



## Full length Article

Remittances, social security, and the crowding-out effect:  
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## ABSTRACT

In the absence of adequate social security systems, many people in developing countries, especially the poor and vulnerable, cope through migration-related remittances. However, when remittances, internal or international, provide social benefits similar to public transfers they may overlap: ‘crowding-out’ effects occur. Employing three long-sample Vietnam Household Living Standard surveys undertaken during the 2000s, this paper studies the crowding-out effects of remittances in Vietnam, a developing country that has experienced a soaring inflow of remittances since 2000. Significant crowding-out effects for both domestic and international remittances on income are found below the poverty line in Vietnam, consistent with an altruistic motive. Beyond this, transfer derivatives are positive and statistically significant in both areas, suggesting a switch of motives from altruism to exchange at the poverty line. The substituting relationship between public transfers and remittances observed for the rural poor reveals key challenges to delivering an equal and efficient social security system in the country.

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## 1. Introduction

Much social policy research on developing countries asks how people secure livelihoods against economic and social distress. The question arises because developing countries’ social security systems generally do not cover everyone, especially the poor and vulnerable. In response, people cope through internal and international migration and migration-related remittances. Generally, remittances are used to cover daily expenditures, as well as health and education. They also provide informal social insurance if they reduce poverty and income inequality (Adams, 1991; Adams & Page, 2005; Ahlburg, 1996; Quartey, 2005; Yang & Choi, 2007). Additionally, several studies show the insurance role of remittances in releasing shocks because households can diminish risks if they send a member to another region or another country where they will not face the same shocks at the same time. (Burgess & Haksar, 2005; Clarke & Wallsten, 2004; Gubert, 2002; Lucas & Stark, 1985; Quartey, 2005; Yang & Choi, 2007). Nevertheless, when remittances provide social benefits similar to public transfers they may overlap and ‘crowding-out’ effects occur because changes in public transfers lead to a corresponding offset in remittances, leaving economic well-being unchanged (Cox, Hansen, & Jimenez, 2004). Expanding public transfers thus

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crowds out remittances and weakens the income distribution impact of social security. Further, since government transfer programs have administrative costs, crowding-out could even create deadweight losses. Given the significant policy implications, this paper aims to analyse the crowding-out effects of remittances in Vietnam, a developing country that has experienced a soaring inflow of remittances since 2000.

Negative transfer derivatives provide a key parameter for evaluating crowding-out effects (Gibson, Olivia, & Rozelle, 2011). They show the amount by which remittances decrease as recipient household income increases. According to Cox et al. (2004), if transfer derivatives are negative and large, meaning remittances respond promptly to changes in a recipient's income, government transfers to those recipients could have limited distributional effects and might 'crowd-out' remittances.

The direction of these transfer derivatives, however, can be negative or positive due to the different motives behind remittances, which include altruism (Becker, 1974) and exchange (Cox, 1987). If the motive is altruistic (i.e., the donor cares about the recipient and ties his utility to the recipient's), an increase in the recipient's income from public transfers will decrease remittances, so altruism explains how public transfers crowd-out remittances (Cox, 1987). The opposite can happen when an exchange motive lies behind remittances (Altonji, Hayashi, & Kotlikoff, 2000; Cox, 1987, 1990; Taylor, 2002). Here the donor sees remittances as payment for services from the recipient (for example, the recipient is taking care of the donor's children or helping to run the donor's business). When the service provider's income rises – due to the receipt of social transfers – the 'opportunity cost' of these services also increases, implying an increase in payment in the form of remittances.

Evidence from developed countries suggests that transfer derivatives are small, making crowding-out unlikely. For example, Cox and Jakubson (1995) estimate that a one-dollar increase in public welfare spending in the United States results in no more than a 12-cent reduction in remittances. Similarly, Altonji, Hayashi, and Kotlikoff (1997) find that American parents increase remittances to a child by only 13 cents for every one-dollar reduction in that child's income. Cox et al. (2004) suggest that because developed countries have experienced a long history of public transfers that have already replaced remittances, they do not provide a guide for studying developing countries.

In some developing countries remittances may reach more than half the population (World Bank, 2001). Hence, concerns about crowding-out are more relevant to developing countries that are constructing formal social security systems. For example, Cox and Jimenez (1995) estimate that unemployment insurance in the Philippines would displace 91% of remittances to the urban unemployed. However, Jensen (2003) concluded that providing pensions to black South Africans displaced only 20–40% of remittances to the elderly. Similarly, a 1989 study showed that remittances in Peru from younger to older family members would have been 20% higher without the presence of social security pension benefits (Cox & Jimenez, 1992). The phenomenon of diminished remittances following the introduction of public transfers also occurs in Armenia (Murrugarra et al., 2004), Mexico (Albarran & Attanasio, 2003), and South Korea (Kang & Sawada, 2009).

