37,492
R^2	0.784	0.787	0.740	0.746

Note: Robust standard errors are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

6.2. Household non-medical consumption:

Table 3 shows the estimate results for several specifications of the interaction and determinants of household non-medical consumption. Column (1) shows some household characteristics such as ethnic status, rural areas, spouse(s) characteristics (age, years of education); head of household occupation level; and log of total household income. Columns (2) and (3) add other variables, including type of house and demographic features including household size, percentage of children under 15 years old, rate of seniors over 60 years old, and poverty status. Column (4) adds a variable to capture geographic location.

The DID coefficients for the interaction terms in Table 3 indicate that the 2005 NHI reform had a strong and positive impact on household non-medical consumption. These results are in agreement with existing literature, for example Sheu and Lu (2014) and Wagstaff and Menno (2005). It is also likely that there are longer impact pathways with effects reaching labor supply and labor productivity (Dizioli and Roberto, 2016; Su et al., 2017). Such an expansion may also effect incomes generally, leading to increases in household non-medical consumption. Expansion of health insurance coverage may also reduce precautionary saving (Chou et al., 2003) further increasing consumption.

The results here illustrate that factors such as being in a rural location, spouse(s) age, lower occupational skill levels, and being a poor household, all saw a negative impact on household non-medical consumption. Conversely, households with spouse(s) in the higher education levels and richer households were more likely to spend on non-medical goods. Households living with a higher percentage of dependent people such children under 15 years or seniors also saw a negative impact on household non-medical consumption.

Table 3. DID results for non-medical consumption

	(1)	(2)	(3)	(4)
HI*Household in non-state sector (DID)	.087***(.016)	.079***(.016)	.085***(.015)	.085***(.015)
Health insurance policy implemented	-.063***(.016)	-.059***(.016)	-.040**(.016)	-.038**(.016)
Household in non-state sector	-.009 (.010)	-.010 (.010)	-.029***(.010)	-.026**(.010)
Ethnic minority	.034***(.006)	.034***(.006)	-.007 (.006)	-.013 (.008)
Live in Rural	-.099***(.007)	-.099***(.007)	-.120***(.007)	-.118***(.007)
Head's Age	-.001 (.0006)	-.001**(.0006)	-.0008 (.0006)	-.0009 (.0006)
Head's years of schooling	.005***(.001)	.003***(.001)	.005***(.001)	.005***(.001)
Spouse's Age	-.0001 (.0006)	-.0005 (.0006)	.0002 (.0007)	.0003 (.0007)
Spouse's year of schooling	.010***(.001)	.007***(.001)	.010***(.001)	.010***(.001)
Unskilled professionals	-.023**(.010)	-.022**(.010)	-	-

(head)			.028***(.010)	.030***(.010)
Elementary professionals (head)	.025**(.011)	.018* (.011)	.020* (.011)	.022**(.011)
Medium professionals (head)	.018 (.016)	.024 (.016)	.029* (.016)	.030* (.016)
Log of total household's income	.713***(.005)	.704***(.005)	.651***(.005)	.649***(.005)
Type of house (Permanent house=1)		.132***(.005)	.124***(.005)	.122***(.005)
Household size			.050***(.001)	.050***(.002)
Kids <15 years old (%)			-.000 (.0001)	-.000 (.0001)
Elderly >60 years old (%)			-.001***(.0001)	-.001***(.0001)
Poor Household			-.014*(.007)	-.016**(.007)
Red River Delta				.006 (.009)
North West				.019**(.009)
North East				.039***(.013)
North Central Coast				.034***(.010)
South Central Coast				-.007 (.010)
Central Highlands				-.001 (.012)
South East				.062***(.010)
GDP growth (%)	-.033***(.007)	-.033***(.007)	-.021***(.007)	-.021***(.007)
CPI growth (%)	.008***(.0007)	.008***(.0007)	.011***(.0007)	.011***(.0007)
No of observations (households)	37,492	37,492	37,492	37,492
R^2	0.602	0.606	0.616	0.616

Note: Robust standard errors are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

