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# Welfare dynamics in rural Vietnam

## Learning from regular, high-quality panel data

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**Abstract:** While many studies of welfare dynamics have been conducted using panel data sets with two or three waves, much richer insights can be obtained where more waves are available. This paper analyses this issue for the case of the Vietnam Access to Resources Household Survey, a carefully collected and high-quality data set collected over a period of eight years from 2008 to 2016. The survey was conducted over a period of impressive overall welfare improvement, but the data set highlights significant heterogeneity in this with significant numbers of households in fact becoming worse off. A panel-based econometric analysis of the evolution of different measures of welfare identifies that there are strong dynamics in welfare for all three measures considered here, but that shocks and changes in household composition are very important drivers of changing welfare levels at the household level

**Keywords:** welfare dynamics, panel survey, Vietnam
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# 1 Introduction

The international debate around the 2030 sustainable development agenda has made it abundantly clear that there is a strong case for improved data on socioeconomic development in developing countries. For example, the High Level Panel Report (United Nations 2013) makes an impassioned call for a data revolution. Furthermore, issues of poverty, inequality, and vulnerability are central in the Sustainable Development Goal (SDG) framework. This calls for high-quality data to assess the evolution of these concepts in specific country contexts, precisely because it is well known that there is a lot of variability in experience across and within countries (e.g. Arndt et al. 2016 for sub-Saharan Africa). This variability reflects many factors, not least because measures at any given point in time may reflect the particular circumstances when they were collected. The focus in the SDG framework on vulnerability reminds us that poverty and inequality are dynamic phenomena which change over time, which makes the case for the need for high-quality panel data. Importantly, this panel data needs to comprise enough waves that the results are not driven by exceptional events or even measurement error in the base and final year.

Taking advantage of an important new high-quality five-wave panel data set covering the period 2008–16, this paper looks at evolution of welfare dynamics in rural Viet Nam. The case of Viet Nam is of particular interest because the country has achieved some of the fastest poverty reduction in the world over the past 25 years, exceeding even China. When the first national household survey was conducted in Viet Nam in 1992/93 nearly 64 per cent of the population were poor according to the World Bank's $1.25 poverty line (World Bank 2015). This fell rapidly over the following 17 years to reach 2.4 per cent in 2012. In other words, according to this source, the proportion of the population that was poor fell over this period to less than one-twentieth of its original value.[1]

This aggregate success in poverty reduction was no doubt facilitated by the *doi moi* reform process which started in 1986. This involved wide-ranging institutional reform, including a greater reliance on market forces in the allocation of resources and the determination of prices. This created a major shift from an economy dominated by the state and cooperative sectors to a situation where the private sector and foreign investment play an increasingly important role in economic activity alongside the state sector. Following the reform Viet Nam enjoyed sustained strong growth, with the local currency value of Gross Domestic Product (GDP) per capita increasing by a factor of 3.6 between 1990 and 2014. This increase continued through the world financial crisis of 2007–08 and the food and fuel price increases of the late 2000s. Without doubt, important strides have been made over a relatively short time span to further the transition from a centrally planned to a market economy. As part of this, Viet Nam has also achieved impressive progress in rural areas. It made rapid progress in the production of rice, its main crop, moving from being a net importer up to the 1980s to a consistent net exporter, now among the top five world exporters of rice. The country also developed a marked international presence in other crops such as coffee, as well as substantially diversifying into non-agricultural activities in rural areas.

All of these far-reaching reforms will inevitably be associated with substantial diversity of experience, with some benefiting more than others, while some may even have lost out. This can only be identified and understood with good quality panel data, reinforcing the above point. We

[1] China according to the same metric reduced poverty from 60.7 per cent in 1990 to 6.3 per cent in 2011. And Viet Nam's achievement is all the more impressive given that its population grew by 34 per cent over the 1990–2012 period in contrast to 18 per cent in China.

examine the evolution of welfare in rural areas carefully, making use of the Viet Nam Access to Resources Household Survey (VARHS) data set, collected every two years between 2006 and 2018, and so covering a period where different international crises were faced. In this paper, we focus on the 2008–16 period, for which a balanced panel of 2,131 households is available (and a larger unbalanced panel). The VARHS surveyed households in 12 provinces across the major regions of the country. We use these data to construct three different measures of household welfare, and then analyse the diversity of experience in the evolution of these measures at household level, and of the factors associated with this.

It is immediately clear from the data that the clear aggregate progress they show masks a striking range of outcomes at the household level, with many instances of households becoming worse off. This is true of all welfare measures, with cases observed of substantial reductions in each. The data also show that households were hit by many shocks, some repeatedly. Despite the high volatility in the data, the econometric analysis provides strong evidence of path dependence in the welfare measures, with current values depending on previous period values. Shocks are also important drivers of welfare dynamics, with natural resource shocks in particular having a negative impact on income and food consumption though not on assets; changes in household composition are also important drivers of changes in the welfare measures. Disaggregating the analysis by ethnicity, gender of the household head, and between the north and south of the country shows some different dynamics. We find that the size of the impact of the lagged dependent variable is greater for the ethnic minorities (the non-Kinh) compared to the ethnic majority (the Kinh), and for female-headed households compared to those with a male head. A quantile analysis shows differences in the size of the dynamic effect throughout the distribution for assets and food consumption. Finally, while any one of these measures individually might be questioned, we find a remarkable consistency of results between the different measures.

The remainder of this paper is structured as follows. A succinct review of the now extensive literature on analysing welfare dynamics using panel data sets is set out in section 2. The data set is described in detail in section 3, and a descriptive analysis of welfare dynamics is presented in section 4. Section 5 then discusses our econometric approach and presents the results of this analysis of welfare dynamics over the period, after which section 6 concludes.

## 2 Literature

A substantial number of studies have examined poverty dynamics in developing countries, using two or more wave panel data sets for this purpose. This has reflected both the increased availability of panel data and the increased recognition that poverty needs to be understood in dynamic terms. Some selected recent examples include the studies in Baulch (2011), Ferreira et al. (2010), Krishna and Shariff (2011), and Radeny et al. (2012).

Other studies, rather than looking at transitions relative to a fixed poverty line, have instead focused on dynamics of the whole distribution. Fields et al. (2003) examine and then model changes in per capita income within panel data sets from four different countries as a function of household characteristics, finding changes in jobs to be a very important common factor in welfare progress. Jalan and Ravallion (2004) and Lokshin and Ravallion (2004) model household income as a non-linear function of income in previous waves to establish if there is any convexity in the income growth process, not finding any. A very long-term case has been the studies conducted of the Indian village of Palanpur (Lanjouw and Stern 2003). The data from the Kagera Health and Development Survey have been widely studied from this perspective, showing a strong positive impact of migration on consumption growth (Hirvonen and de Weerdt 2013; Beegle et al. 2011).

Similarly, correlates of consumption growth in the Ethiopian Rural Household Survey find significant positive impacts of roads and extension visits, and significant negative effects of several shocks (including the 1984 famine) when they are included (Dercon 2004; Dercon et al. 2009). Many of these studies are based on panel data sets with multiple waves. Some other studies have modelled asset dynamics, including Barrett et al. (2006) and Carter and Barrett (2006), often using this to test for the existence of poverty traps.