Degrees of crowding-out may depend not only on the developmental level of social security systems in each country but also on the use of inappropriate empirical methods (Gibson et al., 2011). The measurement of transfer derivatives using a linear relationship between remittances and recipients' income could be mis-specified and fail to recognize true crowding-out. As motives behind remittances can be altruism or exchange, an increase in recipient income may change the motive behind remittances. In that case the sign of these derivatives is different depending on the levels of the recipients' income (Cox et al., 2004). As Dilley et al. (2005) also note, we cannot expect remittances to be driven by a single motive. The relationship between remittances and recipients' income, therefore, cannot be simply linear. Not recognizing the possibility of a non-linear relationship may account for the failure of previous studies when estimating degrees of crowding out (Albarran & Attanasio 2003).

Recent studies, therefore, allow for non-linearity and focus on evidence from developing countries. Brown and Jimenez (2011), Cai, Giles, & Meng (2006), Cox et al. (2004), Gibson et al. (2011) and Kazianga (2006) confirm that transfer derivatives are better determined using a non-linear form. For example, Cox et al. (2004) use a continuous linear spline regression with a single knot and find a non-linear relationship in the Philippines where transfer derivatives are estimated to be approximately  $-0.4$  for the poorest households but almost zero for richer households. These authors also find a stronger crowding-out effect among large families in the lowest household income group. Transfer derivatives in this sample range from  $-0.66$  to  $-1.06$ .

Other papers also explore this non-linear relationship by using the same technique as Cox et al. (2004). However, their findings are inconclusive. For example, Gibson et al. (2011) estimate transfer derivatives in four developing countries – China, Indonesia, Papua New Guinea, and Vietnam – to range between 0 and  $-0.08$  and conclude that a non-monotonic crowding-out effect of public transfers on remittances is not an important feature in developing countries. In contrast, Brown and Jimenez (2011) find significant negative transfer derivatives ( $-0.461$ ) among the poor in Fiji.

In addition to non-linearity, the potential endogeneity of pre-transfer income remains a key empirical issue. To solve the endogeneity problem, instrumental variables (IV) are often adopted in recent studies of crowding-out effects. Remittances are potentially correlated with pre-transfer income because individuals may adjust their income by working or saving less in anticipation of the remittances they receive. Consequently, estimates of the responsiveness of remittances to pre-transfer income could be biased upwards. Widely used instruments for measuring pre-transfer income range from dwelling condition (Gibson et al., 2011), proportion of households in the community with a flush toilet (Brown & Jimenez, 2011) and measures of employment shocks (Wu & Li, 2014).

This study explores the crowding-out effect of remittances in Vietnam by employing a recently available large (long-sample) survey dataset collected during the second half of the 2000s. Although Gibson et al. (2011) find no evidence of crowding-out in Vietnam, even among households with a below-threshold income, they use data collected in 1998, when remittances were still unusual.<sup>1</sup> and formal social security was just beginning.<sup>2</sup> According to the Population and Housing Census of 1999 and 2009, inter-regional migration rates saw the strongest growth, an increase of 1.5 times, from 19 people per thousand in 1994–1999 to 30 per thousand in 2004–2009. In this more recent period, Vietnam offers an opportunity to study the response of remittances to income in a context where around 80–90% of households receive some kind of remittance and formal social insurance is more established.

Adopting a non-linear spline model and IV estimators, the study finds the existence of crowding-out between remittances and public transfers in both rural and urban areas, consistent with an altruistic motive. However, the crowding-out effect is only observed below the poverty line. Beyond this, transfer derivatives are positive and statistically significant in both areas, suggesting a switch of motives from altruistic to exchange at the poverty line. Importantly, these non-linear crowding-out effects apply to both domestic and international remittances.

## 2. Migration and remittances in Vietnam

Both internal and international migration have rapidly surged in recent years in Vietnam and the flow of remittances has increased accordingly. The initial increase in internal migration followed *Doi Moi* (Renovation) in 1986, when Vietnam transformed itself from a centrally planned economy to a 'socialist-oriented market economy'. The transformation reduced the demand for agricultural labour and created more non-farm jobs, resulting in people moving to pursue these jobs. Since the 2000s, Vietnam has witnessed a massive influx of internal migration because urbanization, industrialization and the growth of the non-state sector benefited richer regions. This left poorer regions undeveloped and vulnerable to shocks, such as natural disasters and epidemics, so people moved to the more prosperous areas of the country. According to the 2009 Census, 6.6 million people (approximately 7.7% of the population) over the age of five changed their place of residence to a different administrative unit between 2004 and 2009. Compared to the 1999 Census, the number of migrants increased by 2.1 million.

Over half of these migrants sent money to their households (captured by the 2004 Vietnam Migration Survey). Giang and Pfau (2009) show that remittances are disproportionately directed to households headed by those aged 50 years and older. Households headed by those 70 years and over receive the most remittances. Generally, remittances are used to cover daily expenditures, as well as health and children's education costs. A small proportion, three per cent, was used to run businesses (2004 Vietnam Migration Survey).