6.3. Impact of NHI on household medical consumption:

Following a similar estimation strategy to the previous section, Table 4 shows the DID estimation results for the impact of the 2005 NHI changes on medical consumption. The DID coefficients for the interaction terms indicate that the reform did not have an observable impact on household medical consumption. These results are in agreement with previous literature such as Sepehri et al. 2005; Wagstaff et al., 2007; Wagstaff, 2010; Liu et al. 2012; Cuong, 2012, which showed that NHI promoted healthcare utilization and access in Vietnam. It can be inferred that in the short-run, NHI did not make any noticeable reduction in household health expenditure, or at least it remained unchanged. The results in Table 4concerning household medical consumption are also consistent with the previous section of this paper, showing that in the short run, when household income is increasing, non-medical consumption (i.e. necessary goods) increased, relative to other household goods.

The results also show consistency with findings concerning ethnic minority households or those in rural locations where there was a negative impact on household medical consumption. Wealthier households were more likely to increase their spending on medical

goods or services than their poorer counterparts. Households with spouse(s) without higher education showed an increase in medical consumption, whereas households with a head of household with a higher occupational skill level showed a decrease in medical expenditures. All household demographic features (i.e. household size, percentage of children, rate of elderly people) and poor households, experienced an significant effect on their household medical expenditures.

Variables for outlying regions such as the Red River Delta, North West, North Central Coast, South Central Coast, and South East exhibited negative coefficients for household medical consumption, however as an exception the Central Highlands showed a positive value for medical expenditure. In addition, both GDP growth and CPI index variables had a positive effect on household medical consumption.

Table 4. DID results for medical consumption

	(1)	(2)	(3)	(4)
HI*Household in non-state sector (DID)	-.016 (.037)	-.013 (.037)	-.0003 (.037)	-.0004 (.037)
Health insurance policy implemented	.056 (.039)	.055 (.039)	.064* (.038)	.078**(.038)
Household in non-state sector	.013 (.025)	.014 (.025)	-.008 (.025)	-.005 (.025)
Ethnic minority	-.455***(.019)	-.454***(.019)	-.494***(.019)	-.351***(.022)
Live in Rural	-.054***(.018)	-.055***(.018)	-.074***(.018)	-.040**(.018)
Head's Age	.011***(.001)	.011***(.001)	.008***(.001)	.008***(.001)
Head's years of schooling	.001 (.002)	.002 (.002)	.004 (.002)	.013***(.002)
Spouse's Age	-.002*(.001)	-.002* (.001)	-.003**(.001)	-.002* (.001)
Spouse's year of schooling	.001 (.002)	.003 (.002)	.009***(.002)	.026***(.002)
Unskilled professionals (head)	.008 (.026)	.008 (.026)	.003 (.026)	.011 (.026)
Elementary professionals (head)	.014 (.027)	.019 (.027)	.020 (.027)	.012 (.027)
Medium professionals (head)	-.001 (.038)	-.002 (.038)	.002 (.038)	-.037 (.038)
Log of total household's income	.463***(.011)	.468***(.011)	.450***(.011)	.357***(.011)
Type of house (Permanent house=1)		.072***(.017)	.090***(.017)	.010** (.017)
Household size			.060***(.005)	.068***(.005)
Kids <15 years old (%)			.0008**(.0004)	.0001**(.0004)
Elderly >60 years old (%)			.005***(.0004)	.005***(.0004)
Poor Household			.001 (.024)	.014 (.024)
Red River Delta				-.368***(.023)
North West				-.543***(.025)
North East				-.379***(.038)
North Central Coast				-.414***(.026)
South Central Coast				-.143***(.026)
Central Highlands				.025 (.029)
South East				-.061**(.024)
GDP growth (%)	.070***(.019)	.070***(.019)	.081***(.019)	.090***(.019)
CPI growth (%)	.025***(.001)	.025***(.001)	.027***(.001)	.029***(.001)
No of observations (households)	37,492	37,492	37,492	37,492
R^2	0.158	0.158	0.164	0.181

Note: Robust standard errors are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

6.5. Robustness tests:

6.5.1. Time trend analysis:

Table 1 exhibits some differences between the control and treatment groups in terms of the descriptive statistics for household characteristics. Some points worth noting examining are that total income is always higher in state households than non-state households, average education level for the control group is higher than the treatment group, and the percentage of children under 15 years old in control households is smaller than that found in treatment households. These factors could potentially influence household consumption in the control group. Observations drawn from the control group showed they were more likely to increase spending on goods. If this is the case, then the results from the difference-in-difference effect (β_3) in Equation (1) may be an overestimation. This potential bias arises from the difference in outcomes between the two groups potentially being due to characteristic differences, rather than the result being an effect of a given treatmentper se.

