Cazzuffi, Chiara; McKay, Andrew D.; Perge, Emilie

Working Paper

The impact of commercialization of rice on household welfare in rural Viet Nam

WIDER Working Paper, No. 2018/130

Provided in Cooperation with:
United Nations University (UNU), World Institute for Development Economics Research (WIDER)

Suggested Citation: Cazzuffi, Chiara; McKay, Andrew D.; Perge, Emilie (2018) : The impact of commercialization of rice on household welfare in rural Viet Nam, WIDER Working Paper, No. 2018/130, ISBN 978-92-9256-572-5, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, https://doi.org/10.35188/UNU-WIDER/2018/572-5

This Version is available at:
https://hdl.handle.net/10419/190177

UNITED NATIONS UNIVERSITY
UNU-WIDER

WIDER Working Paper 2018/130

The impact of commercialization of rice on household welfare in rural Viet Nam

Chiara Cazzuffi,[1] Andy McKay,[2] and Emilie Perge[3]

October 2018

United Nations University World Institute for Development Economics Research
wider.unu.edu

Abstract: The past 30 years have seen a consistent increase in agricultural commercialization in rural Viet Nam, at the same time when rural residents have moved increasingly into non-agricultural activities. The contribution of the latter to welfare improvement and poverty reduction is well known; in this paper we investigate the extent to which increased agricultural commercialization has also contributed to improving welfare levels. For this purpose, we use the five-wave Viet Nam Access to Resources Household Survey (VARHS) panel data set from 2008–16 to consider the specific impacts of increased commercialization of rice, Viet Nam's dominant crop. We use three measures of welfare and two measures of agricultural commercialization, and find a significant impact of commercialization on household assets, a longer term welfare measure. However, we do not find much impact on household income and food consumption. The results also show heterogeneous effects across different types of households, with particularly large impacts for those who are frequent sellers.

Keywords: Commercialization, smallholders, rice, Viet Nam

JEL classification: O12, O13, Q12, Q13

Acknowledgements: We are grateful for helpful comments from other researchers who have been involved in this project; and in particular for the guidance and advice received from Saurabh Singhal and Finn Tarp.

[1] RIMISP—Latin American Center for Rural Development, Santiago, Chile, corresponding author: ccazzuffi@rimisp.org; [2] University of Sussex, Brighton, UK; [3] World Bank, Washington DC, USA.

This study has been prepared within the UNU-WIDER project on 'Structural transformation and inclusive growth in Viet Nam'.

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-572-5

Typescript prepared by Ans Vehmaanperä.

The United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Viet Nam has been an impressive success story in terms of growth and poverty reduction since the Doi Moi reforms, initiated in 1986 and accelerated from the early 1990s. Per capita GDP grew at an average rate of 5.0 per cent from 1986 to date, and of 5.5 per cent from 1992 onwards. At the same time there was a dramatic fall in monetary poverty. According to the US$1.90 poverty line, the poverty headcount fell from 49.2 per cent of the population in 1992 to only 3.1 per cent in 2014, one of the fastest rates of poverty reduction in the world. More recent data finds the national poverty headcount, computed relative to a recently reset poverty line, fell from 20.7 per cent in 2010 to 9.8 per cent in 2016. Rural areas very much shared in this impressive poverty reduction, falling in the recent period from 27.0 per cent in 2010 to 13.6 per cent in 2016 (World Bank, 2018a).

This period was accompanied by a major structural transformation, with the share of agriculture falling from 37.3 per cent in 1986 to 32.1 per cent in 1992 to 17.7 per cent in 2016. However, it is important to note that the share of agriculture was still substantial in 2016, and the average growth in value added in agriculture was 3.7 per cent per year between 1992 and 2016 (World Bank, 2018b). The agricultural sector itself has undergone an important structural transformation over this period as well. Productivity has increased substantially, and the levels of productivity of many crops compare favourably with other important producing countries in Asia and worldwide (World Bank, 2016). Viet Nam moved in the early 1990s from being a net importer of rice, which has always been its dominant crop, to becoming a major net exporter. It is now the fourth biggest rice exporter worldwide. At the same time Viet Nam has become an important producer of other products including coffee, fish, and shellfish. Without doubt the agricultural sector has been a very important contributor to growth and exports in Viet Nam over the past 30 years.

While the transition into non-farm activities within rural areas has been a major driving factor behind the rapid rural poverty reduction (Kinghan and Newman, 2017), the substantial progress in agriculture and its shift from mainly subsistence to increasing commercialization have also played a great role in improving rural living conditions. This issue has been much less studied and in this paper we make use of the five waves of the Viet Nam Access to Resources Household Survey (VARHS) panel data set to consider the extent to which this increased commercialization is associated with improvements in welfare levels of rural households, considering both more short-term welfare measures (food consumption, income) as well as longer term measures (asset holdings).

Our contribution is based on the use of high-quality panel survey data on rural smallholder farmers, which enables us to control for unobserved heterogeneity across farmers. The survey covers an 8-year period from 2008 to 2016, including the period of the major food price rise – which impacted Viet Nam positively in aggregate but not for all individual farmers (McKay and Tarp, 2015). This time span also allows short-term fluctuations and medium-term impacts to be distinguished. While agricultural commercialization in Viet Nam took many forms, in this paper we focus on rice, a crop produced by most smallholder households and sold by many. It is also grown throughout the country as opposed to cash crops, for instance coffee, which are mainly grown in some specific regions. Rice in Viet Nam is cultivated both as a food and a cash crop, for both domestic and export markets, and sold across a diverse range of channels. Thus, compared to most of the literature on commercialization, which tends to focus on cash or export crops, or on particular forms, such as contract farming, we examine a more comprehensive concept of commercialization. We measure commercialization as the share of rice output that is sold, and as the relative weight of rice sales over total household income, and we focus on heterogeneity of

impacts between farmers with different characteristics, based both on the characteristics of the households (gender of head, ethnicity) and the nature of their engagement with the market. Understanding this heterogeneity may help improving the ability of commercialization to be a driver for income growth and poverty reduction.

We find evidence, based on a fixed-effects model, that households who sell a higher proportion of the rice they produce accumulate more assets, and that this result is particularly striking for households who sell on a regular basis. Household income and food consumption are not significantly affected. When we look at a second measure of commercialization, that is, the ratio of rice sales relative to gross household income, the results are different; this measure does not have a significant impact on asset accumulation and is often associated with lower levels of household income. This result is likely to reflect the increasing importance of wage and nonfarm income in helping to make rural Vietnamese households better off.

This paper is structured as follows. Following this introduction, section 2 reviews the relevant literature in this field. In section 3 we introduce the data and how we use it, and we present an in-depth descriptive analysis. Our modelling approach is set out in section 4, after which section 5 highlights our results. Section 6 concludes.

2 The literature on impacts of agricultural commercialization

2.1 Defining agricultural commercialization

Agricultural commercialization may be defined as the degree to which a farm household is connected to markets. This connection can be observed at any given point in time, or as a dynamic process whereby a household increases its interaction with input or output markets over time (Jaleta et al. and, 2009). The concept of agricultural commercialization is a continuum. At one extreme, fully commercialized households make production decisions based on market signals and comparative advantage; at the other, subsistence farm households make production decisions based on their semi-fixed factor endowments and subsistence requirements, selling only the surplus left after household consumption requirements are met (Pingali and Rosegrant, 1995).

The literature has used various measures to qualify a farm household as commercialized, including whether it is producing a significant amount of cash commodities, or selling a considerable proportion of agricultural output. A definition of commercialization focused on resources allocated to cash crops may be misleading, as food crops are also often sold. Von Braun (1994) defined three indices for measuring different and complementary aspects of commercialization: (a) the proportion of agricultural output sold to the market and input acquired from market to the total value of agricultural production; (b) the ratio of the value of goods and services acquired through market transactions to total household income, including in-kind transaction; and (c) the ratio of the value of goods and services acquired by cash transactions to total household income. These indices, especially variations of the first two, are the measures of commercialization most widely used in the literature.

2.2 Impacts of commercialization

From a theoretical point of view, commercialization is expected to generate welfare gains at both household and aggregate levels. The gains derive, on the one hand, from static welfare effects of specialization and trade according to comparative advantage. These translate into income and employment effects directly reflected in household welfare, and into improvements in health and

nutrition which are contingent on the level of income. On the other hand, dynamic gains derive from the growth in productivity arising from technological changes fostered by increased interactions and exchange of ideas (Barrett, 2008).

Empirically, however, the question of whether agricultural commercialization has a positive impact on household welfare has not been settled yet, partly due to the empirical challenges to identification of a causal impact, and partly because impacts appear to be heterogeneous and highly specific to location and policy environments. When markets are imperfect, switching from subsistence to commercial agriculture may have negative impacts on household welfare by exposing households to volatile prices and food insecurity (Jaleta et al., 2009).