A number of both poverty and welfare dynamics studies have been conducted for the specific context of Viet Nam, particularly using the panel data from the Vietnam Living Standards Surveys (VLSS) for 1992/3 to 1997/8, and from the later Vietnam Household Living Conditions Surveys (VHLSS) of 2002, 2004, and 2006 (each of which included panel components). Imai et al. (2011) study poverty dynamics and vulnerability in Viet Nam, while studies by Justino et al. (2008), Coello et al. (2010), and Baulch and Dat (2011) study both poverty and welfare dynamics. Justino et al. (2008) and Coello et al. (2010) both model changes in household per capita consumption, while Baulch and Dat (2011) use simultaneous quantile regressions to compare differences between the chronic poor and the never poor in the responsiveness of their per capita consumption to different explanatory variables. In addition, an early Viet Nam study by Glewwe and Nguyen (2002) examined economic mobility based on the VLSS panel data set (seeking to take measurement error into account). Relatedly, Benjamin et al. (2017) examine the evolution of income inequality over 2002–14.

The analysis presented here adds to these studies, by updating the story, covering more waves, and covering a longer period of time.

## 3 Data

Our analysis in this paper is based on the Viet Nam Access to Resources Household Survey (VARHS), for which a pilot was conducted in 2002 in four provinces covering some 900 households. Subsequently the questionnaire was extended in 2006 and the geographic coverage was expanded to 12 provinces across seven of the eight regions of Viet Nam, with the intention of establishing a longer-term, high-quality panel data set specifically designed to capture the living conditions of rural households. In 2008 a further extension to the questionnaire was made, which among other things collected all the information necessary to construct a comprehensive measure of total household income. Five rounds have now been conducted every two years since 2008, with the latest round completed this year.

The VARHS survey was developed as part of a long-term institutional collaboration between the University of Copenhagen, on the one side, and the Central Institute for Economic Management (CIEM) of the Ministry and Planning and Investment (MPI), the Institute for Labour Science and Social Affairs (ILSSA) of the Ministry of Labour and Social Affairs (MOLISA), and the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) of the Ministry of Agriculture and Rural Development (MARD), on the other.[2] This is the longest and largest panel data set available for Viet Nam. The number of households interviewed in each of the five rounds between 2008 and 2016 was 2,131. The distribution of the number of households by wave is presented in Table 1. This shows that a number of households were added to the sample in 2012; it also shows some attrition over time. 2,278 panel households were surveyed in 2008, of whom

[2] See CIEM et al. (2009, 2011, 2013; UNU-WIDER 2017) for further background information and details.

2,131 were re-interviewed in 2016, an attrition rate of only 6.5 per cent over an eight-year period. The survey also collects detailed information to be able to assess the nature (and to some extent causes) of this attrition, and this reveals that movement of households is the main reason for the attrition.

Table 1: Number of households interviewed by wave, 2008–16

| Year | No. of households |
|---|---|
| 2008 | 2,278 |
| 2010 | 2,245 |
| 2012 | 2,760 |
| 2014 | 2,725 |
| 2016 | 2,669 |
| Total | 12,677 |

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

The VARHS survey specifically collects data on land use, agricultural and non-agricultural livelihoods, income, food consumption, consumer and producer assets, credit and savings, and social capital. This paper considers three measures of welfare that can be computed from the survey data: (i) food consumption, (ii) household income, and (iii) household ownership of assets. The income measure is computed based on detailed information on the households' earnings from many different sources: agriculture (covering crops, livestock, and aquaculture, enabling the estimation of profits from each), wage earnings, income from different non-farm business activities, transfers of different types, and common property resources. Information is collected on household food consumption in the previous four weeks, covering purchases, consumption from own production, and gifts. As the focus in this paper is on analysing the over time dynamics of income and consumption, the food consumption and income measures were adjusted to take account of price differences over time using Consumer Price Index (CPI) data provided by the Vietnamese General Statistics Office (GSO). Income was deflated using the province-specific rural CPI, and food consumption using the province-specific food CPI.

In this analysis we consider it important to consider both income and consumption. Their levels are likely to fluctuate significantly over the lifetime of the panel in response to changing household circumstances. A particular effort was made in VARHS to compile comprehensive data on income. While consumption is routinely considered to be a better welfare measure than income (Deaton 1997; Deaton and Grosh 2000), in this case only food consumption was collected, and it is therefore informative to consider both measures here.

In addition, the survey collects comprehensive information on households' asset ownership, covering productive assets of many types, durable goods, human capital, and social capital. Assets are potentially less subject to fluctuations than income or consumption, which is potentially valuable given the household level focus of the analysis. They can form the basis for an important and informative welfare measure in its own right. The comprehensive information on assets was summarized by constructing an asset index using factor analysis following the principles set out by Sahn and Stifel (2000) and the routine practice used in the Demographic and Health Surveys. The precise form of the index is presented in Appendix Table 1.

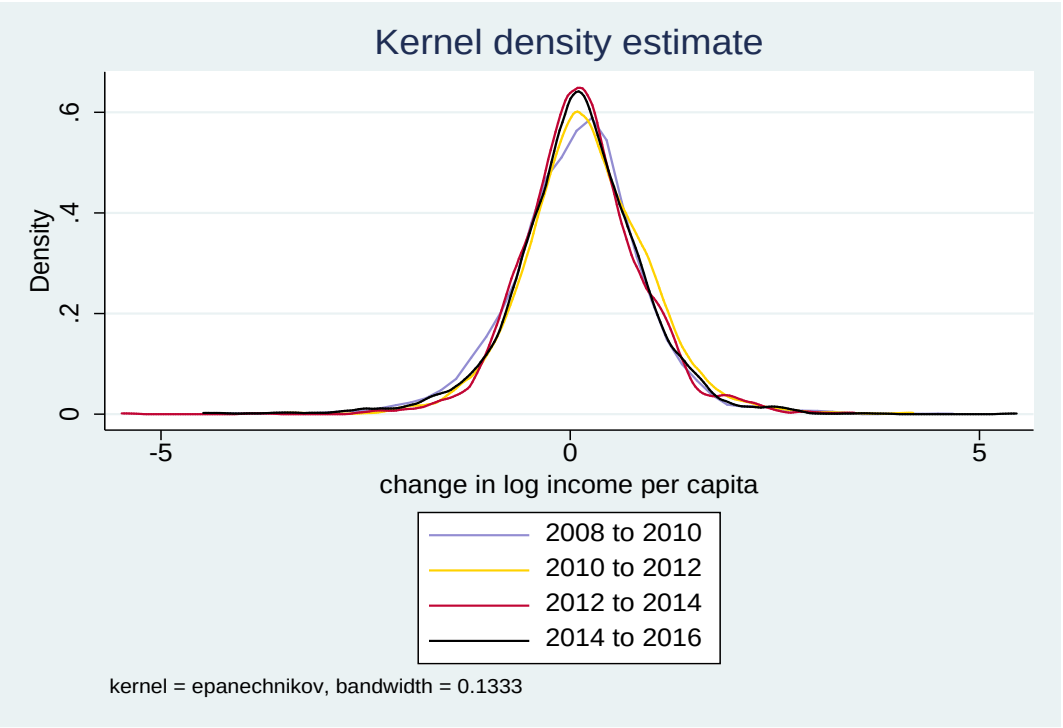
Finally, the survey also collected a second measure of income, based on direct questions to households about their overall earnings from eight main sources. Because of the aggregate nature of the question this is less likely to be more accurately answered than the measure described above;

but we use this as a robustness check for our results using the preferred income measure. This measure is also deflated and expressed on a per capita basis.