The increase in international migration from Vietnam began with the opening of the economy when it resumed its export of workers. Since the late 1990s, Vietnam has signed bilateral agreements with Asian and Middle Eastern countries to provide workers under temporary contracts. These arrangements increase Vietnam's export earnings and provide higher-income job opportunities for young people. The government has sent workers to 40 countries, totalling some 70–80 thousand workers per year during 2005–2008 and contributing to international remittances inflow. Dang, Tran, Nguyen, and Dao (2010) estimate that 100% of migrants who live with their spouses abroad and leave children behind in Vietnam remit, with an average amount almost double that sent by unmarried migrants (VND 84 million compared to VND 46 million). Moreover, 91.4% of migrants who migrate with their spouse and children send money home. However, they remit the smallest amount compared to other types of migrants. Their remittances may be sent to their parents. This partly reflects the Vietnamese tradition that as parents age they begin to rely on their children.

A comparison of domestic and international remittances suggests that the former is more common in Vietnam, while the latter also contributes considerably to gross remittance value. The household survey statistics detailed in the next section show that 80–90% of both rural and urban households received domestic remittances during 2004–2008. In contrast, only five per cent of rural households received international remittances. This ratio doubled among urban households. However, because of their high value, international remittances accounted for nearly 30% of total remittances among the rural poor<sup>3</sup> and around 35% among the non-poor in rural areas. They constituted more than 40% of total remittances received by the urban poor and 30–45% by the urban non-poor.

<sup>1</sup> In 1998, only about 20% of Vietnamese households received remittances. This figure was around 80–90% in the 2000s.

<sup>2</sup> The Labour Code came into effect in January 1995, with its Chapter 12 on Social Insurance becoming the highest legal document for implementing social insurance policy in Vietnam. On February 16, 1995 the Government established Vietnam Social Security in order to administer national social insurance schemes and manage the social insurance fund.

<sup>3</sup> Please refer to formal definitions of 'poor' and 'non-poor' in Section 3.2.

**Table 1**  
Household characteristics among rural poor and rural non-poor.

	Rural Poor			Rural Non-poor		
	2004	2006	2008	2004	2006	2008
Kinh/Hoa	0.69***	0.67***	0.67***	0.89	0.88	0.86
Red River Delta	0.18***	0.18***	0.17***	0.24	0.24	0.24
North East	0.18***	0.18***	0.19***	0.13	0.13	0.14
North West	0.09***	0.10***	0.09***	0.03	0.03	0.04
North Central Coast	0.18***	0.19***	0.18***	0.09	0.10	0.11
South Central Coast	0.09**	0.09	0.10***	0.08	0.08	0.08
Central Highlands	0.07***	0.06	0.07**	0.06	0.06	0.06
South East	0.05***	0.05***	0.04***	0.12	0.12	0.11
Mekong River Delta	0.16***	0.15***	0.17***	0.25	0.24	0.23
Female head	0.23***	0.23***	0.26***	0.19	0.19	0.19
Married female head	0.05***	0.04***	0.05***	0.07	0.07	0.06
Years of schooling	5.15***	5.11***	4.83***	7.07	7.12	7.18
No. of children under 1	0.07***	0.07***	0.07***	0.04	0.04	0.05
No. of children age 1–5	0.40***	0.36***	0.37***	0.24	0.24	0.25
No. of children age 6–10	0.59***	0.50***	0.43***	0.39	0.32	0.29
No. of children age 11–14	0.57***	0.51***	0.45***	0.45	0.40	0.35
No. of elders <sup>a</sup>	0.54***	0.60***	0.65***	0.43	0.44	0.45
HH member receiving social welfare	0.14***	0.17***	0.24***	0.06	0.08	0.12
HH member receiving pension	0.03***	0.01***	0.02***	0.11	0.08	0.09
HH receiving domestic remittances	0.81***	0.84	0.83***	0.82	0.85	0.84
HH receiving international remittances	0.04	0.05	0.05	0.04	0.04	0.05
Ill household head	0.40***	0.43***	0.43***	0.37	0.36	0.37
Having major housing repair	0.01***	0.01***	0.04***	0.02	0.02	0.07
Having a husband/wife migrating	0.02***	0.02***	0.03***	0.02	0.02	0.02
Having parents migrating	0.02***	0.02***	0.04***	0.01	0.01	0.01
Monthly p.c. social welfare (000 VND)	9.17***	22.15***	22.97***	3.31	8.46	7.66
Monthly p.c. pension (000 VND)	2.74***	1.63***	2.36***	27.48	31.11	31.17
Monthly p.c. domestic remittances (000 VND)	39.45***	49.70***	52.05***	32.69	34.22	40.12
Monthly p.c. inter. remittances (000 VND)	14.31	19.41	21.14	16.32	19.34	21.32
Monthly p.c. total remittances (000 VND)	53.76**	69.11***	73.20***	49.02	53.55	61.45
Monthly p.c. pre-transfer income (000 VND)	190.09***	192.64***	184.56***	620.15	686.16	765.10
Observations	12,235	10,447	8,055	22,459	23,963	26,130