Cross-section studies addressing endogeneity issues by controlling for self-selection into agricultural commercialization tend to find positive impacts of commercialization on various aspects of household welfare. Using an instrumental variable technique, Tipraqsa and Schreinemachers (2009) find that integration into output markets improves farm productivity and net per capita income among the Karen Hill tribes in Thailand, and Bellemare (2012) finds that participating in contract farming is associated with an increase in household income, a decrease in its variability, and a shortening of the hunger season experienced by households in Madagascar. Rao and Qaim (2011), using an endogenous switching regression model, find positive effects of supplying to supermarkets on household income in Kenya, especially for households that are poor or own little land. Ogutu and Qaim (2018) use a control function method and find that commercialization significantly reduces both income and multidimensional poverty in Kenya, and that impacts are heterogeneous: while the magnitude of income gains increases with income, the magnitude of poverty reduction is strongest among the poorest households. Meanwhile, Romero and Wollni (2018) combine cross-sectional household data with longitudinal data on export market transactions. They estimate a duration model of smallholders' entry and exit from the market for broccoli in Ecuador, and then use the predicted length of participation derived from the duration model as the treatment of interest in a least squares equation. They find no evidence that participation translates into tangible benefits for farmers.

Studies using panel data tend to find more nuanced results. Carletto et al. (2011) use panel data and a difference-in-difference estimation to evaluate the long term impact (1985–2005) of non-traditional agricultural exports on changes in household consumption status and asset position in Guatemala, taking into account the timing and duration of participation. On average, they find that welfare levels have improved for all households regardless of adoption status and duration, but the extent of the improvement varies widely across groups: households with longer term participation experienced the smallest increase in welfare, while early participants who switched out after the 1980s boom in export commodities achieved the best outcomes in terms of assets and housing conditions. Using similar methods, Michelson (2013) estimates that participation in the supermarket supply chain of vegetables in Nicaragua is associated with higher holdings of productive assets, but not of consumer durables or land. Muricho et al. (2017) use an endogenous switching regression model and correlated random effects estimation strategy, and find that agricultural commercialization significantly increases annual per capita household expenditure in Kenya. Meanwhile, Carletto et al (2017) find little evidence of a positive relationship between commercialization and nutritional status in Malawi, Tanzania, and Uganda. Finally, Muriithi and Matz (2015) find positive impacts of vegetable commercialization on welfare in Kenya, with sales for exports positively associated with increases in income, and sales for the domestic market associated with increases in both incomes and assets.

2.3 Agriculture and commercialization in Viet Nam

Agriculture has been a critical part of Viet Nam's development and structural transformation over the past thirty years (Glewwe et al., 2004; McCaig and Pavcnik, 2013). Rice commercialization and exports are considered a success story of agricultural policy reforms (Goletti and Minot, 1997). The 1986 Doi Moi reforms were followed by several land reforms transferring land use rights from collectives to individual households, and progressively increasing tenure security and duration, with significant impacts on investment, especially in irrigation (Bellemare et al., 2018; Markussen, 2017), and on productivity (Newman et al., 2015).

As restrictions on internal and external trade of agricultural inputs and outputs were relaxed in the 1990s, rice productivity increased substantially. Rice export liberalization is estimated to have increased average real income in the country and to have reduced, albeit slightly, the incidence and severity of poverty (Minot and Goletti, 1998). Agriculture has also been a part of the decline in inequality over time (Benjamin et al., 2017).

Increased connection to the world market also means higher exposure to its volatility. Vu and Glewwe (2011) analyse the welfare impacts of price changes until 2006, and find that, overall, the increase in food prices raised average household welfare. However, they find that higher food prices made most households worse-off. The positive average effect arises because the average welfare loss of net food purchasers was smaller than the average welfare gains of food sellers. Examining a much stronger increase in food prices, McKay and Tarp (2015) conclude that thanks to effective government policies, the majority of rice producers gained from the food price spike, increasing production levels and adoption of improved seeds.

Despite the overall positive role of agriculture in Viet Nam's development, important distributional concerns exist. Benjamin and Brandt (2004) find that agricultural liberalization and other reforms have benefitted farm households living in the South more than those in the North. Benjamin et al. (2017) highlight the deteriorating position of ethnic minorities compared to the rest of the population. McKay and Tarp (2017) confirm both geographic and ethnic heterogeneities in welfare improvements.

The transformation in Viet Nam's agriculture is not confined to the farm level. Agricultural value chains, especially for rice, are undergoing significant transformations, which may have important future distributional effects for producers. Reardon et al. (2014) argue that Viet Nam is in an intermediate position within the continuum between traditional and modern value chains. Some features typical of traditional value chains persist, such as the importance of intermediaries, especially traders, who continue to concentrate most of rice sales, while more modern rice value chains in China and India are characterized by significant disintermediation. Meanwhile, the retail sector is undergoing a process of fast modernization, with a rapid increase in supermarkets, driven by urbanization, rising incomes, and food security concerns of consumers (Mergenthaler et al., 2009; Moustier et al., 2010).

3 The data

The data used in this study come from the VARHS, that collected data every two years between 2006 until 2016. The survey was undertaken in the rural areas of 12 provinces[1] by the Institute for Labour Science and Social Affairs (ILSSA) of the Ministry of Labour, Invalids and Social Affairs (MOLISA) in partnership with the Central Institute for Economic Management (CIEM) and was financed over many years by DANIDA. Further details on the survey can be found in Tarp (2017). The analysis in this paper is based on the five-wave balanced panel from 2008 to 2016. In these five waves, 2,131 households were repeatedly surveyed. We begin here by presenting some descriptive analysis of the survey data set, before moving on in the next section to focus on the measures of commercialization and welfare that form the basis for this paper.

Agriculture is central to the livelihood strategies of rural households in Viet Nam: more than 80 per cent of households report at least some income from agriculture. Almost all households, however, combine agriculture with other income sources, of which the most important is wage income (McKay and Tarp, 2017).

Across the survey years, households engaged in agriculture consistently have lower total and per capita incomes compared to non-agricultural households. However, between 2008 and 2016 they experience a much faster growth rate in incomes compared to non-agricultural households: 64 per cent in total household incomes, compared to 26 per cent among non-agricultural households, and 79 per cent in per capita incomes, compared to 42 per cent among non-agricultural households. Agricultural households are on average larger than non-agricultural households, with 80 per cent of them headed by a man compared to 66 per cent of non-agricultural households. Heads of agricultural households are younger than heads of non-agricultural households, and agricultural households also have more members in the active age range (15 to 60) while non-agricultural households have, on average, more elder members.

Rice continues to be the most important crop in Viet Nam, even though we observe a downward trend in participation in rice production over the five VARHS waves, going from 3 out of 4 households cultivating rice in 2008 down to 3 out 5 households in 2016. It is produced in all the provinces included in the sample, with the highest density in the northern uplands provinces of Dien Bien, Lai Chau and Lao Cai, where on average 90 per cent or more of households cultivate rice over the survey period. In comparison, other food crops are cultivated by a relatively smaller percentage of households. A third of households cultivate maize in 2008 and less than one fifth in 2016; one fifth of households cultivate potatoes in 2008 and less than one tenth in 2016. About one out of ten households in the period cultivate peanuts. At the same time, coffee is grown by only a minority (10 per cent) of households in three Central Highlands provinces: Dak Lak, Dak Nong, and Lam Dong. The trend is stable over time.

The share of households growing rice was highest in the bottom three quintiles of per capita food expenditure in 2008, but by 2016 it had become quite homogeneous across quintiles. The share of households selling some of their rice production follows an upward trend until 2014, and a decline in 2016. Meanwhile, the proportion of rice that is sold increases from 48 per cent to 62 per cent over the five waves. This increase is observed across quintiles, although with some differences in pattern: in the bottom two quintiles we observe the highest fluctuation in the proportion of output sold from one wave to the next, while in the top quintile the increase is steady throughout the

[1] Dak Lak, Dak Nong, Dien Bien, Ha Tay, Khanh Hoa, Lai Chau, Lam Dong, Lao Cai, Long An, Nghe An, Phu Tho, and Quang Nam

survey period.[2] Rice cultivation is a stable activity; on average 85 per cent of households have grown rice three times or more over the period and many have grown rice in all five periods. More than half of these households have sold rice constantly in the five waves.

We define as 'regular sellers' those households selling rice three time and more over the survey period, and as 'occasional sellers' those households selling rice once or twice over the survey period. We observe that regular sellers sell on average more rice (on average 50 per cent each year) than 'occasional' sellers (on average 16 per cent). Regular sellers have on average larger landholdings, more irrigated land, and more plots than occasional sellers, while they are as likely as the others to have a land title (red book) for their land. Using irrigated land as the measure of land used for rice cultivation, regular sellers have significantly greater yields per square meter of irrigated land. After decreasing in 2010, yields increase until 2014 and then decrease again.

Regular sellers have significantly more income per capita than occasional sellers in 2012 and 2016. To some extent the statistical differences in income from crop cultivation between regular and occasional sellers is cancelled out by other sources of income, as total income and shares of income from crop cultivation are not statistically different between both types of sellers. Regular sellers get more of their income from wages in all years but 2014. Even if actively participating in the rice market, regular sellers depend greatly on wage activities for their welfare. As expected, regular sellers produce and sell more rice than occasional sellers. For both groups, however, we observe a mostly downward trend in both rice production and sales.