Moreover, one critical assumption with the DID approach is that the effect of social changes on the outcome (Y_{it}) is similar to both the control and treatment group (Hsieh et al., 2015; Kuo and Lin, 2018; Khiem et al., 2020). To tackle this problem a time trend variable was added to the interaction term of the treatment group in Equation (1). This allowed for different time trends on the control and treatment groups to be tested as shown in Equation (2) below:

$$\mathrm{Ln}Y_{it} = \beta_0 + \beta_1 NHI_{it} + \beta_2 Treat_{it} + \beta_3 NHI_{it} \times Treat_{it} + \gamma X_{it} + \lambda Region_{it} + \beta_4 T + \beta_5 (T * Treat_{it}) + u_{it} \quad (2)$$

where, T is the number of years from the start of the study period, *t*=1, 2, 3, 4; and ($T * Hh_{it}$) is an interacting linear time trend *T* with a dummy variable for each individual in a treatment or control household.

Table 5 presents the regression results and changes in household consumption over time. The coefficient of the interaction term for the four indicators of household consumption (total household consumption, per capita consumption, non-medical consumption) are all statistically significant and positive effects, but medical consumption is negative effect and statistically insignificant, consistent with the previous DID estimation.

Table 5. The results for DID model with time trend analysis

	Total household consumption	***Per capita consumption***	***Non-medical consumption***	***Medical consumption***
Interactions of HI and Household in non-state sector (difference-in-differences)	.018** (.009)	.082*** (.011)	.084*** (.015)	-.105 (.207)
Number of Observation	37,492	37,492	37,492	37,492

Note: Robust standard errors are in parentheses; * p<0.10, ** p<0.05, *** p<0.01; for detail, can be seen in appendix A1.

6.5.2. Propensity score matching with difference-in-differences:

Whenapplying the DID method, a completely random selection must be made to satisfy the common trend hypothesis; however, it is not possible to ensure that the household decision to participate in the NHI program is completely random. For example, these households could

have been chosen due to higher consumption which would result in biased DID results. Fortunately, Heckman et al. (1997, 1998) addressed this issue by developing the combined PSM-DID approach.

The combination of PSM and DID uses a matching estimator, where the basic idea is to choose a household *j* in the control group that is shares similar characteristics to observable characteristics of a matching household *i* in the treatment group. This results in a close equivalence to $X_i = X_j$. The matching estimator helpsaddress the problem of not satisfying any common trend that may exist between the treatment and control groups when using DID.

When all households in the control group have been matchedto households in the treatment group, each household in the control group will be given a weighting such that they match the household in the treatment group (Rosenbaum, 2010; Rubin, 1980, 2007). In this paper, the kernel matching method was used, and the steps are as follows. (1) The probit model is used to estimate the propensity score of the group variables and control variables. (2) The differences before and after entering NHI for the households in the treatment group, and the differences pre/post 2005 for matching the households in the control and treatment group are calculated. (3) Derive the average treatment effect (ATT) between the control and treatment groupsby subtracting one from the other.

In order to overcome systematic differences in the macroeconomic environment trends such as location, and to reduce the bias of the DID estimation, this applied the PSM-DID to test robustness. Using this type of test, the NHI impact was found to have a significant effect on the control variables. After PSM matching was performed, the averages of the control variables showed no significant differences, and had balanced the treatment and control groups successfully. This means that the PSM-DID method was appropriate for this data set and for this type of study. Kernel matching method was also used to estimate the effect of NHI on urbanand rural environments and the results are shown in Table 6. According to the regression results, the coefficients of the four indicators of the household consumption were significantly negative when using PSM-DID. These results were consistent with the benchmarkregression.