Notes: (i) All values in the table, except money values (000 VND), are ratios, ranging from 0 to 1. (ii) <sup>a</sup>An elder is defined as a female who is above 55 years old or a male who is above 60 years old; (iii) \*\*\*  $p \leq 1\%$ , \*\*  $p \leq 5\%$ , \*  $p \leq 10\%$  ( $H_0$ : Average values in poor and non-poor samples are equal).  
Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

### 3. Data description

#### 3.1. Vietnam household living standard survey (VHLSS)

Data for the study is from long samples<sup>4</sup> of the VHLSS of 2004, 2006, and 2008. These surveys were conducted by the General Statistical Office of Vietnam with technical support from the World Bank. Field work was mostly conducted between May and November 2004, 2006 and 2008. The surveys relied on a master sample, which was randomly selected from the enumeration areas (EA) of the 1999 Population and Housing Census. From this master sample, the samples of households were selected using a stratified three-stage sampling design, thus being representative for the whole of Vietnam. The samples consisted of approximately 46,000 households each year.

The surveys provide useful micro-data essential for the study of remittance and public transfer at the household-level. For instance, the surveys collected information through household questionnaires covering basic demography, employment and labour force participation, education, health, income, expenditure, housing, fixed assets and durable goods. This information reveals variations in attributes among households that receive remittances and or public transfers or otherwise. Also, households indicated in the questionnaires whether their income came from agricultural or non-agricultural production, salaries/wages or other sources (a scholarship, interest, rents, a pension, social welfare, domestic or international remittances). We constructed our variables of key interests – pre-transfer income and remittance – based on this. The data covered are the previous 12 months, and are adjusted for regional price indexes and inflation rates according to January 2008 prices.

Remittances are defined in these surveys as 'the amount of money and monetary value of in-kind benefits received by a household, which do not require repayment'. The surveys identify whether received remittances were sourced domestically

<sup>4</sup> The VHLSS contains both long and short samples. Long samples cover income-related questionnaires whereas short samples include both income and expenditure questionnaires. Compared to the short sample, long samples cover households five times as large as in the short samples. To our knowledge, this is the first study of crowding-out effects in Vietnam that uses this extensive dataset.

**Table 2**

Household characteristics among urban poor and urban non-poor.

	Urban Poor			Urban Non-poor		
	2004	2006	2008	2004	2006	2008
Kinh/Hoa	0.91***	0.90***	0.92***	0.96	0.96	0.96
Red River Delta	0.15***	0.14***	0.13***	0.20	0.19	0.19
North East	0.11***	0.10***	0.10**	0.13	0.13	0.13
North West	0.03	0.02	0.02**	0.03	0.03	0.03
North Central Coast	0.10***	0.09***	0.09***	0.07	0.07	0.07
South Central Coast	0.16***	0.14***	0.14***	0.11	0.11	0.11
Central Highlands	0.09***	0.09***	0.09***	0.07	0.07	0.07
South East	0.14***	0.15***	0.18***	0.25	0.25	0.24
Mekong River Delta	0.23***	0.26***	0.25***	0.15	0.16	0.16
Female head	0.38	0.39	0.45***	0.38	0.37	0.36
Married female head	0.11***	0.10***	0.12***	0.22	0.21	0.20
Years of schooling	6.00***	5.73***	5.72***	9.29	9.24	9.36
No. of children under 1	0.06*	0.07***	0.06	0.05	0.05	0.05
No. of children age 1–5	0.28***	0.32***	0.29**	0.23	0.23	0.26
No. of children age 6–10	0.43***	0.36***	0.29***	0.29	0.26	0.23
No. of children age 11–14	0.48***	0.4***	0.34***	0.32	0.3	0.27
No. of elders*	0.61***	0.65***	0.73***	0.45	0.47	0.49
HH member receiving social welfare	0.10***	0.16***	0.17***	0.04	0.07	0.07
HH member receiving pension	0.07***	0.04***	0.04***	0.20	0.20	0.21
HH receiving domestic remittances	0.83***	0.89***	0.88***	0.80	0.84	0.81
HH receiving international remittances	0.11***	0.11***	0.13***	0.09	0.09	0.08
Ill household head	0.43***	0.42***	0.43***	0.34	0.32	0.31
Having major housing repair	0.01***	0.01**	0.05	0.02	0.02	0.06
Having a husband/wife migrating	0.03*	0.03	0.04***	0.02	0.02	0.02
Having parents migrating	0.03***	0.03***	0.03***	0.01	0.01	0.01
Monthly p.c. social welfare (000 VND)	7.48***	20.16***	19.07***	2.63	8.02	6.51
Monthly p.c. pension (000 VND)	10.56***	6.60***	5.55***	70.68	90.86	119.44
Monthly p.c. domestic remittances (000 VND)	96.71***	117.74***	188.28***	60.91	57.88	98.28
Monthly p.c. inter. remittances (000 VND)	72.62***	85.50***	126.59***	44.52	45.86	40.59
Monthly p.c. total remittances (000 VND)	169.33***	203.24***	314.87***	105.43	103.74	138.87
Monthly p.c. pre-transfer income (000 VND)	237.03***	237.82***	223.00***	1,060.41	1,189.22	1,329.30
Observations	1,930	1,544	1,243	9,320	9,946	10,517

Notes: (i) All values in the table, except money values (VND), are ratios, ranging from 0 to 1; (ii) \* An elder is defined as a female who is above 55 years old or a male who is above 60 years old; (iii) \*\*\*  $p \leq 1\%$ , \*\*  $p \leq 5\%$ , \*  $p \leq 10\%$  ( $H_0$ : Average values in poor and non-poor samples are equal).