Although household sizes are not very different between regular and occasional sellers, the former have on average more working-age members and fewer dependent members (children and elders aged 60 or older) than occasional sellers. Regular sellers are more likely to be headed by a man than occasional sellers. Heads of regular sellers are on average younger than the ones of occasional sellers, and are more likely to identify as belonging to the main ethnicity (Kinh) than the occasional sellers.

Table 1: Rice production and sales, 2008–16

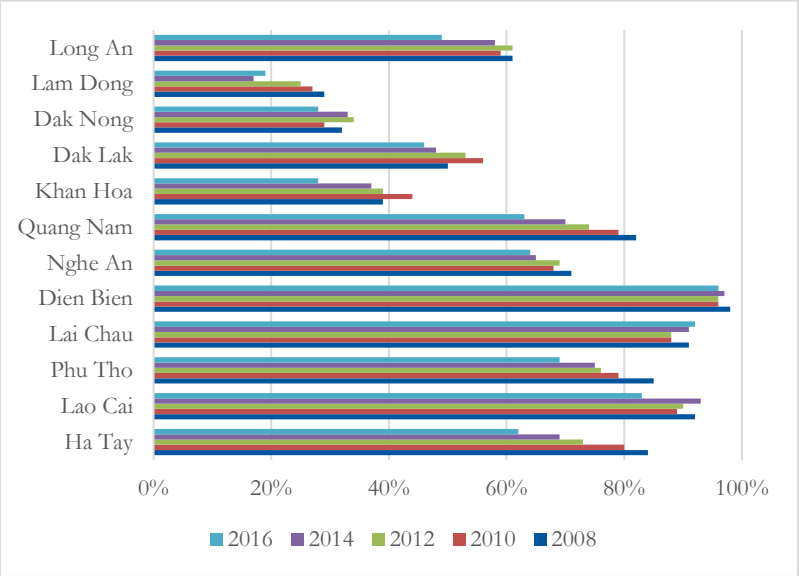
	2008	2010	2012	2014	2016
Production	74% (44%)	71% (45%)	69% (46%)	66% (47%)	60% (49%)
Sales	54% (50%)	56% (50%)	57% (49%)	58% (49%)	51% (50%)
Percentage sold	48% (28%)	54% (27%)	54% (26%)	59% (26%)	62% (27%)

Note: Standard deviation in parentheses.

Source: Authors' elaboration using the VARHS 2008–16 panel.

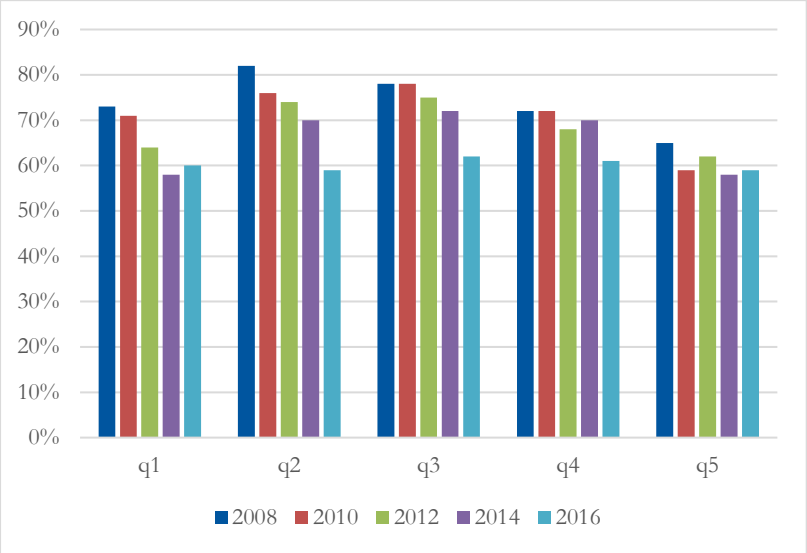
[2] In contrast, close to 60 per cent of households growing coffee are in the top two quintiles of per capita food consumption in the first four waves; in 2016, only 30 per cent of households growing coffee are in the top two quintiles of per capita food consumption. All households growing coffee sell on average more than 90 per cent of their production in all five waves.

Figure 1: Percentage of households growing rice, by province, 2008–16



Source: Authors' elaboration using the VARHS 2008–16 panel.

Figure 2: Percentage of households growing rice, by food expenditure quintiles, 2008–16

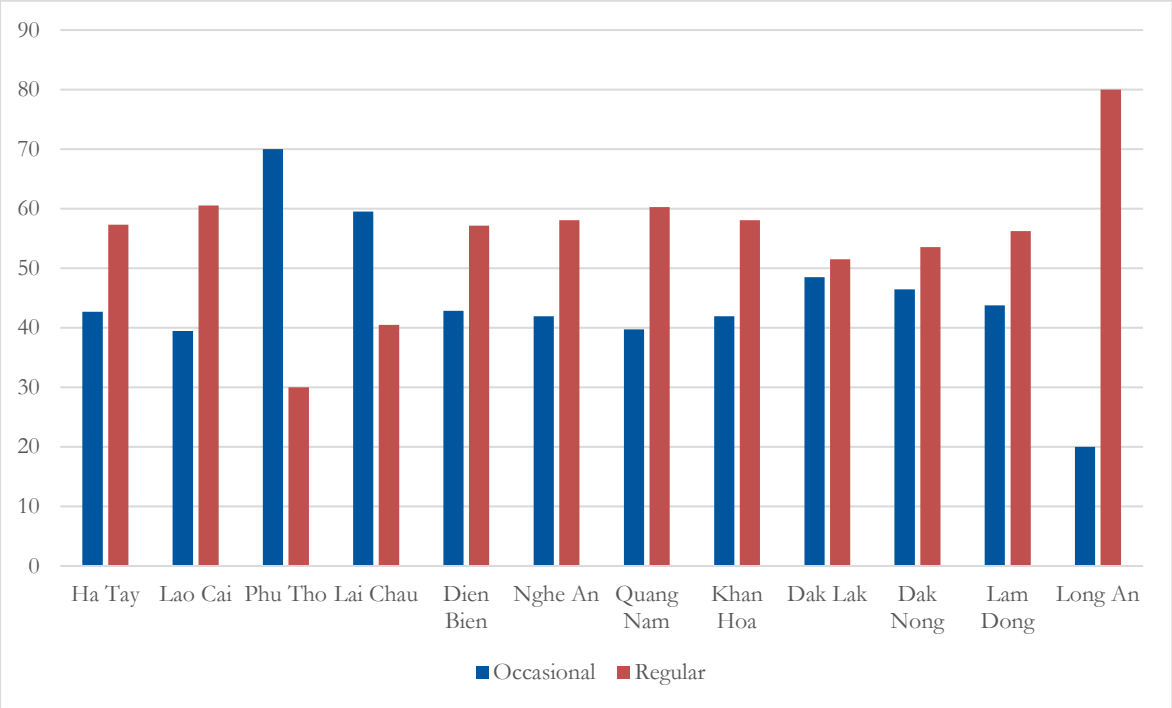


Source: Authors' elaboration using the VARHS 2008–16 panel.

Over the panel period, occasional sellers are more likely to have received public and private transfers than the regular sellers. The former are more likely to be categorized as poor by MOLISA, the Vietnamese Ministry of Labour, Invalids, and Social Affairs.[3] Consistent with this, occasional sellers have significantly fewer assets than regular sellers, while differences in consumption are not statistically significant.

[3] The MOLISA poverty measures are based on a National Census on Poverty administered every five years with intra-census updates based on village-level consultations, i.e. meetings in which the village would vote on who is poor and who is not.

Figure 3 Percentage of occasional vs. regular sellers, by provinces (%)



Source: Authors' elaboration using the VARHS 2008–16 panel.