## 4 Descriptive analysis

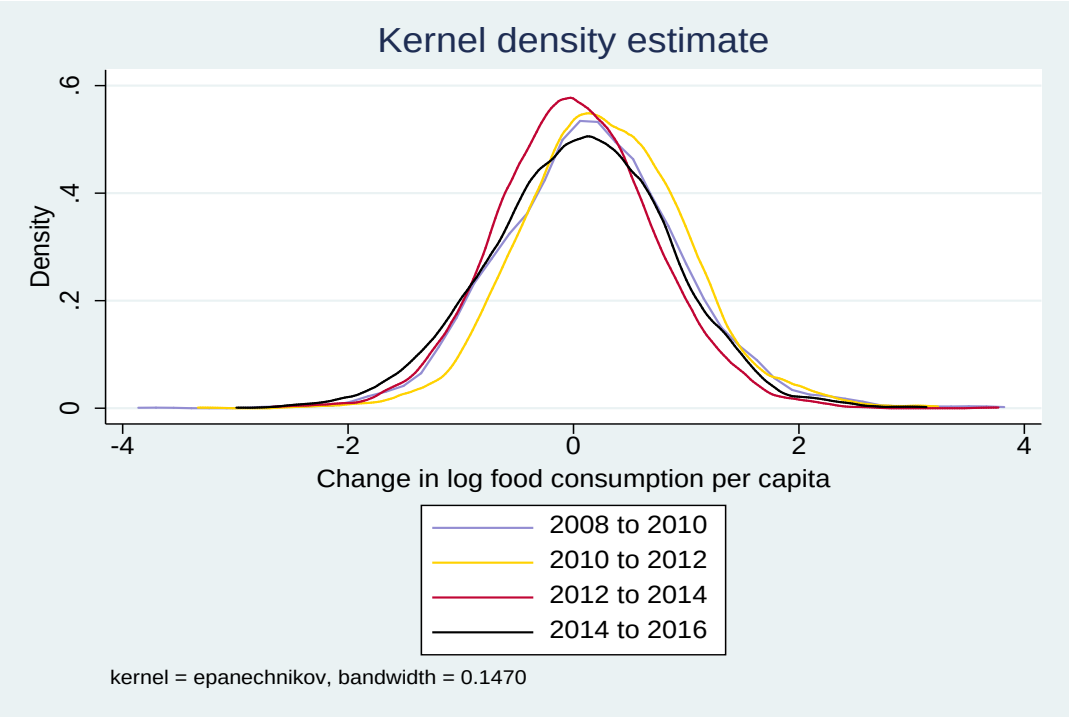
The focus in this paper is on the changes over the five waves of the panel at the household level in the three welfare measures described above. For this purpose, we look at wave-to-wave changes in the log of real household income per capita, the log of real food consumption, and the changes in the asset index. The first two series are of course the proportionate changes in the underlying variable. Table 2 summarizes the statistical properties of these variables and Figures 1a, 1b, and 1c plot the frequency distribution of the wave-to-wave changes.

Figure 1a: Frequency distribution of changes in the logarithm of household per capita income between survey waves



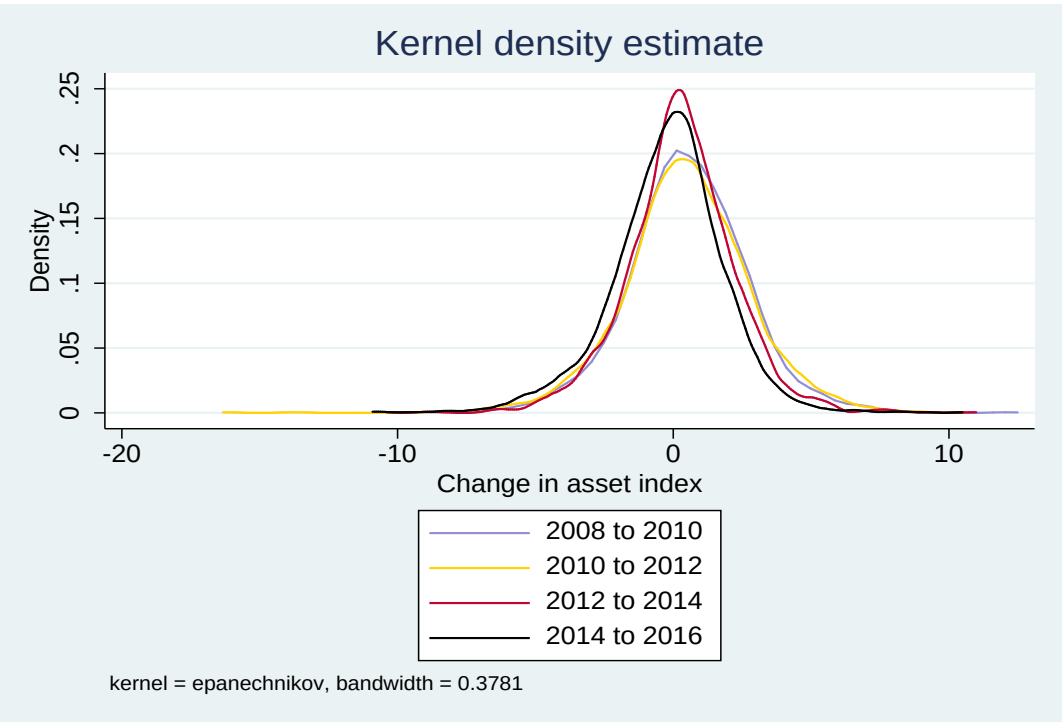

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Figure 1b: Frequency distribution of changes in the logarithm of household per capita food consumption between survey waves




Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Figure 1c: Frequency distribution of changes in the household asset index between survey waves




Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Table 2: Summary statistics of changes between waves in the different household welfare measures