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

or internationally. We capture the characteristics of households with migrants using family components in the survey questions. The samples comprise 45,944 households in 2004, 45,900 in 2006, and 45,945 in 2008. Of these, there are 11,250 urban households and 34,694 rural households in 2004, 11,490 urban and 34,410 rural in 2006, and 11,760 urban and 34,185 rural in 2008.

Because these survey samples are chosen following a three-stage stratified random sampling method, standard errors are clustered at the commune levels. As a result, robust standard errors are applied in the empirical models.

### 3.2. Poor and non-poor characteristics

The surveys reveal distinctive characteristics of the households that sit on different sides of the poverty line. Poverty lines were defined by the Vietnamese General Statistics Office (GSO) in 2008. Anyone with an income below VND 290,000 per capita, per month in rural areas and VND 370,000 per capita, per month in urban areas is considered poor. These poverty lines are applied consistently for 2004, 2006 and 2008. Incomes in years 2004 and 2006 are converted to 2008 values. The empirical model specified in the section below and the data under study generally confirms the poverty line as the threshold at which the remittance motive switches from altruism to exchange.

In this analysis, we consider households with a per capita monthly pre-transfer income below the poverty line as poor. Under this definition, poverty rates were 17.2% in urban areas and 35.3% in rural areas in 2004. These rates fell to 10.6% in urban areas and 23.6% in rural areas in 2008.

Tables 1 and 2 show characteristics for poor and non-poor households in rural and urban areas. Households are classified and examined separately because there are large differences between the poor and non-poor and between urban and rural living standards. More than 85% of rural non-poor households and more than 95% of urban non-poor households belong to

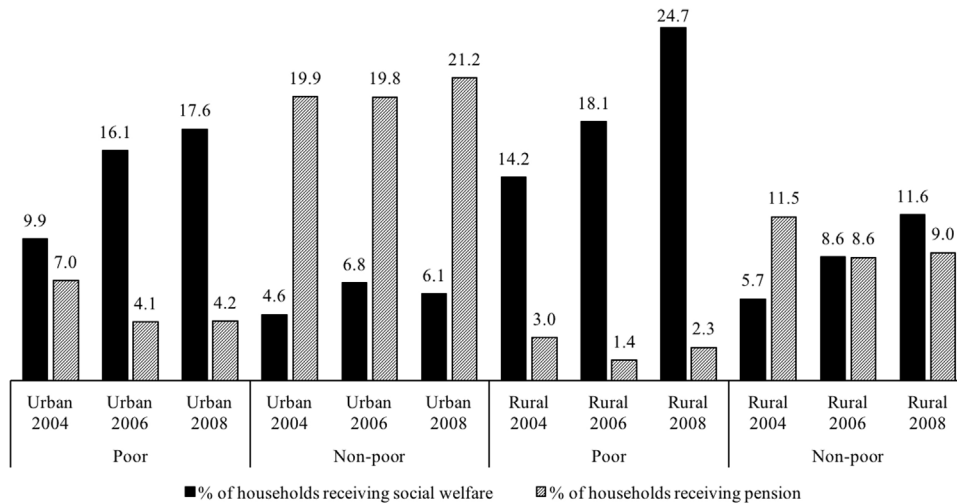


Fig. 1. Percentage of households receiving social welfare and pension.

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

the ethnic majority, Kinh and Hoa. Around 10% of urban poor households are neither Kinh nor Hoa. In contrast, more than 30% of rural poor households belong to ethnic minorities. Further, the rural poor generally live in the North East, North West and North Central Coast. Most rural non-poor households live in the South East, Mekong River Delta and Red River Delta.<sup>5</sup> The urban poor are concentrated in the North Central Coast, South Central Coast, Central Highlands and the Mekong River Delta, while the urban non-poor are concentrated more in the South East and the Red River Delta.<sup>6</sup> Therefore, the poor tend to live in rural areas, among ethnic minorities and reside in regions more vulnerable to natural disasters.

A number of features stand out regarding the head of the household. Females were the household head in around 20% of rural households and about 40 percent of urban households. About 20–30% of female heads of rural households were married. Urban areas are different. Twenty-five per cent of female heads of poor households were married, while more than 55% of female heads of non-poor households were married.