Table 2 Selected household characteristics, by seller types, 2008–16

	2008		2010		2012		2014		2016	
	Occasional	**Regular**	**Occasional**	**Regular**	**Occasional**	**Regular**	**Occasional**	**Regular**	**Occasional**	**Regular**
HH income	54046.4 (58669.2)	59806.3 (98061.5)	71935.7 (163100.5)	64873.7 (115105.6)	62561 (73947)	77364.7*** (59935)	85800.2 (100386.3)	89514.5 (71767.3)	85388.2 (88112.6)	103274.9*** (98380.7)
Per capita HH income	12521 (14221.3)	13355.9 (18606.9)	17627.4 (31542.8)	15741.7 (28982.7)	15386.7 (18130)	18977.8*** (16183.2)	22454.8 (24405.9)	21988.2 (17664.2)	22167.2 (25583.7)	25879.3* (25131.9)
Income from crop cultivation	16003.6 (25275.1)	18555.9 (33774.7)	12192.1 (22257.5)	15734.7** (22520.3)	13288.5 (29626.7)	19907.3*** (26506.5)	13950.1 (36156.9)	21433.3*** (34009.5)	14227.4 (34126.6)	20613.6** (42680.2)
Share income crops (%)	38 (70.1)	44.4 (144.7)	28.9 (99.6)	28.3 (101.9)	22.6 (38.3)	30.4*** (46.8)	28.5 (234)	28.2 (48.9)	11.2 (131.9)	26.1 (76.3)
Income from wage	23353 (37562)	26659.3 (39736.9)	28492.9 (49603.6)	28227.4 (37461.6)	23197.7 (36091.4)	32792.9*** (39715.7)	32918.7 (57013.6)	37971.9* (47903.3)	36341.6 (55300.7)	48753.3*** (58240.1)
Share income wage (%)	23.3 (79.4)	30.4** (43.4)	29 (33.4)	34.3* (65.3)	29.1 (36.4)	37.5*** (47)	61 (723.1)	40.6 (45.1)	30.4 (95.2)	42.2** (83.9)
RICE: Prod value	18155.7 (29339.2)	55097*** (119295.5)	13384.9 (17982.3)	44593.5*** (97553)	10242.8 (13124)	38378.7*** (73264.5)	10263.2 (20293.3)	35418.9*** (68590.8)	8100.6 (11654.4)	35443*** (87639.1)
RICE: Sale value	4873 (20796.5)	35325*** (109124)	3283 (16231.2)	32027.5*** (97453.4)	2677.6 (10553.3)	27973.8*** (72471.8)	3546.7 (17457.4)	28997.1*** (76183.8)	10060.2 (20695.7)	63866.5*** (175955)
Share rice sold	0.2 (0.3)	0.4*** (0.3)	0.2 (0.3)	0.5*** (0.3)	0.2 (0.3)	0.5*** (0.3)	0.2 (0.3)	0.5*** (0.3)	0.1 (0.3)	0.5*** (0.3)
Poor MOLISA	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.1* (0.3)	0.2 (0.4)	0.2*** (0.4)	0.2 (0.4)	0.1*** (0.3)	0.1 (0.2)	0*** (0.2)
Total area own (sq. meters)	7334.2 (12868.8)	9367.5*** (16198.1)	6797.5 (12613.3)	9374.7*** (15238.1)	5936.9 (10773.1)	9186.6*** (14035.2)	3769.2 (6381.2)	5250.2*** (8003.3)	3462.7 (5820.2)	5094.6*** (7921)
Irrigated area (sq. meters)	3207.7 (8016.6)	5575.7*** (13002.1)	3393.6 (8156.4)	6332.6**** (12552.8)	2909.3 (5528.7)	6362.5*** (11668.2)	1966.4 (3508.3)	3525.2*** (6586)	2167 (4036.7)	3693.9*** (6421.5)
Number plots owned	5.6 (2.9)	5.8 (3)	5.1 (2.9)	5.7*** (3)	4.8 (2.7)	5.7*** (2.9)	3 (1.3)	3.2** (1.4)	2.9 (1.2)	3** (1.3)
Rice yields (kg/m2)	0.84 (0.69)	1.13*** (0.97)	0.87 (1.30)	0.98* (0.71)	0.84 (1.24)	1.10*** (1.03)	1.31 (1.63)	2.02*** (3.21)	1.19 (1.45)	1.65*** (1.61)
HH has a red book	0.9 (0.3)	0.9 (0.3)	0.8 (0.4)	0.8* (0.4)	0.9 (0.3)	0.9* (0.3)	0.9 (0.3)	0.9 (0.3)	0.9 (0.3)	0.9* (0.3)
HH size	4.6 (1.8)	4.8* (1.6)	4.4 (1.8)	4.5* (1.6)	4.2 (1.9)	4.4** (1.6)	4.1 (1.8)	4.3** (1.7)	4.1 (1.8)	4.2* (1.8)
Dependency ratio	0.6 (0.7)	0.5*** (0.6)	0.7 (0.7)	0.5*** (0.6)	0.6 (0.7)	0.5*** (0.6)	0.6 (0.7)	0.5*** (0.6)	0.6 (0.7)	0.5* (0.7)
HH Kinh	0.7 (0.5)	0.8*** (0.4)	0.7 (0.5)	0.8** (0.4)	0.7 (0.5)	0.8** (0.4)	0.7 (0.5)	0.8** (0.4)	0.7 (0.5)	0.8** (0.4)
Sex HH head (=1 if man)	0.80 (0.4)	0.83 (0.4)	0.79 (0.4)	0.83* (0.4)	0.78 (0.4)	0.82** (0.4)	0.76 (0.4)	0.81** (0.4)	0.75 (0.4)	0.80** (0.4)
Age HH head (years)	52.1 (13.5)	50.4** (12.5)	53.7 (13.3)	51.5*** (11.8)	55.3 (13.3)	53.1*** (11.7)	56.9 (13.3)	54.6*** (11.8)	58.2 (13.3)	56.1*** (11.8)
HH receives private transfers	0.4 (0.5)	0.3*** (0.5)	0.6 (0.5)	0.6 (0.5)	0.6 (0.5)	0.5*** (0.5)	0.6 (0.5)	0.5*** (0.5)	0.6 (0.5)	0.7*** (0.5)
HH receives public transfers	0.4 (0.5)	0.4* (0.5)	0.5 (0.5)	0.4*** (0.5)	0.5 (0.5)	0.4*** (0.5)	0.5 (0.5)	0.4*** (0.5)	0.5 (0.5)	0.4*** (0.5)
Nearest all weather road (km)	3.5 (9.8)	4.1 (13.1)	2.5 (5.7)	3* (5.6)	2.1 (6.4)	3.4*** (9.8)	1.7 (3.1)	2.4** (8)	1.4 (4.5)	1.9* (6.5)
Asset index	-0.80 (2.91)	-0.48** (2.56)	-0.29 (3.02)	0.13*** (2.78)	0.07 (2.99)	0.62*** (2.78)	0.41 (3.02)	0.89*** (2.68)	0.16 (2.92)	0.77*** (2.68)

Per capita food expenditures	280.6 (327.1)	276.2 (211.1)	304.5 (202.3)	305.9 (202.0)	396.2 (282.4)	419.9 (297.4)	406.7 (295.6)	403.3 (253.9)	436.6 (339.1)	448.7 (350.5)
CI 1 (%)	11.6 (20.3)	35.5*** (31.1)	12.1 (21.8)	40.5**** (31.4)	11.8 (21.1)	41.1*** (31.3)	13.7 (23.8)	44.5*** (32.9)	10.2 (19.9)	40.9*** (35.4)
CI 2 (%)	4.3 (9.5)	21.6*** (78.5)	3.5 (9.5)	17.3*** (25.1)	3.4 (8.4)	16.8*** (22.9)	3.3 (9)	17.9*** (30.3)	2.3 (7.3)	14.4*** (22)

Notes: we define 'always sellers' as households selling rice more than 3 times in the 5 waves and 'one-off sellers' if they sell once or twice in the five waves. All values (income, sales, and inputs) are in real terms in thousand dongs.

For each row, the reported measure is the mean value for the variable and the t-test of the null hypothesis that this mean is equal to the mean for one-off seller.

CI 1 = rice sales over total produce values

CI 2 = rice sales over total gross household income

Standard deviation in parenthesis.

* Difference in means that is significant at the 10% levels.

** Difference in means that is significant at the 5% levels.

*** Difference in means that is significant at the 1% levels.

Source: Authors' elaboration using the VARHS 2008–16 panel.

4 Method

4.1 Definition and measurement of commercialization

In this paper, we define commercialization as the sale of rice output. We use two measures of commercialization, similar to Muriithi and Matz (2015) and Von Braun (1994):

$$CI\ 1_{it} = \frac{Gross\ value\ of\ rice\ sales_{it}}{Total\ gross\ value\ of\ rice\ production_{it}} \times 100 \quad (1)$$

$$CI\ 2_{it} = \frac{Gross\ value\ of\ rice\ sales_{it}}{Total\ gross\ household\ income_{it}} \times 100 \quad (2)$$

For each household *i* and time *t*, CI 1 measures commercialization as the gross value of rice sales as a share of total gross value of rice production; and CI 2 measures commercialization as the gross value of rice sales as a share of total gross household income. Aggregate summary statistics shown in Table 3 below show variability over time in both indices; in broad terms, sales relative to production increase over time (more rice is being sold) but sales fall relative to gross household income, implying that other forms of agricultural and non-agricultural income become more important over time. Both measures of commercialization are higher among regular sellers compared to occasional sellers.

Table 3 Household commercialization indexes, 2008–16

	2008	2010	2012	2014	2016
CI 1 (over total rice production)	18.15	24.8	25.78	28.52	25.72
	(27.0)	(30.6)	(30.7)	(32.9)	(33.2)
CI 2 (over total gross household income)	9.12	8.61	10.05	8.84	6.82
	(48.7)	(19.0)	(18.8)	(22.2)	(16.3)

Note: Standard deviation in brackets.

Source: Authors' elaboration using the VARHS 2008–16 panel.

4.2 Definition and measurement of household welfare

Household welfare is a complex and multidimensional concept. First, a household is composed by various individuals, each with individual-specific preferences and access to resources. In this paper, we abstract from the discussion and measurement of intra-household welfare effects of commercialization and treat the household as a unit, because we do not have sufficient information on individual-specific measures of welfare and on how resources and earnings are distributed within the household. Second, welfare cannot be observed and measured in its complexity, and the approach in the literature on commercialization typically is to approximate the measurement of one or more of its dimensions through income, assets, food security, subjective well-being, or multidimensional poverty.