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| *Panel A: Changes in log household income* | | | | |
| 2008 to 2010 | 0.083 | 0.806 | -4.206 | 4.544 |
| 2010 to 2012 | 0.204 | 0.776 | -3.474 | 4.189 |
| 2012 to 2014 | 0.137 | 0.735 | -5.479 | 3.474 |
| 2014 to 2016 | 0.109 | 0.802 | -4.483 | 5.453 |
| *Panel B: Changes in log household food consumption* | | | | |
| 2008 to 2010 | 0.165 | 0.799 | -3.714 | 3.674 |
| 2010 to 2012 | 0.275 | 0.736 | -3.332 | 3.234 |
| 2012 to 2014 | 0.015 | 0.706 | -2.677 | 3.77 |
| 2014 to 2016 | 0.063 | 0.795 | -2.991 | 3.131 |
| *Panel C: Changes in asset index* | | | | |
| 2008 to 2010 | 0.52 | 2.166 | -8.772 | 12.112 |
| 2010 to 2012 | 0.473 | 2.325 | -16.332 | 10.62 |
| 2012 to 2014 | 0.274 | 1.971 | -10.412 | 10.989 |
| 2014 to 2016 | -0.215 | 2.068 | -10.908 | 10.497 |

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

The mean values of changes in the welfare measures are all positive (Table 2), with the exception of the asset index between 2014 and 2016, which records a decline. The average increases in household income are large throughout. For food consumption, the average changes are large between 2008 and 2012 and lower after that. The increases in the asset index between 2008 and 2012 are quite large compared to the mean value of the level of the asset index (which ranges from -0.76 in 2008 to 0.43 in 2014), suggesting there was quite a lot of asset accumulation over that period (continuing at a slower pace into 2014), but then asset holdings fell slightly between 2014 and 2016. But these results certainly show quite fast increases in average welfare levels over this period, a message which broadly holds across the alternative welfare measures. This is also entirely consistent with the macroeconomic situation over this period.

But the same table shows that the standard deviation of the changes in the welfare measures between the waves is very large, substantially larger than the mean change in all cases. There are some very large minimum and maximum values (for instance an income increase of 450 per cent and a reduction of nearly 550 per cent), which will inflate the reported standard deviations, but Figures 1a to 1c show a widely spread distribution of both upward and downward changes. The frequency distributions show that there a substantial number or large changes, in both directions, for all welfare measures.

All welfare measures clearly report a very high degree of volatility. Without question this is driven to a large extent by measurement error in the data; income and consumption in particular are very difficult to measure precisely, and when the focus here is on changes at the individual household level measurement error will inevitably have a big impact. But the asset measure is likely to be less affected by measurement error, as it is based on the same questions in every round about whether households have a particular asset or not or sometimes how many of an asset they have.

Households should be able to answer such questions much more accurately, but the asset index, a summary of these responses, still shows substantial numbers of households reporting large upward and downward movement in the reported asset index.

This strongly suggests that a lot of the reported volatility is real. It is certainly to be expected that for many households, income can fluctuate substantially from one period to another, especially for households for whom agriculture, non-farm self-employment, or causal wage labour is a major income source. Shocks may potentially be a major driver of this. It might be expected that food consumption would be less variable, as households will seek to smooth their consumption over time. This is suggested to some extent in these data, but food consumption is still very volatile suggesting that households hit by shocks may not be fully able to engage in consumption smoothing (for example, see Beck et al. 2018). Also, these are both per capita measures and so will change as household composition changes, due to migration, births, deaths, etc. Shocks and changing household compositions are therefore likely to be two major drivers of genuine fluctuations in the income- and consumption-based welfare measures. Assets may also respond to shocks; in fact they may be an important margin of household adjustment to negative or positive shocks and may be a key channel through which households seek to smooth their consumption. The asset measure is not a per capita measure so there the impact of household size and composition is expected to be different.

Table 3: Frequency distribution of changes in household size between waves

| | 2008 to 2010 | 2010 to 2012 | 2012 to 2014 | 2014 to 2016 |
|---|---|---|---|---|
| -5 or more | 0.9% | 0.4% | 0.6% | 0.6% |
| -4 | 1.2% | 1.0% | 1.2% | 1.4% |
| -3 | 2.4% | 2.6% | 1.7% | 2.2% |
| -2 | 5.5% | 4.4% | 3.7% | 3.7% |
| -1 | 15.5% | 12.5% | 13.3% | 13.6% |
| 0 | 60.5% | 62.3% | 62.6% | 61.3% |
| 1 | 9.4% | 11.3% | 11.7% | 11.7% |
| 2 | 3.1% | 3.9% | 3.2% | 3.6% |
| 3 | 0.7% | 0.9% | 1.5% | 1.3% |
| 4 | 0.5% | 0.3% | 0.4% | 0.4% |
| 5 or more | 0.2% | 0.3% | 0.2% | 0.3% |

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

The survey, of course, collects information on household composition and Table 3 reports on changes in household size between consecutive waves in the panel. Between any two consecutive waves the size of more than 60 per cent of households remains the same, but there are significant numbers of reductions and increases between waves, with slightly fewer of the latter. The greatest number of cases are of changes by one person in either direction, but there are a number of bigger changes as well. Only 29 per cent of households have the same size in 2016 as they had in 2008. Changes in household size then is an important dynamic.

Table 4: Extent to which households reported different types of shocks in the two years preceding the interview

| Year | Natural shock | Pest | Economic shock | Serious illness or death |
|---|---|---|---|---|
| 2008 | 43.2% | 26.7% | 23.2% | 10.2% |
| 2010 | 42.4% | 25.2% | 16.6% | 11.0% |
| 2012 | 29.5% | 23.1% | 18.6% | 10.5% |
| 2014 | 23.3% | 15.9% | 13.3% | 10.3% |
| 2016 | 19.9% | 11.9% | 12.6% | 9.9% |
| % experiencing this shock in at least 3 rounds | 25.4% | 11.9% | 5.8% | 2.5% |

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

The survey also collects detailed information on shocks that households experience. Households are asked if they experienced a wide range of different shocks in the two years preceding each round of the survey, as well as about the size of the impact and their response. For the purposes of this paper the shocks were classified into four groups: natural shocks (landslides, droughts, storms, floods); pests (including avian 'flu'); economic shocks (changes in prices, input shortages etc.); and illness (serious injury, serious illness, death). Table 4 reports the number of households which experienced each of these shocks in the different waves. The shocks which are most commonly reported are natural shocks, and in 2008 and 2010 these affected more than 40 per cent of households. Pest and economic shocks also affect a significant number of households. For all these shocks though, the numbers reporting them declines over time. This probably reflects changes in livelihood patterns over the period with non-agricultural activities becoming increasingly more important for many households over this time period. Serious illnesses affect a smaller number of households, but the numbers are not negligible.

The panel feature of the survey though allows identification of households hit by repeated shocks. Table 4 also reports the percentage of households hit by a given type of shock in at least three of the five waves; nearly 30 per cent of households were hit by some kind of shock in three out of five waves. Natural shocks are the ones most commonly reported to have hit households three times or more. These shocks, and especially cases were households experienced repeated shocks, are likely to be very important drivers of welfare dynamics.