Another characteristic of household heads that reflects an asymmetry between poor and non-poor is education, measured by years of schooling. There is a correlation between lower education of household heads and a higher probability of being poor. The average number of school years for heads was five and seven years for poor and non-poor households in rural areas and six and nine years in urban areas.

In general, poor households had more dependents than non-poor. In rural areas, the average number of children and elders was around 2.0 people in poor households but only 1.5 in non-poor households. Urban household numbers were 1.8 and 1.3, respectively. Elders were one third of total dependents, with more elders living in poor relative to non-poor households.

Poor and non-poor households also differ in their entitlement to social security. Vietnamese social security comprises two components: social insurance (pension) and social welfare (social assistance). Fig. 1 shows the main beneficiaries. While non-poor households were the main beneficiaries of pensions, more than 10% of rural poor households and more than 14% of urban poor households received social welfare in the three years of the surveys. This percentage increased to 25% of the rural poor in 2008. Meanwhile, these percentages among the non-poor were below 7% in urban areas and below 12% in rural areas (Fig. 1).

In contrast, households whose members received pensions tended to be among the non-poor, especially in urban areas. Around 20% of the urban non-poor received pensions, whereas only 10% of the rural non-poor did so. Only a small proportion of the poor received pensions: below 3% in rural areas and below 7% in urban areas (see Fig. 1).

### 3.3. The role of remittances among the poor and non-poor

Remittances generally aim to supplement household income. Poor households, on average, received a higher amount of both international and domestic remittances than non-poor households. This is especially true for urban areas, where poor households received 1.5 times to twice as much as that received by non-poor households (Fig. 2). Poor urban households

<sup>5</sup> Almost all two-sample *t*-tests for equal mean values in rural samples are rejected at the one per cent significance level. This means that in rural samples, mean values of almost all variables in poor samples are statistically, significantly different from those in non-poor samples.

<sup>6</sup> However, two-sample *t*-tests for equal means in these two regions are not strongly rejected over time.



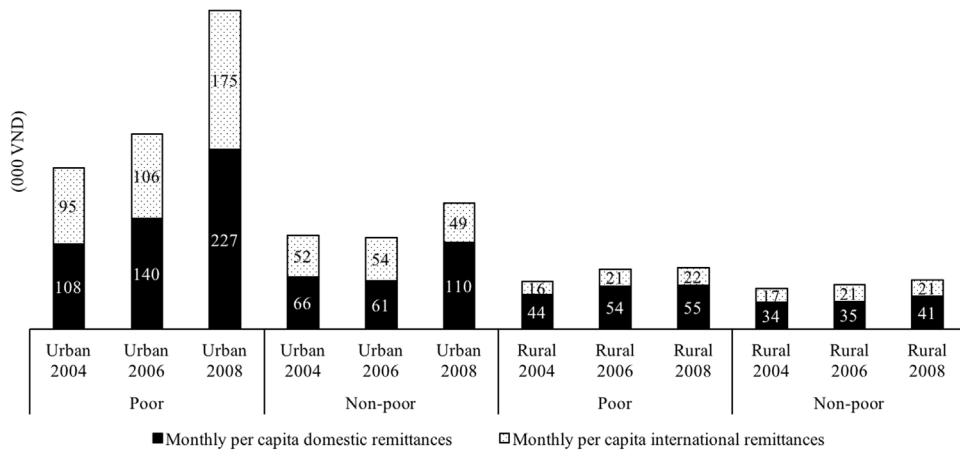


Fig. 2. Monthly per capita remittances by poor and non-poor households.

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

received twice to three times higher international remittances. Owing to the larger amount of remittances sent to the poor, remittances contributed a much greater proportion of their income than that of the non-poor. While remittances accounted for 30–40% of pre-transfer income for rural poor households, and they could be 70–140% of pre-transfer income for urban poor households, they constituted only 8–10% of the pre-transfer income of rural and urban non-poor households. Meanwhile, less importantly, only 6–14% of rural poor income and five per cent of rural non-poor income came from pensions and social welfare, while these ratios were around 10% of urban income. These statistics demonstrate the greater importance of remittances to the income of the poor than public transfers.

Sometimes remittances target specific events. Around 30–40% of household heads were sick, one to five per cent of poor households and two to seven per cent of non-poor households required a major housing repair activity. In addition, remittances are more likely to be sent in a larger amount by household heads' partners, or parents who leave their children with grandparents. These groups accounted for under 10% of households in both rural and urban areas.

#### 4. Theoretical framework

Transfer derivatives provide a key parameter to analyse the hypothesis that expanded public transfer crowds out remittances (Gibson et al., 2011). If a significant negative relationship between remittances and recipient income (i.e., the altruistic motive) exists, there could be strong crowding-out. Cox et al. (2004) have suggested that a linear functional form may provide a poor approximation of the relationship between remittances and recipients' income. Instead, where altruistic and exchange motives co-exist, remittances can exhibit a non-linear pattern in recipient income. As indicated by Gibson et al. (2011), there may be crowding-out in some parts of the income distribution, where altruistic motives predominate, but not in other parts, where exchange motives predominate. In their theoretical model, Cox et al. (2004) explain these differing responses that remittances can have to recipients' income.