In this paper we focus on three complementary household welfare measures: income, food consumption, and assets. Income is measured as the log of income per capita and includes incomes from all productive activities of the household, including sales revenues from crop, livestock, aquaculture and forestry, revenues from own-account activities, salaries, plus rents, government and private transfers. Food consumption is measured as the log of food expenditure per capita. In each wave, the survey collects information on household consumption of main food commodities

over the preceding four weeks (from purchases, own production, or other sources). Both income and consumption expenditures are adjusted for price differences over time and between provinces. The price adjustment over time for the income measure is made using the rural value of the consumer price index (CPI) at province level; and the adjustment over time for consumption expenditure is made using the province-level value of the food price index from the consumer price index. Both indices were supplied by the General Statistics Office of Viet Nam (GSO).

Assets are measured with an index that aggregates and weighs a wide range of household assets, estimated by factor analysis following Sahn and Stifel (2000). Price information on certain assets may be unavailable or unreliable, so we construct the index aggregating categorical measures for ownership of productive assets (land, livestock), durable goods, human capital, and social/political connections.[4] The asset index is our preferred measure of welfare, because of its scope (including a wide range of physical and non-physical assets), because it tends to fluctuate less over the short term compared to incomes, and because, compared to income, it can make a direct contribution to future household productivity.

On average and throughout the period of analysis, households growing rice tend to have higher levels of assets, but lower levels of income and food expenditure per capita, compared to households that do not grow rice. And as seen in Table 4, among rice producers, households who sell rice in a given year are significantly better off in all welfare measures compared to rice producers not participating in sales markets.

Table 4: Average values of welfare measures for households growing and selling rice, by wave

Year	Rice	Welfare measures		
		Asset index	Food expenditure p.c.	Household income p.c.
2008	Growing	-0.6	275.14***(-)	13005.62***(-)
	Selling	0.7***(+)	366.08***(+)	24650.84***(+)
2010	Growing	-0.02**(+)	298***(-)	15725***(-)
	Selling	1.18***(+)	363.6**(+)	20370.44
2012	Growing	0.52***(+)	404.54***(-)	18029.02***(+)
	Selling	1.48***(+)	433.91	29924***(+)
2014	Growing	0.84***(+)	389.56***(-)	21223.15***(-)
	Selling	1.7***(+)	443.93	31725.97***(+)
2016	Growing	0.73***(+)	429.04***(-)	23289.42***(-)
	Selling	1.5***(+)	418.09**(-)	34527.09***(+)

Note: For each row, the reported measure is the mean value for the variable and the t-test of the null hypothesis that this mean is equal to the mean for households not growing rice or for households growing rice, from the mean of households not selling rice.

* Difference in means that is significant at the 10% levels.

** Difference in means that is significant at the 5% levels.

*** Difference in means that is significant at the 1% levels.

Source: Authors' elaboration using the VARHS 2008–16 panel.

4.3 Empirical strategy

At each point in time, a household decides whether or not to sell rice based on the utility it expects to derive from each option. We assume that farmers engaging in commercialization are expecting their welfare to improve as a result of market participation, but we do not know which aspects of

[4] Because the Asset Index assigns different weights to different assets and includes a broad range of assets, it is capturing something different, i.e. overall household wealth, compared to what is captured by the individual assets we include as control variables in the analysis.

welfare a household believes will be improved. Moreover, the coexistence of regular and occasional sellers in the panel suggests that the benefits from commercialization are household-specific and time-varying. To understand the welfare impacts of rice commercialization, we estimate two models. Both models only include households who were growing rice consistently over the five waves.

As a starting point, we make the naïve assumption that the decision to sell rice is exogenous, that is, that there are no factors that simultaneously influence the decision to produce rice, commercialization, and household welfare. For each welfare outcome and commercialization measure, we use pooled ordinary least squares (OLS) to estimate the following equation:

$$Y_{idt} = \theta_t + \gamma CI_{Kidt} + \boldsymbol{X_{idt}\beta} + Dist_d + \varepsilon_{idt} \quad (1)$$

Where Y_{idt} is the measure of household welfare for household *i* in district *d* at time *t*; and CI_{Kidt} is the index of commercialization *K* (CI1 and CI2) for household *i* in district *d* at time *t*. γ is the coefficient of interest, expected to be positive for each commercialization index, suggesting a positive association between commercialization and household welfare. Parameter θ is a time varying intercept, $Dist$ is a categorical variable to control for unobserved time-invariant district heterogeneity, and ε is the error term that, in this specification, we assume to be uncorrelated with the commercialization measure.

The vector $\boldsymbol{X}$ includes a set of controls that we expect to affect household welfare outcomes. These include demographic characteristics of the household (size and age groups) and of the household head (sex, age, ethnicity, and education); dummy variables for the availability of other income sources (wage income, household enterprises, public transfers and remittances); and we include dummy variables to control for various types of past shocks to the household. We control for volume and quality of production by using the total area of land owned and the area of own land that is irrigated. We also control for household relative isolation, by including household distance from the nearest paved road. In the OLS model we also control for the proportion of households selling at the commune level to indicate communes more engaged in the market.

Commercialization decisions, however, are most likely endogenous. Unobserved individual or household characteristics that affect welfare outcomes, such as skills and motivation, may also affect the decision to sell rice. If households with better unobserved skills decide to participate in rice commercialization, Equation 1 would be overestimating the impact of commercialization on household welfare. Other sources of potential endogeneity are production decisions and household location, both of which may simultaneously affect commercialization decisions and welfare outcomes, and both of which may be correlated with unobserved characteristics that also affect household welfare.

To address these potential endogeneity issues, we exploit the panel nature of the data by using a fixed effect estimator, which controls for unobserved heterogeneity across households and helps address self-selection into commercialization, production and location decisions. The fixed effects estimator allows us to measure the effect of commercialization on welfare changes *within* households. Equation 1 thus becomes

$$Y_{it} = \theta_t + \gamma CI_{it} + \boldsymbol{X_{it}\beta} + \alpha_i + \mu_{it} \quad (2)$$

Where α_i controls for unobserved heterogeneity across households, and the district variable disappears as it is time invariant.

One of the key questions in the commercialization literature, however, is whether or not, and to what extent, the welfare impacts of commercialization are heterogeneous across groups. To explore heterogenous impacts, we estimate variations of equation 2 for the following sub-samples: households of Kinh ethnicity versus ethnic minority households; female-headed versus male-headed households; households who are regular rice sellers (defined, as above, as those who sell rice in three or more of the years we observe), and households who are occasional sellers; and for households that sell to a trader or enterprise as opposed to selling private individuals.

5 Results

The sample used for our econometric analysis in this paper is based on all households who cultivated some rice in all five waves of the VARHS survey; this amounts to more than half the panel sample, 1146 households all observed at five points in time. Table 5 reports the results for the OLS estimation of the correlation between commercialization and the outcomes of interest. The first commercialization index, CI1, sales over total production of rice, has no statistically significant correlation with any of the welfare measures in this model. There is, however, a statistically significant association between the second commercialization measure and household income: a one percentage point increase in the index is associated with a 0.7 per cent lower income level, *ceteris paribus*. Households who earn more of their income from rice sales have slightly lower income levels, this reflecting the increasing importance of non-farm sources of income as households become better off. Other factors are also important in these models, with key factors being the area of land and irrigated land of a household, which is positively associated with all welfare measures, and remoteness in terms of distance from a road which is negatively associated with all welfare measures. Better educated household heads often have higher asset levels and female headed households seem to have higher per capita income levels. Having more females and males aged between 5 and 60 years is positively associated with assets (not a per capita measure) but negatively associated with per capita food consumption and income.

However, these results are likely to be affected by significant problems of self-selection and endogeneity, so we base our analysis predominantly on the fixed effects models, the results of which are presented in Table 6. These models focus on welfare changes over time *within* households. In this case, holding everything else equal, an increase in CI1 has a positive and significant effect on household assets, but its magnitude is small. Increasing the share of rice sold (as a percentage of total rice produced) by 1 percentage point leads to a 0.003 increase in the household asset index (the mean value of this index over the five waves for these households is 0.284). No significant correlation is observed with food consumption or household income. Meanwhile, increasing household specialization in rice sales over time (CI2) leads to a decrease in household income per capita, on average and *ceteris paribus*. The magnitude of the fixed effects coefficients is very similar to the OLS estimation. No significant association is seen between CI2 and the asset index or food consumption.