## 5 Econometric analysis of welfare change

We turn now to studying the correlates of household level changes in the three welfare measures (income, consumption, and assets) through a multivariate analysis. For income and consumption, we focus on the logarithm of the variables, given the skewed nature of the raw data; a price of this though is that some incomes are negative, reflecting losses in farming or self-employment activities. The evolution of welfare can be estimated as a growth model, regressing the change in the logarithm of the welfare measure for household $i$ between two waves on its previous period level, a series of control variables which vary over time, and household fixed effects $\gamma_i$ to capture unobserved time invariant effects at this level, year fixed effects $\eta_t$ and province time trends $\delta_p t$ as follows:

$$\log y_{i,t} - \log y_{i.t-1} = (\alpha - 1) \log y_{i,t-1} + X'_{i,t}\beta + \gamma_i + \delta_p t \ + \eta_t + \varepsilon_{i,t} \qquad (1)$$

Equivalently though, this may be estimated in level terms:

$$\log y_{i,t} = \alpha \log y_{i,t-1} + X'_{i,t-2}\beta + \gamma_i + \delta_p t + \eta_t + \varepsilon_{i,t} \quad (2)$$

Two fundamental issues arise in estimating this model. One is that the lagged dependent variable is almost certainly endogenous. The second is measurement error which will certainly affect the income or consumption estimates. Estimating these models by ordinary least squares (OLS) is likely to generate highly biased results. One alternative approach might be to seek to identify an instrumental variable for the lagged dependent variable, such as the lagged level of some assets. But it is very hard to identify a prospective instrumental variable which can plausibly satisfy the exclusion restriction. A potentially more convincing approach in this case is to use an Arellano–Bond or Arellano–Bover/Blundell–Bond estimation procedure which use further lagged values of the dependent variable as instruments. Both approaches will all be presented here.

In addition to the above income and consumption models, we also estimate equivalent model for the change in the asset index as follows:

$$A_{i,t} = \alpha A_{i,t-2} + X'_{i,t}\beta + \gamma_i + \delta_p t + \eta_t + \varepsilon_{i,t} \quad (3)$$

While endogeneity and measurement error may be less severe in this case, they are still highly likely to be present. It therefore makes sense to adopt the same estimation approach here.

The explanatory variables used in the models need to be variables that can change over time given the inclusion of fixed effects in all models. In this case the two key categories of variables already discussed in the descriptive analysis are included in the model: measures of household composition by age group and gender; and different shocks experienced by the household in the previous two years. The age of the household head is also included as the head may change over time. We include year fixed effects ($\eta_t$) to control for any unobserved countrywide macroeconomic conditions at the time of the survey. Further, our welfare measures may be trending upwards over time. In order to avoid any spurious correlations due to these underlying time trends we also include a linear time trend in all the models and allow this to vary by province ($\delta_p$). Finally, we cluster the standard errors at the level of the commune to allow household decisions to be correlated within a commune and also over time.

### 5.1 Main results

The results of the Arellano–Bond model estimated for each of the three welfare measures based on the balanced panel data set are presented in Table 5. In all cases the lagged dependent variable is strongly statistically significant and positive, indicating path dependence. Despite the volatility seen in the descriptive analysis, it is very clear that current values of the welfare measure reflect past values, showing an important and strong dynamic in the evolution of welfare. The coefficient on the lagged dependent is 0.09 and 0.10 for the income and food consumption measure, but much larger for the asset index (0.24). This is expected as this is likely to be the measure which is most accurately measured, and also the one which is likely to fluctuate least over time.

Table 5: Results of base econometric analysis of welfare dynamics

| | HH income | | Food consumption | | Asset index | |
|---|---|---|---|---|---|---|
| | AB | ABBB | AB | ABBB | AB | ABBB |
| Lagged per capita income | 0.0949*** | 0.0704*** | | | | |
| | 0.0247 | 0.0239 | | | | |
| Lagged pc food consumption | | | 0.0962*** | 0.0665*** | | |
| | | | 0.018 | 0.0177 | | |
| Lagged asset index | | | | | 0.235*** | 0.188*** |
| | | | | | 0.0272 | 0.0224 |
| Females < 5 years | -0.136*** | -0.137*** | -0.0520** | -0.0504** | 0.161* | 0.160* |
| | 0.0288 | 0.0284 | 0.026 | 0.0256 | 0.0858 | 0.0837 |
| Females 5 to 15 years | -0.139*** | -0.145*** | -0.0785*** | -0.0771*** | 0.323*** | 0.299*** |
| | 0.0257 | 0.0254 | 0.0239 | 0.0236 | 0.0732 | 0.0705 |
| Females 15 to 60 years | -0.0814*** | -0.0870*** | -0.101*** | -0.100*** | 1.028*** | 1.007*** |
| | 0.019 | 0.0188 | 0.0163 | 0.016 | 0.0519 | 0.05 |
| Females 60 and above | -0.168*** | -0.162*** | -0.186*** | -0.181*** | 0.494*** | 0.491*** |
| | 0.0433 | 0.0427 | 0.037 | 0.0366 | 0.104 | 0.101 |
| Males < 5 years | -0.159*** | -0.159*** | -0.0717*** | -0.0691*** | 0.113 | 0.116 |
| | 0.0318 | 0.0314 | 0.0269 | 0.0265 | 0.0872 | 0.0853 |
| Males 5 to 15 years | -0.109*** | -0.118*** | -0.0818*** | -0.0823*** | 0.333*** | 0.310*** |
| | 0.0287 | 0.0282 | 0.0239 | 0.0236 | 0.0753 | 0.0727 |
| Males 15 to 60 years | -0.0398** | -0.0436** | -0.0822*** | -0.0842*** | 1.100*** | 1.077*** |
| | 0.0195 | 0.0192 | 0.0178 | 0.0176 | 0.0538 | 0.0517 |
| Males 60 and above | -0.176*** | -0.177*** | -0.161*** | -0.159*** | 0.479*** | 0.490*** |
| | 0.053 | 0.0525 | 0.0399 | 0.0393 | 0.137 | 0.134 |
| Age of head | -0.0031 | -0.0024 | 0.00249 | 0.00214 | -0.00929 | -0.00676 |
| | 0.00231 | 0.00228 | 0.002 | 0.00198 | 0.00582 | 0.00567 |
| If had natural shock | -0.135*** | -0.132*** | -0.0835*** | -0.0834*** | 0.0987 | 0.111 |
| | 0.03 | 0.0297 | 0.0287 | 0.0282 | 0.0763 | 0.0744 |
| If had pest shock | 0.0967*** | 0.0909*** | 0.0766** | 0.0764** | 0.0732 | 0.0617 |
| | 0.0348 | 0.0343 | 0.0311 | 0.0306 | 0.0877 | 0.0847 |
| If had economic shock | 0.0729* | 0.0765* | 0.0812** | 0.0798** | 0.202** | 0.199** |
| | 0.0417 | 0.0411 | 0.0356 | 0.035 | 0.101 | 0.0984 |
| If had illness shock | 0.0649 | 0.0597 | -0.04 | -0.039 | -0.0743 | -0.0594 |
| | 0.0493 | 0.0485 | 0.0416 | 0.041 | 0.115 | 0.112 |
| Constant | 9.004*** | 9.221*** | 5.189*** | 5.363*** | -3.540*** | -3.642*** |
| | 0.256 | 0.253 | 0.147 | 0.143 | 0.316 | 0.309 |
| Observations | 5,679 | 8,782 | 7,014 | 9,803 | 7,042 | 9,829 |
| Number of households | 2,213 | 2,770 | 2,724 | 2,786 | 2,731 | 2,787 |

Notes: Standard errors clustered at the commune level are reported. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

It is very clear though from these results that changes in household composition and shocks, both of which have already been seen to be substantial, play a major role in influencing the evolution of household welfare. These clearly play an important role in explaining the high degree of volatility seen in the data. But despite that, and despite measurement error, there is still a strong over time dynamic in all of these welfare measures.