Table 6. PSM-DID evaluation results

	Total household consumption	***Per capita consumption***	***Non-medical consumption***	***Medical consumption***
Interactions of HI and Household in non-state sector (difference-in-differences)	.001*** (.012)	.057*** (.013)	.046*** (.014)	-.000** (.027)
Number of Observation	39,360	39,360	39,360	38,614

Note: Standard errors are in parentheses; * p<0.10, ** p<0.05, *** p<0.01; for detail, can be seen in appendix A2, A3, A4, A5.

7. Conclusions:

Existing literature indicated that NHI could help households increase their disposable income, reduce precautionary savings, and increase household labor supply. There are still too few studies examining the potential impact of NHI on household consumption (in terms of household consumption, including medical consumption and non-medical consumption), particularly for low-middle income countries. This study used four waves of the VHLSS database, 2002, 2004, 2004 and 2008. Evaluating effects of the 2005NHI reform showed there was a significant impact on household consumption, when measured by four indicators:

total household consumption, per capita consumption, medical consumption and non-medical consumption.

Using the quasi-experimental DID method and then testing for robustnessusing additional time trend analysis and PSM-DID approaches, the findings indicated that the 2005 NHI reform had a strong and positive impact on both of total household consumption and per capita household consumption (around 2% points and 8% points, respectively). Particularly, there was astrong and positive impact on household non-medical consumption (approximately 8.5% points) with a high level of significance. These results arein line with the conclusions of the Chinese studies by Bai and Wu (2012), and Taiwanesestudies by Sheu and Lu (2014).However, in the case of Vietnam, the impact of NHI on household consumption was considerably higher than for other countries.

This study did not find any evidence that NHI had a negative impact on household medical consumption. This may be explained by the fact that in the short-run, when households begin participating in the NHI system, healthcare access may increase, but it only has a small effect on the total health expenditure of households.

The findings also suggest that ethnic minority households, households in rural areas and poor households were less likely to decrease their spending on both of medical expenditures and non-medical consumption.

While the proportion of population covered by NHI increased rapidly, it still only covered a proportion of the population (43%). If the government could expand NHI coverage for the remainder of the population and make NHI fully universal, there may be other unintended, positive downstream effects for citizens not discussed here. Any policy implemented, however, should be suitable for citizens living in rural areas and poorer demographics to maximize people's outcomes.

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Appendix

Table A1. DID modelsand estimation of time trend results

	Total household consumption	**Per capita consumption**	**Non-medical consumption**	**Medical consumption**
Health insurance policy implemented	-.534***(.023)	-1.057***(.026)	-.606***(.037)	.107(.581)
Household in non-state sector	-.058***(.007)	-.046***(.008)	-.026**(.010)	-.559***(.150)
HI*Household in non-state sector (DID)	.018*(.009)	.082***(.011)	.085***(.015)	-.105(.207)
Ethnic minority	-.029***(.005)	.004(.006)	-.013(.008)	1.624***(.134)
Live in Rural	-.141***(.005)	-.095***(.006)	-.118***(.007)	-.461***(.118)
Head's Age	.001*(.000)	.000(.000)	-.001(.000)	-.025**(.010)
Head's years of schooling	.008***(.000)	.004***(.000)	.005***(.001)	-.056***(.018)
Spouse's Age	.001**(.000)	.000(.000)	.000(.000)	.007(.010)
Spouse's year of schooling	.010***(.000)	.005***(.000)	.010***(.001)	-.076***(.018)
Unskilled professionals (head)	-.033***(.006)	-.044***(.007)	-.030***(.010)	-.198(.161)
Elementary professionals (head)	-.001(.007)	-.014*(.008)	.022**(.011)	.212(.164)
Medium professionals (head)	.013(.010)	.021(.013)	.030*(.016)	.492**(.212)
Log of total household's income	.566***(.004)	.750***(.005)	.649***(.006)	.574***(.090)
Type of house (Permanent house=1)	.051***(.004)	.037***(.005)	.122***(.006)	.383***(.121)
Household size	.059***(.001)	-.171***(.001)	.050***(.002)	.117***(.030)
Kids <15 years old (%)	-.001***(.000)	-.001***(.000)	-.000(.000)	-.004*(.002)
Elderly >60 years old (%)	-.001***(.000)	.001***(.000)	-.001***(.000)	-.041***(.003)
Poor Household	-.056***(.005)	-.043***(.006)	-.016**(.007)	-.711***(.161)
Red River Delta	-.090***(.006)	-.060***(.007)	.006(.009)	.582***(.146)