Table 5: results of OLS models for welfare as function of commercialization

VARIABLES	1 asset index	2 lfoodexp	3 lhhincome	4 asset index	5 lfoodexp	6 lhhincome
no. females < 5 years	0.0925	-0.0609**	-0.119***	0.0896	-0.0602**	-0.122***
	(0.0698)	(0.0244)	(0.0261)	(0.0698)	(0.0244)	(0.0258)
no. females 5-15 years	0.955***	-0.0752***	-0.0695***	0.956***	-0.0757***	-0.0694***
	(0.0304)	(0.0106)	(0.0113)	(0.0304)	(0.0106)	(0.0112)
no. females 15-60 years	0.0949**	-0.160***	-0.173***	0.0914**	-0.159***	-0.181***
	(0.0437)	(0.0152)	(0.0163)	(0.0436)	(0.0152)	(0.0162)
no. females >60 years	0.314***	-0.134***	-0.169***	0.315***	-0.136***	-0.164***
	(0.0654)	(0.0229)	(0.0245)	(0.0655)	(0.0229)	(0.0242)
no. males < 5 years	-0.0108	-0.111***	-0.158***	-0.0144	-0.110***	-0.163***
	(0.0687)	(0.0240)	(0.0256)	(0.0687)	(0.0240)	(0.0254)
no. males 5-15 years	0.169***	-0.172***	-0.199***	0.166***	-0.171***	-0.206***
	(0.0457)	(0.0160)	(0.0170)	(0.0457)	(0.0160)	(0.0169)
no. males 15-60 years	0.926***	-0.0405***	-0.0153	0.926***	-0.0408***	-0.0220*
	(0.0305)	(0.0107)	(0.0114)	(0.0305)	(0.0107)	(0.0113)
if hit by natural shock	0.254***	-0.0459*	-0.113***	0.252***	-0.0443*	-0.109***
	(0.0737)	(0.0257)	(0.0274)	(0.0737)	(0.0257)	(0.0272)
if hit by pest shock	-0.204**	0.0354	0.0309	-0.207***	0.0357	0.0183
	(0.0796)	(0.0278)	(0.0297)	(0.0797)	(0.0278)	(0.0294)
if agriculture hit by economic shock	0.626***	0.144***	0.0897*	0.629***	0.142***	0.0979**
	(0.128)	(0.0446)	(0.0475)	(0.128)	(0.0446)	(0.0470)
if his by illness shock	-0.0428	0.0111	0.0522*	-0.0449	0.0124	0.0460
	(0.0778)	(0.0272)	(0.0292)	(0.0779)	(0.0272)	(0.0289)
if received private transfers	0.0788	0.0368**	0.107***	0.0798*	0.0357**	0.102***
	(0.0482)	(0.0168)	(0.0180)	(0.0483)	(0.0168)	(0.0178)
If received public transfers	-0.0699	-0.0297	-0.0441**	-0.0762	-0.0277	-0.0527***
	(0.0545)	(0.0191)	(0.0203)	(0.0544)	(0.0190)	(0.0201)
if received wage income	0.114**	0.0892***	0.185***	0.113**	0.0883***	0.158***
	(0.0545)	(0.0190)	(0.0204)	(0.0547)	(0.0191)	(0.0204)
if received income from hh enterprise	0.947***	0.132***	0.283***	0.940***	0.134***	0.245***
	(0.0598)	(0.0209)	(0.0223)	(0.0597)	(0.0209)	(0.0223)
total land area owned	2.66e-05***	4.36e-06***	6.35e-06***	2.65e-05***	4.36e-06***	6.64e-06***
	(3.62e-06)	(1.27e-06)	(1.35e-06)	(3.62e-06)	(1.27e-06)	(1.34e-06)
total irrigated area owned	3.40e-05***	1.34e-06	5.24e-06***	3.39e-05***	1.39e-06	6.52e-06***
	(4.89e-06)	(1.72e-06)	(1.84e-06)	(4.90e-06)	(1.72e-06)	(1.83e-06)
distance from all-weather road	-0.00687**	-0.00265**	-0.00272**	-0.00683**	-0.00266**	-0.00245**
	(0.00300)	(0.00105)	(0.00111)	(0.00300)	(0.00105)	(0.00110)
age of head	0.0300***	0.00129	0.00334***	0.0300***	0.00135	0.00319***
	(0.00279)	(0.000976)	(0.00104)	(0.00280)	(0.000977)	(0.00103)
if head married	0.683***	0.0447	0.0768*	0.685***	0.0450	0.0818**
	(0.110)	(0.0386)	(0.0411)	(0.111)	(0.0387)	(0.0407)
head illiterate	1.614	0.147	0.235	1.648	0.158	0.231
	(1.008)	(0.352)	(0.374)	(1.009)	(0.352)	(0.370)
head completed primary	2.253**	0.206	0.295	2.289**	0.217	0.283
	(1.006)	(0.351)	(0.373)	(1.007)	(0.351)	(0.369)
head completed lower secondary	3.264***	0.320	0.442	3.298***	0.330	0.429
	(1.006)	(0.351)	(0.373)	(1.006)	(0.351)	(0.369)
head completed upper secondary	3.913***	0.457	0.583	3.949***	0.467	0.570

	(1.008)	(0.352)	(0.374)	(1.009)	(0.352)	(0.370)
head unschooled but literate	1.869*	0.175	0.250	1.903*	0.185	0.254
	(1.016)	(0.355)	(0.377)	(1.017)	(0.355)	(0.373)
Female head	-0.142	0.0272	0.135***	-0.144	0.0275	0.128***
	(0.106)	(0.0369)	(0.0393)	(0.106)	(0.0370)	(0.0389)
if head of Kinh ethnicity	0.139	0.0961	0.0707	0.135	0.0970	0.0496
	(0.191)	(0.0666)	(0.0709)	(0.191)	(0.0666)	(0.0702)
proportion selling in commune	-2.878	1.790	2.148	-2.509	1.678	2.563
	(5.292)	(1.847)	(1.961)	(5.289)	(1.846)	(1.940)
Rice sales as share of production	0.00174	-0.000561	-1.18e-05			
	(0.00106)	(0.000372)	(0.000398)			
Rice sales as share of gross income				0.000373	-0.000209	-0.00659***
				(0.000761)	(0.000266)	(0.000638)
Year 2010	0.833***	0.144***	0.130***	0.842***	0.143***	0.136***
	(0.0714)	(0.0250)	(0.0267)	(0.0714)	(0.0250)	(0.0264)
Year 2012	1.392***	0.448***	0.309***	1.400***	0.445***	0.312***
	(0.0720)	(0.0252)	(0.0268)	(0.0719)	(0.0251)	(0.0265)
Year 2014	1.885***	0.419***	0.491***	1.896***	0.415***	0.502***
	(0.0752)	(0.0263)	(0.0280)	(0.0749)	(0.0262)	(0.0277)
Year 2016	1.683***	0.434***	0.554***	1.690***	0.431***	0.554***
	(0.0776)	(0.0271)	(0.0290)	(0.0776)	(0.0271)	(0.0287)
Constant	-8.901**	3.384**	6.954***	-9.132**	3.432**	6.808***
	(3.881)	(1.355)	(1.438)	(3.880)	(1.354)	(1.423)
Observations	5,728	5,721	5,655	5,726	5,719	5,655
R-squared	0.670	0.462	0.476	0.670	0.462	0.486

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration using the VARHS 2008–16 panel.

Table 6: results of fixed effects models for welfare as function of commercialization