Table 5 also reports results using the Arellano–Bover/Blundell–Bond linear dynamic panel data estimator, a system Generalized Method of Moments (GMM) estimator which is argued to be more efficient because of using a much larger number of instruments. This again estimated for the unbalanced panel data set. The results of this estimator are almost exactly the same in terms of which variables are significant and the coefficient magnitudes are quite similar; in this case though the coefficients of the lagged dependent variables are consistently smaller than in the original Arellano–Bond model. Nevertheless, the conclusions from this alternative estimation approach are the same.

We now consider two robustness checks of our results. In Table 6 we report the results of estimating the same Arellano–Bond models as in Table 5, but now using the balanced panel. The results in terms of sign and significance of coefficients are identical to those using the unbalanced panel, and the magnitudes of the coefficients are also very similar. The coefficient of the lagged dependent variable is slightly lower for income and food consumption and slightly higher for the asset index, but the values remain very similar. Table 7 then reports estimates using the summary measure of income referred to above. One again the signs, significance, and magnitude of the coefficients are remarkably similar to those using the preferred income measure, even though the raw series of the data only have a correlation coefficient of 0.55. These results provide strong evidence for the robustness of the results using the preferred measures.

Table 6: Welfare dynamics models estimated using the balanced panel

| | Income | Food consumption | Assets |
|---|---|---|---|
| Lagged per capita income | 0.0876*** | | |
| | 0.0253 | | |
| Lagged pc food consumption | | 0.0995*** | |
| | | 0.0182 | |
| Lagged asset index | | | 0.225*** |
| | | | 0.0273 |
| Females < 5 years | -0.124*** | -0.0487* | 0.156* |
| | 0.0301 | 0.0275 | 0.0919 |
| Females 5 to 15 years | -0.144*** | -0.0721*** | 0.303*** |
| | 0.027 | 0.0256 | 0.0794 |
| Females 15 to 60 years | 0.0896*** | -0.110*** | 1.021*** |
| | 0.0194 | 0.0168 | 0.0537 |
| Females 60 and above | -0.186*** | -0.187*** | 0.484*** |
| | 0.0446 | 0.0385 | 0.107 |
| Males < 5 years | -0.156*** | -0.0695** | 0.134 |
| | 0.0341 | 0.0285 | 0.0952 |
| Males 5 to 15 years | -0.103*** | -0.0812*** | 0.359*** |
| | 0.0304 | 0.0255 | 0.0813 |
| Males 15 to 60 years | -0.0394* | -0.0822*** | 1.090*** |
| | 0.0202 | 0.0186 | 0.0549 |
| Males 60 and above | -0.163*** | -0.142*** | 0.461*** |
| | 0.0543 | 0.0409 | 0.14 |
| Age of head | -0.00262 | 0.00209 | -0.0110* |
| | 0.00239 | 0.00204 | 0.00587 |
| If had natural shock | -0.133*** | -0.0748** | 0.12 |
| | 0.0311 | 0.0299 | 0.0787 |
| If had pest shock | 0.103*** | 0.0688** | 0.04 |
| | 0.036 | 0.0321 | 0.0902 |
| If had economic shock | 0.0720* | 0.0737** | 0.212** |
| | 0.043 | 0.0369 | 0.105 |
| If had illness shock | 0.0744 | -0.0278 | -0.0851 |
| | 0.051 | 0.0434 | 0.12 |
| Constant | 9.063*** | 5.201*** | 3.399*** |
| | 0.264 | 0.151 | 0.327 |
| Observations | 5,212 | 6,368 | 6,391 |
| Number of households | 1,779 | 2,128 | 2,131 |

Notes: Standard errors clustered at the commune level are reported. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Table 7: Welfare dynamics models using the alternative income measure

| | Change in log of per capita summary household income | | |
|---|---|---|---|
| | AB unbalanced panel | AB balanced panel | ABBB unbalanced panel |
| Lagged per capita summary income | 0.0958*** | 0.0932*** | 0.0699*** |
| | 0.0252 | 0.0262 | 0.0245 |
| Females < 5 years | -0.134*** | -0.121*** | -0.134*** |
| | 0.029 | 0.0303 | 0.0286 |
| Females 5 to 15 years | -0.136*** | -0.140*** | -0.141*** |
| | 0.0258 | 0.0272 | 0.0256 |
| Females 15 to 60 years | -0.0796*** | -0.0855*** | -0.0845*** |
| | 0.0192 | 0.0197 | 0.0191 |
| Females 60 and above | -0.163*** | -0.179*** | -0.157*** |
| | 0.0435 | 0.045 | 0.0429 |
| Males < 5 years | -0.153*** | -0.156*** | -0.152*** |
| | 0.0321 | 0.0344 | 0.0317 |
| Males 5 to 15 years | -0.105*** | -0.102*** | -0.113*** |
| | 0.0289 | 0.0307 | 0.0285 |
| Males 15 to 60 years | -0.0366* | -0.0400* | -0.0399** |
| | 0.0198 | 0.0205 | 0.0195 |
| Males 60 and above | -0.172*** | -0.166*** | -0.172*** |
| | 0.0535 | 0.0548 | 0.053 |
| Age of head | -0.00335 | -0.00285 | -0.00263 |
| | 0.00232 | 0.0024 | 0.00228 |
| If had natural shock | -0.127*** | -0.126*** | -0.124*** |
| | 0.0302 | 0.0314 | 0.0299 |
| If had pest shock | 0.0915*** | 0.0965*** | 0.0869** |
| | 0.0351 | 0.0363 | 0.0346 |
| If had economic shock | 0.0711* | 0.0671 | 0.0750* |
| | 0.0423 | 0.0437 | 0.0417 |
| If had illness shock | 0.0684 | 0.0834 | 0.063 |
| | 0.0496 | 0.0513 | 0.0488 |
| Constant | 8.954*** | 8.976*** | 9.174*** |
| | 0.253 | 0.264 | 0.251 |
| Observations | 5,678 | 5,211 | 8,781 |
| Number of households | 2,213 | 1,779 | 2,770 |

Notes: Standard errors clustered at the commune level are reported. *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

## 5.2 Heterogeneity

We also seek to estimate the model for subsamples of the data, considering three disaggregations: the north of the country versus the south; female heads and male heads; and households from the Kinh majority population as opposed to ethnic minorities. Each of these is very important and relevant in contemporary Viet Nam. In this discussion, we will focus on the results of the original Arellano–Bond model, and especially the coefficient on the lagged dependent variable and the shock terms.