Consider the relationship between a donor and recipient. The donor obtains his utility ( $U$ ) from his own consumption ( $C_d$ ), services ( $s$ ) provided by the recipient in exchange for remittances<sup>7</sup> and the recipient's utility ( $V$ ). Meanwhile, the recipient's utility  $V(C_r, s)$  depends on her consumption ( $C_r$ ) and the services she provides to the donor ( $s$ ), where  $\partial V/\partial s$  is negative.<sup>8</sup> The recipient's budget constraint is  $C_r = I_r + T$ , where  $I_r$  is her income before remittances (so called pre-transfer income) and  $T$  is the amount of remittances that she receives.

Because they care about recipients, altruistically motivated donors increase their remittances as recipients' pre-transfer income decreases (i.e.,  $\partial T/\partial I_r < 0$ ). In contrast, donor remittances fall as the recipient's income rises. The introduction of a poverty alleviation program, for example, can lead the donor to cut his support to the recipient.

However, when the recipient is well enough off ( $I_r = K$ ), the altruistic motive can fade. While the donor may still care about the recipient, other motives come into play. Thus, when recipient income begins to exceed some threshold level ( $I_r > K$ ), the motive for sending remittances can switch from altruism to exchange. The latter motive occurs when remittances were made to pay an implicit price  $p$  (or the 'opportunity cost') for services supplied by the recipient. Under this motive, the relationship between remittances and services is expressed as  $T = s \times p$ . Cox (1987) shows that under the exchange motive, remittances first increase with recipient's income until the income level  $K$  is reached. Beyond this income level, remittances

<sup>7</sup> Services can include, for example, taking care of donors' children or helping to run donors' businesses.

<sup>8</sup> Assuming that the recipients dislike supplying services.

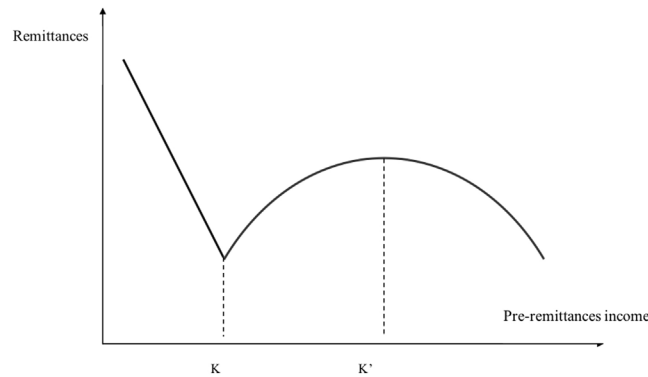


Fig. 3. Remittance response to pre-transfer income in theory.

Source: Cox et al., 2004.

fall with the recipient's income, generating an inverted U-shape.<sup>9</sup> As a result, switching motivation from altruism to exchange creates a non-linear relationship, made up of a linear segment followed by an inverted-U-shape (Fig. 3).

The linear model with the spline income specification using a single knot  $K$  is applied to capture the turning point at which the transfer motive switches from altruism to exchange. The general specification of the remittance function follows Altonji et al. (1997) and Altonji, Ichimura, and Otsu, 2011<sup>10</sup>:

$$T = g(I_r) + \beta X + \varepsilon \quad (1)$$

where  $T$  is per capita remittances received,  $I_r$  is the recipient's pre-transfer income per capita, and  $X$  is a set of control variables describing household characteristics that affect remittance inflows.

Let  $K$  denote the knot or threshold level of income at which remittance behaviour switches from altruism to exchange. According to Cox's theoretical model, one single knot ( $K$ ) makes a change in transfer derivatives from a negative sign (below  $K$ ) to a positive or negative sign (above  $K$ ) (Fig. 3). Because the crowding-out effect is our concern, we should concentrate on the altruistic motive. A model with one knot point (at  $K$ ) instead of two knots (at  $K$  and  $K'$ ) is enough to capture this. Beyond knot  $K$ , the transfer derivative may become insignificant (i.e., the positive and negative effect in the exchange motive cancel each other out). For a fixed  $K$ , the continuous spline income specification is a function of the variables  $I_{r1} = \min(I_r, K)$  and  $I_{r2} = \max(I_r, K)$  – Chan and Tsay (1998) have shown that these estimates are consistent and asymptotically normal.

How is  $K$  determined? Treating the threshold income level  $K$  as an unknown, Cox et al. (2004) find that the estimated threshold point was very close to the official poverty line for the Philippines, a form of subjectively assessed minimum consumption bundle (Cox et al., 2004). As explained by Brown and Jimenez (2011), this subjectively assessed measure provides an obvious and explicit threshold income level with which to determine the knot-point at which the donor's main motive switches from altruism to exchange. Below this threshold, the altruistic motive prevails because the donor assesses the recipient's pre-transfer income as inadequate to ensure a minimum living standard. It is then reasonable to assume that remittances aim to increase the recipient's welfare. When the pre-transfer income is above the threshold, the donor may not be so concerned about the recipient's level of welfare. This explains why the exchange motive can become dominant at the margin.