VARIABLES	(1) AI	(2) lfoodexp	(3) lhhincome	(1) AI	(2) lfoodexp	(3) lhhincome
no. females < 5 years	0.213***	-0.0261	-0.103***	0.211***	-0.0259	-0.106***
	(0.0795)	(0.0299)	(0.0310)	(0.0796)	(0.0299)	(0.0306)
no. females 5-15 years	0.776***	-0.107***	-0.106***	0.774***	-0.107***	-0.106***
	(0.0422)	(0.0158)	(0.0164)	(0.0422)	(0.0158)	(0.0162)
no. females 15-60 years	-0.0169	-0.176***	-0.185***	-0.0198	-0.175***	-0.190***
	(0.0657)	(0.0247)	(0.0256)	(0.0658)	(0.0247)	(0.0253)
no. females >60 years	0.0195	-0.203***	-0.247***	0.0134	-0.203***	-0.239***
	(0.100)	(0.0377)	(0.0393)	(0.101)	(0.0377)	(0.0388)
no. males < 5 years	0.0976	-0.0671**	-0.125***	0.0936	-0.0670**	-0.129***
	(0.0777)	(0.0292)	(0.0303)	(0.0778)	(0.0292)	(0.0299)
no. males 5-15 years	0.00146	-0.197***	-0.224***	-0.00981	-0.199***	-0.227***
	(0.0679)	(0.0255)	(0.0266)	(0.0680)	(0.0255)	(0.0262)
no. males 15-60 years	0.673***	-0.0799***	-0.0525***	0.665***	-0.0812***	-0.0613***
	(0.0452)	(0.0170)	(0.0176)	(0.0453)	(0.0170)	(0.0174)
if hit by natural shock	-0.0838	-0.147***	-0.227***	-0.0939	-0.147***	-0.225***
	(0.0728)	(0.0273)	(0.0283)	(0.0729)	(0.0273)	(0.0279)
if hit by pest shock	0.0186	0.110***	0.102***	0.0159	0.110***	0.0917***
	(0.0799)	(0.0300)	(0.0311)	(0.0800)	(0.0300)	(0.0307)
if agriculture hit by economic shock	0.359***	0.100**	0.0215	0.361***	0.100**	0.0243
	(0.127)	(0.0476)	(0.0493)	(0.127)	(0.0476)	(0.0486)
if his by illness shock	0.0671	0.0180	0.0600*	0.0678	0.0201	0.0544*
	(0.0805)	(0.0302)	(0.0315)	(0.0806)	(0.0302)	(0.0311)
if received private transfers	0.270***	0.0952***	0.180***	0.270***	0.0937***	0.172***
	(0.0481)	(0.0181)	(0.0188)	(0.0482)	(0.0181)	(0.0185)
If received public transfers	0.112*	0.0418*	-0.00848	0.0989*	0.0421*	-0.0186
	(0.0592)	(0.0222)	(0.0231)	(0.0592)	(0.0222)	(0.0228)
if received wage income	0.366***	0.166***	0.258***	0.361***	0.164***	0.232***
	(0.0596)	(0.0224)	(0.0233)	(0.0598)	(0.0224)	(0.0231)
if received income from hh enterprise	0.728***	0.0446*	0.194***	0.709***	0.0435*	0.160***
	(0.0679)	(0.0255)	(0.0266)	(0.0679)	(0.0254)	(0.0263)
total land area owned	-1.13e-05**	-1.06e-06	-3.92e-06**	-1.17e-05**	-9.86e-07	-4.73e-06***
	(4.72e-06)	(1.77e-06)	(1.84e-06)	(4.73e-06)	(1.77e-06)	(1.81e-06)
total irrigated area owned	2.60e-05***	2.32e-08	2.41e-06	2.63e-05***	6.58e-08	3.19e-06
	(5.91e-06)	(2.24e-06)	(2.31e-06)	(5.92e-06)	(2.24e-06)	(2.28e-06)
distance from all weather road	-0.00892***	-0.00424***	-0.00435***	-0.00876***	-0.00422***	-0.00405***
	(0.00307)	(0.00116)	(0.00119)	(0.00307)	(0.00116)	(0.00117)
age of head	0.0790***	0.0130***	0.0164***	0.0791***	0.0130***	0.0158***
	(0.00491)	(0.00184)	(0.00192)	(0.00492)	(0.00184)	(0.00190)
if head married	0.620***	0.0424	0.0109	0.605***	0.0394	0.00889
	(0.164)	(0.0617)	(0.0638)	(0.164)	(0.0617)	(0.0630)
head illiterate	0.295	-0.482	-0.346	0.316	-0.495	-0.369
	(1.012)	(0.380)	(0.396)	(1.024)	(0.384)	(0.391)
head completed primary	1.079	-0.339	-0.260	1.098	-0.351	-0.291
	(1.010)	(0.379)	(0.395)	(1.022)	(0.383)	(0.390)
head completed lower secondary	2.001**	-0.188	-0.0451	2.026**	-0.201	-0.0774
	(1.011)	(0.379)	(0.395)	(1.023)	(0.383)	(0.390)
head completed upper secondary	2.234**	-0.135	0.0593	2.264**	-0.148	0.0254
	(1.016)	(0.381)	(0.397)	(1.028)	(0.385)	(0.392)

head unschooled but literate	0.627	-0.362	-0.259	0.659	-0.374	-0.271
	(1.023)	(0.384)	(0.400)	(1.034)	(0.387)	(0.395)
If head female	0.00141	0.102	0.224***	0.00205	0.0987	0.217***
	(0.189)	(0.0711)	(0.0735)	(0.189)	(0.0711)	(0.0725)
if head of Kinh ethnicity	0.0799	0.260**	0.316***	0.0568	0.258**	0.286***
	(0.274)	(0.103)	(0.107)	(0.274)	(0.103)	(0.106)
Rice sales as share of production	0.00364***	-4.19e-05	-0.000190			
	(0.00113)	(0.000425)	(0.000442)			
Rice sales as share of gross income				-0.000586	-0.000402	-0.00781***
				(0.000793)	(0.000297)	(0.000722)
Constant	-9.150***	5.273***	8.708***	-9.003***	5.292***	8.927***
	(1.091)	(0.409)	(0.426)	(1.100)	(0.412)	(0.421)
Observations	5,728	5,721	5,655	5,726	5,719	5,655
R-squared	0.249	0.100	0.165	0.247	0.101	0.187
Number of hhid	1,146	1,146	1,146	1,146	1,146	1,146

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration using the VARHS 2008–16 panel.

With respect to variables that we expect to influence welfare changes within households over time, we find similar effects to what we observed in the OLS model. Remoteness is associated with lower welfare levels; having a bigger area of irrigated land has a positive association with household welfare; and having more males aged 15–60 in the household is positively associated with asset ownership, but negatively associated with food consumption and income. Wage income, income from a household enterprise and receipt of private transfers are each strongly positively associated with all welfare measures and the magnitudes of these effects are large. Public transfers have smaller and less significant impacts on the asset index and food consumption, though not on income. The importance of private transfers suggests that migration is an important livelihood strategy for these households. Meanwhile, experiencing a natural shock such as drought or floods is associated with significantly lower household welfare. In contrast, experiencing other kinds of shock is associated with higher welfare in subsequent years, possibly as households respond to the shock by adjusting their livelihood strategies accordingly. Total area of land owned has a negative and significant correlation with all welfare measures, but its magnitude is very small. With respect to other socio-demographic characteristics, households whose head is older have systematically higher levels of welfare, regardless of the measure used. We find some evidence that higher levels of education of the household head are associated with higher levels of assets, but not with a significant change in income and food expenditure per capita. Kinh households have significantly higher levels of income and food expenditure per capita, but no significant difference appears with respect to assets accumulation. Meanwhile, female headed households tend to have slightly higher levels of income per capita, but not food consumption or asset levels.

The effect of commercialization on welfare changes within households is heterogeneous, however, depending both on household characteristics and on the aspect of commercialization one focuses on. Table 7 reports the coefficients on CI1 and CI2 estimated for the whole sample and for different sub-groups. Overall, our results suggest that two different roles of rice commercialization coexist.

On the one hand, households that progressively sell more frequently the rice they produce increases their assets over time, whereas this is not the case for occasional sellers. The impact of commercialization measure CI1 on assets is observed for male heads but not for female heads,

and the magnitude of the effect is bigger for ethnic minority households compared to Kinh households. Surprisingly, perhaps, households selling directly to private individuals see their levels of assets increase over time, while this pattern does not appear for those selling to enterprises. Commercialization measure CI1 is also positively associated with income for non-Kinh households but not for the Kinh majority.

On the other hand, as the relative importance of rice commercialization in total household income (CI2) increases, its relationship with household income per capita is consistently negative, on average, and for all sub-groups of the population we analyse. In other words, we observe a decrease in household per capita income as household dependence on agriculture increases over time. Households that only sell occasionally seem to be the ones suffering the largest short-term negative impact of dependence on rice commercialization. Meanwhile, household dependence on rice commercialization does not appear to have any significant relationship with household assets accumulation or food consumption.

Table 7: Coefficients of commercialization variables for different disaggregated models

	CI1			CI2		
	1	2	3	4	5	6
VARIABLES	AI	lfoodexp	lhhincome	AI	lfoodexp	lhhincome
Kinh	0.00304**	-0.000180	-0.000506	-0.000496	-0.000323	-0.00770***
	(0.00120)	(0.000449)	(0.000480)	(0.000770)	(0.000288)	(0.000762)
Non-Kinh	0.00526*	-0.000133	0.00245**	0.00268	-0.00166	-0.00448**
	(0.00295)	(0.00113)	(0.00108)	(0.00567)	(0.00217)	(0.00207)
Female head	0.00261	-0.00142	-0.000862	-0.000953	-0.00145	-0.00818***
	(0.00220)	(0.000994)	(0.000976)	(0.00289)	(0.00132)	(0.00165)
Male head	0.00378***	0.000238	-2.59e-05	-0.000693	-0.000353	-0.00741***
	(0.00131)	(0.000477)	(0.000502)	(0.000836)	(0.000304)	(0.000807)
Regular sellers	0.00355***	-9.95e-05	-0.000297	-0.000681	-0.000422	-0.00768***
	(0.00130)	(0.000489)	(0.000505)	(0.000795)	(0.000299)	(0.000740)
Occasional sellers	0.00362	-0.000197	-6.43e-05	0.00117	-0.00401	-0.0108***
	(0.00226)	(0.000853)	(0.000900)	(0.00663)	(0.00250)	(0.00263)
Sellers to enterprises	-0.00159	-0.000608	-0.00118*	-0.000965	-0.000303	-0.00818***
	(0.00174)	(0.000653)	(0.000687)	(0.000821)	(0.000308)	(0.000915)
Other sellers	0.00546**	0.000829	0.000615	0.00752	-0.00202	-0.00797***
	(0.00243)	(0.000911)	(0.000960)	(0.00715)	(0.00268)	(0.00281)

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration using the VARHS 2008–16 panel.

6 Conclusions

The analysis of welfare changes within households over time, using a balanced panel and a fixed effects model, allows us to draw some conclusions on the role and importance of rice commercialization among smallholders in Viet Nam. Three main findings emerge.

First, when we measure commercialization as the proportion of produced rice which is sold, we find evidence of a positive average effect of commercialization on assets, which is a measure of longer-term household welfare and also important for future household productivity. Meanwhile,

we observe no significant effects in either income or consumption per capita, both measures of shorter-term welfare.