Table 8: Coefficient on lagged dependent variable in disaggregated models

| | Income | | Food consumption | | Asset index | |
|---|---|---|---|---|---|---|
| | Coefficient | Std. error | Coefficient | Std. error | Coefficient | Std. error |
| Kinh | 0.0798*** | 0.029 | 0.0806*** | 0.0211 | 0.219*** | 0.0319 |
| Non-Kinh | 0.131*** | 0.0451 | 0.110*** | 0.0313 | 0.272*** | 0.0514 |
| Female | 0.150*** | 0.0554 | 0.0941** | 0.0406 | 0.401*** | 0.0754 |
| Male | 0.0832*** | 0.0271 | 0.0970*** | 0.02 | 0.203*** | 0.0282 |
| South | 0.0824*** | 0.0319 | 0.105*** | 0.0222 | 0.202*** | 0.0303 |
| North | 0.0784** | 0.0386 | 0.0704** | 0.0307 | 0.297*** | 0.0506 |

Notes: This table reports estimates from Arellano–Bond models discussed in the text. Kinh/non-Kinh refers to the ethnicity of the household head. Female/Male refers to the gender of the household head. Standard errors clustered at the commune level are calculated. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

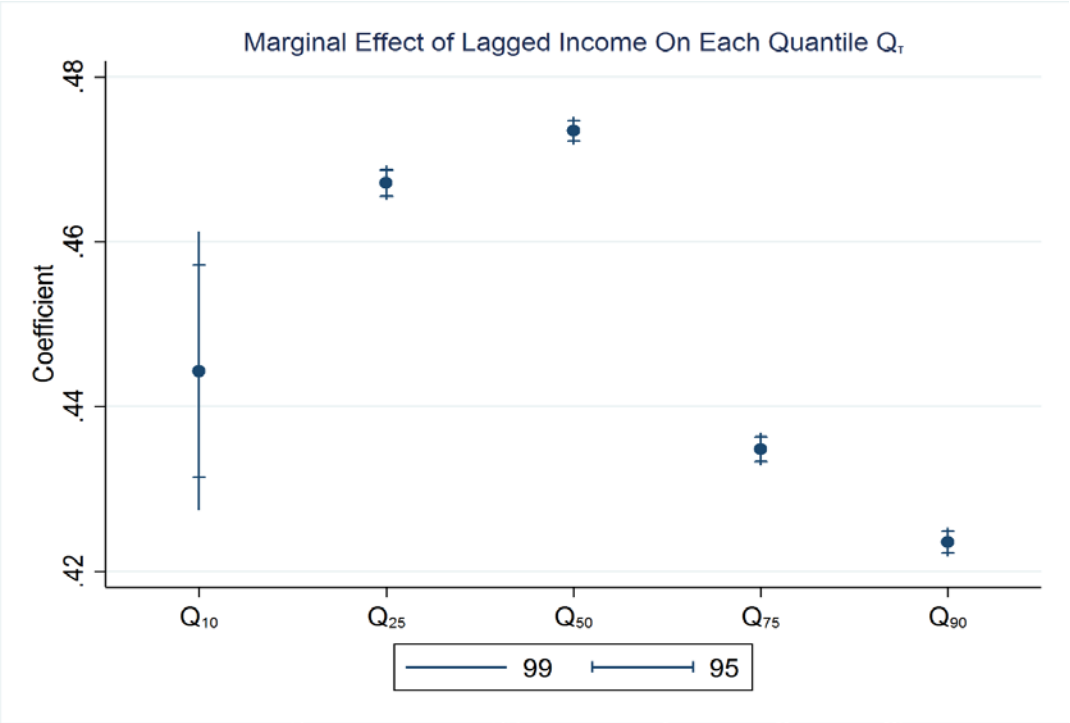
Comparing the Kinh and non-Kinh, the coefficient on the lagged dependent variable (Table 8) is higher for the non-Kinh than for the Kinh for all welfare measures, implying that the non-Kinh have a higher level of over time dependence. This finding is consistent with the literature that finds the non-Kinh to be systematically worse off relative to the Kinh (Baulch and Dat 2011; Beck et al. 2018; Kozel 2014; Singhal and Beck 2015). For income and assets, female-headed households have a higher level of over time dependence than male-headed households, though there is no significant difference for food consumption. This result is interesting as the study by Baulch and Dat (2011) did not find female-headed households to be systematically worse off relative to male-headed households during the period 2002–06. There is not though much systematic difference between provinces in the north and south of the country in the coefficients on the lagged dependent variables. The other explanatory variables included in the model (shocks and composition) mostly did not differ systematically between the different groups considered and so are not reported here.

While the analysis so far presents effects of variables at the mean, the degree of path dependence may differ over the distribution of the outcome variable. For example, it may be stronger for poorer households that lack access to credit and social networks to borrow in times of need. We investigate this source of heterogeneity by estimating instrumental variable quantile regression models proposed by Powell (2016). Figures 2a, 2b and 2c present plots of the coefficients on the lagged dependent variables for the income, food consumption, and asset models estimated relative to the 10th, 25th, 50$^{th}$, 75$^{th}$, and 90th percentiles. For income there is not a systematic variation by quantile. But for food consumption the dynamics are stronger at the bottom of the distribution and decrease with increasing food consumption levels; this may reflect the much greater

importance of non-food consumption for households (not measured here) for households with higher food consumption levels. With assets though the dynamics increase across the distribution. Households that have more assets would also seem to have a stronger pattern of asset accumulation. These results may suggest some convergence in food consumption levels; they would also seem to show increasing divergence in assets.

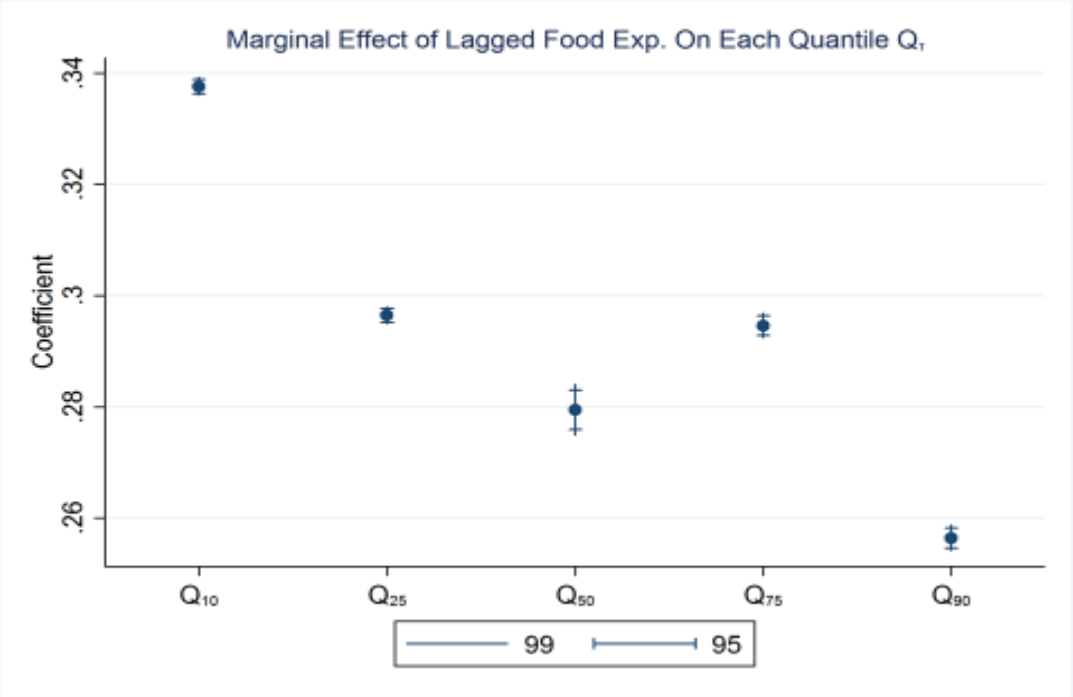
These models include all the other variables included in the main models presented here, and the signs and significance of effects are largely the same as those reported in Table 5. But they do not show clear systematic patterns in the impacts of shocks for example across the distribution.