North West	-.068***(.006)	-.117***(.007)	.019**(.009)	1.113***(.156)
North East	-.048***(.009)	-.085***(.009)	.039***(.013)	.642***(.201)
North Central Coast	-.088***(.006)	-.143***(.007)	.0343***(.010)	.935***(.173)
South Central Coast	-.044***(.006)	-.107***(.007)	-.007(.010)	.317*(.174)
Central Highlands	-.050***(.007)	-.082***(.008)	-.001(.012)	-.842***(.201)
South East	.056***(.006)	.074***(.010)	.062***(.010)	.235(.161)
Time trend T	.073***(.007)	-.220***(.007)	.017 (.011)	-1.014***(.187)
Time trend T * households in non-state sector	.174***(.009)	.411***(.010)	.186***(.014)	.559**(.240)
No of observations (households)	37,492	37,492	37,492	37,492
R^2	0.787	0.746	0.616	0.030

Note: Standard errors in parentheses: "* p<0.10, ** p<0.05, *** p<0.01

Table A2. Robustness check results of PSM-DID modelfor total household consumption

Difference	**Total household consumption**
Before NHI reform (2005)	
Control group	9.509
Treatment group	9.393
Difference (T-C)	-.114*** (.007)
After NHI reform (2005)	
Control group	10.166
Treatment group	10.053
Difference (T-C)	-.113*** (.009)
Difference in differences	.001***(.012)
Number of observations	39,360

Notes: Standard errors are in parentheses under coefficients; * p<0.10, ** p<0.05, *** p<0.01. The model with the total household consumption, treatment group consists of 33,384 samples, including 20,572 before 2005 and 12,812 after; the control group consists of 5,976 samples, comprised of 3,861 before 2005 and 2,115 after.

Table A3. Robustness check results of PSM-DID model for per capita consumption

Difference	Per capita consumption
Before NHI reform (2005)	
Control group	5.743
Treatment group	5.591
Difference (T-C)	-.151*** (.008)
After NHI reform (2005)	
Control group	6.220
Treatment group	6.133
Difference (T-C)	-.095*** (.011)
Difference in differences	.057***(.013)
Number of observations	39,360

Notes: Standard errors are in parentheses under coefficients; * p<0.10, ** p<0.05, *** p<0.01. The model with the total household consumption, treatment group consists of 33,384 samples, including 20,572 before 2005 and 12,812 after; the control group consists of 5,976 samples, comprised of 3,861 before 2005 and 2,115 after.

Table A4. Robustness check results of PSM-DID model for household non-medical consumption

Difference	Non-medical consumption
Before NHI reform (2005)	
Control group	9.277
Treatment group	9.173
Difference (T-C)	-.104*** (.008)
After NHI reform (2005)	
Control group	9.829
Treatment group	9.770
Difference (T-C)	-.058*** (.011)
Difference in differences	.046***(.014)
Number of observations	39,360

Notes: Standard errors are in parentheses under coefficients; * p<0.10, ** p<0.05, *** p<0.01. The model with the total household consumption, treatment group consists of 33,384 samples, including 20,572 before 2005 and 12,812 after; the control group consists of 5,976 samples, comprised of 3,861 before 2005 and 2,115 after.

Table A5. The results of robustness check using PSM-DID model with household's medical consumption

Difference	Medical consumption
Before NHI reform (2005)	
Control group	5.943
Treatment group	5.790
Difference (T-C)	-.153*** (.016)
After NHI reform (2005)	
Control group	6.586
Treatment group	6.424

Difference (T-C)	-.161*** (.022)
Difference in differences	-.008***(.027)
Number of observations	38,614

Notes: Standard errors are in parentheses under coefficients; * p<0.10, ** p<0.05, *** p<0.01. The model with the total household consumption, treatment group consists of 32,715 samples, including 20,178 before 2005 and 12,537 after; the control group consists of 5,899 samples, comprised of 3,806 before 2005 and 2,093 after.