Second, this same measure of commercialization appears to have important differential effects. We observe a positive impact on assets accumulation for regular sellers but not occasional sellers, which is not a surprising result. We find significant positive effects of commercialization on assets accumulation for both Kinh and non-Kinh households, and for both female- and male-headed households; however, the effects are bigger among Kinh households, and among female-headed households. Thus, it is clear that not all households benefit equally from selling more of the rice they produce; and it is also clear that the benefits are seen in the longer-term measure of welfare, with households investing in more assets. Income or food consumption are not significantly affected.

Third, when we analyse commercialization as the importance of rice sales relative to a household's gross income, we find a different picture. A household may sell more rice over time, but its contribution to gross income may fall, as households diversify into other activities. An increase in household dependence on rice commercialization appears to have no significant impact on asset accumulation. Meanwhile, we find evidence of a significant negative effect on a household's overall income. This is consistent with the increasing importance of non-farm income for improving household welfare over time.

Overall, being able to progressively increase their participation in the rice market, and being able to do so consistently over time, appears to have played an important role in improving the welfare of rural households in Viet Nam. However, our results also suggest that diversification of income sources is important for improving household welfare over time, especially with respect to income.

References

Barrett, C. B. (2008). 'Smallholder market participation: Concepts and evidence from eastern and southern Africa'. *Food Policy*, *33*(4), 299–317. https://doi.org/10.1016/j.foodpol.2007.10.005

Bellemare, M. F. (2012). 'As You Sow, So Shall You Reap: The Welfare Impacts of Contract Farming'. *World Development*, *40*(7), 1418–34. https://doi.org/10.1016/j.worlddev.2011.12.008

Bellemare, M. F., Chua, K., Santamaria, J., and Vu, K. (2018). 'Tenurial security and agricultural investment: Evidence from Viet Nam'. WIDER working paper 2018/76. Helsinki: UNU-WIDER

Benjamin, D., and Brandt, L. (2004). 'Agriculture and Income Distribution in Rural Vietnam under Economic Reforms: A Tale of Two Regions'. In P. Glewwe, N. Agrawal, and D. Dollar (Eds.), *Economic Growth, Poverty, and Household Welfare in Vietnam* (pp. 133–85). Washington, DC: World Bank.

Benjamin, D., Brandt, L., and McCaig, B. (2017). Growth with equity: income inequality in Vietnam, 2002–14'. *The Journal of Economic Inequality*, *15*(1), 25–46. https://doi.org/10.1007/s10888-016-9341-7

Carletto, C., Corral, P., and Guelfi, A. (2017). 'Agricultural commercialization and nutrition revisited: Empirical evidence from three African countries'. *Food Policy*, *67*, 106–18. https://doi.org/10.1016/j.foodpol.2016.09.020

Carletto, C., Kilic, T., and Kirk, A. (2011). 'Nontraditional crops, traditional constraints: The long-term welfare impacts of export crop adoption among Guatemalan smallholders'. *Agricultural Economics*, *42*, 61–76.

Glewwe, P., Agrawal, N., and Dollar, D. (Eds.). (2004). *Economic growth, poverty, and household welfare in Vietnam*. Washington, DC: World Bank.

Goletti, and Minot. (1997). 'Rice markets, agricultural growth, and policy options in Viet Nam'. MTID Discussion Paper. Washington DC: IFPRI. Availailable at https://www.ifpri.org/publication/rice-markets-agricultural-growth-and-policy-options-viet-nam (accessed on 15 September 2018).

Granja, C. R., and Wollni, M. (2018). 'Dynamics of smallholder participation in horticultural export chains: evidence from Ecuador'. *Agricultural Economics*, *49*(2), 225–35. https://doi.org/10.1111/agec.12411

Jaleta, M., Gebremedhin, B., and Hoekstra, D. (2009). 'Smallholder commercialization: processes, determinants and impact'. ILRI Discussion Paper 18. Nairobi: ILRI. Available at: https://cgspace.cgiar.org/handle/10568/27

Markussen, T. (2017). 'Land issues: Markets, property righs, and investment'. In F. Tarp (Ed.), *Growth, structural transformation, and rural change in Viet Nam: A rising dragon on the move* (pp. 117–38). Oxford: Oxford University Press.

McCaig, B., and Pavcnik, N. (2013). 'Moving out of Agriculture: Structural Change in Vietnam' NBER Working Paper No. 19616. Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w19616

McKay, A., and Tarp, F. (2015). 'Distributional impacts of the 2008 global food price spike in Vietnam'. In D. E. Sahn (Ed.), *The Fight Against Hunger and Malnutrition: The Role of Food, Agriculture, and Targeted Policies*. Oxford: Oxford University Press.

McKay, A., and Tarp, F. (2017). 'Welfare dynamics: 2006-14'. In F. Tarp (Ed.), *Growth, structural transformation, and rural change in Viet Nam: A rising dragon on the move*. Oxford: Oxford University Press.

Mergenthaler, M., Weinberger, K., and Qaim, M. (2009). 'The food system transformation in developing countries: A disaggregate demand analysis for fruits and vegetables in Vietnam'. *Food Policy*, *34*(5), 426–36. https://doi.org/10.1016/j.foodpol.2009.03.009

Michelson, H. C. (2013). 'Small Farmers, NGOs, and a Walmart World: Welfare Effects of Supermarkets Operating in Nicaragua'. *American Journal of Agricultural Economics*, *95*(3), 628–49. https://doi.org/10.1093/ajae/aas139

Minot, N., and Goletti, F. (1998). 'Export Liberalization and Household Welfare: The Case of Rice in Vietnam'. *American Journal of Agricultural Economics*, *80*(4), 738–49. https://doi.org/10.2307/1244060

Moustier, P., Tam, P. T. G., Anh, D. T., Binh, V. T., and Loc, N. T. T. (2010). 'The role of farmer organizations in supplying supermarkets with quality food in Vietnam'. *Food Policy*, *35*(1), 69–78. https://doi.org/10.1016/j.foodpol.2009.08.003

Muricho, G., Manda, D., Sule, F., and Kassie, M. (2017). 'Smallholder agricultural commercialization and poverty: empirical evidence of panel data from Kenya'. Presented at the 91st Annual Conference, April 24-26, 2017, Royal Dublin Society, Dublin, Ireland, Agricultural Economics Society.

Muriithi, B. W., and Matz, J. A. (2015). 'Welfare effects of vegetable commercialization: Evidence from smallholder producers in Kenya'. *Food Policy*, *50*, 80–91. https://doi.org/10.1016/j.foodpol.2014.11.001

Newman, C., Tarp, F., and Broeck, K. van den. (2015). 'Property Rights and Productivity: The Case of Joint Land Titling in Vietnam'. *Land Economics*, *91*(1), 91–105. https://doi.org/10.3368/le.91.1.91

Ogutu, S. O., and Qaim, M. (2018). 'Commercialization of the small farm sector and multidimensional poverty'. GlobalFood Discussion Papers, No. 117. Göttingen: Research Training Group (RTG) 1666 'GlobalFood'.

Pingali, P. L., and Rosegrant, M. W. (1995). 'Agricultural commercialization and diversification: processes and policies'. *Food Policy*, *20*(3), 171–85. https://doi.org/10.1016/0306-9192(95)00012-4

Rao, E. J. O., and Qaim, M. (2011). 'Supermarkets, Farm Household Income, and Poverty: Insights from Kenya'. *World Development*, *39*(5), 784–96. https://doi.org/10.1016/j.worlddev.2010.09.005

Reardon, T., Chen, K. Z., Minten, B., Adriano, L., Dao, T. A., Wang, J., and Gupta, S. D. (2014). 'The quiet revolution in Asia's rice value chains'. *Annals of the New York Academy of Sciences*, *1331*, 106–18. https://doi.org/10.1111/nyas.12391

Sahn, D. E., and Stifel, D. C. (2000). 'Poverty Comparisons Over Time and Across Countries in Africa'. *World Development*, *28*(12), 2123–55. https://doi.org/10.1016/S0305-750X(00)00075-9

Tipraqsa, P., and Schreinemachers, P. (2009). 'Agricultural commercialization of Karen Hill tribes in northern Thailand'. *Agricultural Economics*, *40*(1), 43–53. https://doi.org/10.1111/j.1574-0862.2008.00343.x

von Braun. (1994). 'Introduction'. In Joachim von Braun and Eileen Kennedy (Eds.), *Agricultural commercialization, economic development, and nutrition* (pp. 3–8). Baltimore, Maryland: Johns Hopkins University.

Vu, L., and Glewwe, P. (2011). 'Impacts of Rising Food Prices on Poverty and Welfare in Vietnam'. *Journal of Agricultural and Resource Economics*, *36*(1), 14–27.

World Bank. (2016). 'Transforming Vietnamese Agriculture: Gaining More for Less'. Vietnam Development Report. Washington, DC: World Bank.

World Bank. (2018a). 'Climbing the Ladder: Poverty reduction and Shared Prosperity In Vietnam'. Update report 2018. Washington DC: World Bank.

World Bank. (2018b). World Development Indicators. Database. Washington DC: World Bank.