Figure 2a: Coefficients on lagged dependent variable from quantile regressions for income



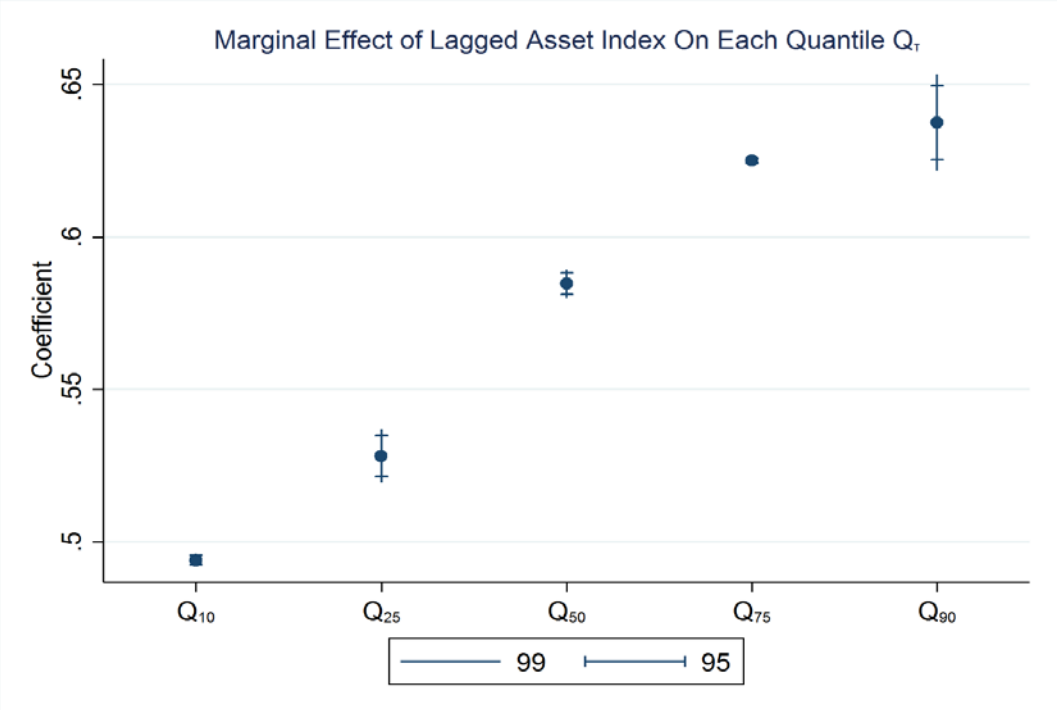

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Figure 2b: Coefficients on lagged dependent variable from quantile regressions for food consumption




Source: authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

Figure 2c: Coefficients on lagged dependent variable from quantile regressions for household asset index




Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).

## 6 Conclusions

The analysis presented in this paper was possible due to the existence of a large, high-quality, five-wave panel data set, the Viet Nam Access to Resources Household Survey (VARHS). VARHS seeks to document the wellbeing of rural households in Viet Nam focusing, in particular, on access to and the use of productive resources. It is based on a highly context-relevant survey questionnaire and is affected by very low levels of attrition.

While the three measures of welfare used here all bear witness to the considerable progress that has taken place in Viet Nam in the period under study, what they also strikingly show is the very great diversity of experience. While many households have experienced quite large increases in their welfare measures, many others have experienced sharp reductions. This pattern is consistent across the three welfare measures. While measurement error is definitely a factor in measuring these variables at the household level, there is strong evidence that much of the volatility is real, reflecting the uncertain environment in which many of these households live and work. The econometric analysis shows a strong dynamic: all welfare measures are strongly associated with past values even if the magnitudes of the coefficients are not very large.

Shocks and changes in household composition are very important drivers of dynamics. Changes in household composition reflecting births and deaths are likely to have direct effects on per capita food consumption or per capita income and are situations households need to adjust to. Many changes in household composition here reflect children leaving the household as they grow up, migrating elsewhere for work or marrying. Again, these are situations that are likely to affect the welfare of the household members left behind. In addition, they may affect household assets, which for example may need to be sold to pay for migration or may be exchanged as part of a marriage. The evidence here suggests that household assets decline if households become smaller.

Shocks are also a major factor driving dynamics. Natural resource shocks are most common and are particularly relevant for agricultural activities, which most of these households depend on to some extent. These shocks, which may have happened any time in the two years before the period for which the household welfare is measured, are clearly associated with negative impacts on household income and consumption. This shows that these shocks can be long lasting and that households have problems insuring themselves against their effects. Households are typically able to insure themselves better against other types of shocks, which may have less severe or shorter lasting impacts. Even if natural shocks may be affecting households less over time, they remain very common; and it is very clear though that households in rural Viet Nam have difficulty insuring themselves against the adverse effects of these shocks, which clearly have important welfare consequences.

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## Appendix

Appendix Table 1: Factor index weights for asset index

| Variable | Weight |
|---|---|
| Years of education per capita | 0.171 |
| Number of active household members | 0.105 |
| Number of plots owned | 0.051 |
| Total area owned | 0.035 |
| Irrigated area owned | 0.049 |
| Number of cows | 0.039 |
| Number of buffalos | 0.000 |
| Number of pigs | 0.024 |
| Number of chickens | 0.027 |
| If household has a business | 0.032 |
| Number of colour TVs | 0.074 |
| Number of videos/DVDs | 0.074 |
| Number of telephones | 0.061 |
| Number of motorcycles | 0.094 |
| Number of bicycles | 0.079 |
| Number of pesticide sprayers | 0.041 |
| Number of cars | 0.034 |
| Number of groups attended | 0.391 |
| Number of political groups | 0.407 |
| Area of dwelling | 0.054 |
| If has a good lighting source | 0.050 |
| If has a toilet | 0.067 |
| If has a good drinking water source | 0.042 |

Source: Authors' computation from VARHS data set (CIEM et al. 2009, 2011, 2013; UNU-WIDER 2017).