The hypothesized relationship between remittances and income is depicted in Fig. 4. For the 'subjectively poor' recipient, remittances are hypothesized to be driven by altruism and the relationship is negative. However, once the income reaches threshold  $K$ , remittances become driven by the exchange motive and the relationship may become positive.

The IV model is used to address the potential endogeneity of pre-transfer income. If household members adjust their income by working or saving less in anticipation of future private transfers, estimators of derivatives are upward biased. Following Richard and Eliana (2011), we select an instrument variable identifying the proportion of households in a commune with their own flush toilet: communes with more widespread use of flush toilets reflect a higher living standard as a result of higher levels of income. This instrument is not expected to directly influence the amount of remittances received, except indirectly through the household's income, thus serving as a potentially strong instrument. We use the 1999 Population and Housing Census to calculate the proportion of families with a flush toilet. Another key merit of this instrument lies in the fact that this variable is constructed from a survey that is separate to the household surveys, on which all the other variables in the model rely.

<sup>9</sup> Cox (1987) argues that under the exchange motive, the transfer derivative is measured by:  $\frac{\partial T}{\partial I_r} = \frac{\partial T}{\partial I_r} P + \frac{\partial T}{\partial I_r} S$

<sup>10</sup> The model used by these authors includes the donor's income. However, this variable cannot be captured in the model because of limitations on donor information.



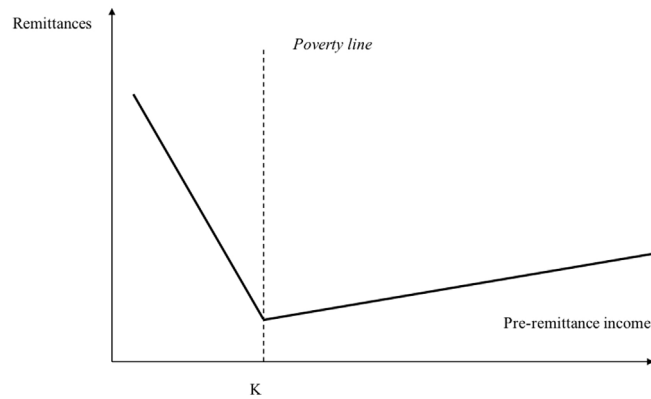


Fig. 4. Remittance response to pre-transfer income in empirical model.

Apart from pre-transfer income, other household characteristics are added to the remittance function. Firstly, the level of education of the household head is included to capture permanent income effects (Cox et al., 2004). Secondly, a dummy variable indicates whether the household is headed by a female. Many studies show that remittances disproportionately target female heads of households (e.g., Cox, 1987; Cox & Jimenez, 1995; Kaufmann & Lindauer, 1986; Lucas & Stark, 1985; Cox & Jimenez, 1995; Kaufmann & Lindauer, 1986; Lucas & Stark, 1985). Other variables include a dummy for a married female head, the number of dependents (children and elderly), dummies for events that attract more remittances (illness, major housing repair), family components reflecting those with migrants (households including grandparents and grandchildren, households with one married parent and their children) and dummies for ethnicity and region.

## 5. Results

This section reports the main findings. We estimate international and domestic transfer derivatives in terms of international and domestic remittances separately.

### 5.1. The response of domestic remittances to recipients' income

The OLS results are presented in Appendix A and Appendix B. Appendix C reports the first stage IV results testing the quality of the instrument. In this case, the endogenous variable is just identified with one instrumental variable. This instrument is found to be valid in both international and domestic remittance models for both urban and rural areas in all three years: 2004, 2006 and 2008. All coefficients on the instrument are statistically significant at the one percent level. F-statistics are highly significant across the panel. The hypothesis that the main variable of interest in each model is not correlated with the error term of the remittances equation (i.e., it can be treated as exogenous) is also tested. This null hypothesis of the Durbin-Wu-Hausman test – that an OLS estimator of the same equation would yield consistent estimates – is rejected in all models, indicating that endogeneity has serious effects on the OLS estimates. Hence, the validity of the instrument is vigorously tested and justified.

Table 3 reports the final (second-stage) results of the IV estimation model using the spline income specification. Dependent variables are monthly domestic remittances per capita (thousand VND), in standard deviation form. Six separate regressions are reported in the six columns of Table 3 for urban and rural samples in the three years 2004, 2006, and 2008. All coefficients in this table report the IV estimation results.

The key parameters are the first two independent variables. They report the transfer derivatives to the households below the poverty line and to those above. The most striking similarity between the six regressions is that for the poor households the derivatives are negative and statistically significant at the one per cent level. The transfer derivatives are  $-0.397$  in 2004 (column 1),  $-0.419$  in 2006 (column 2), and  $-0.264$  in 2008 (column 3) for income below the poverty line in urban areas. Potentially, for a standard deviation increase in pre-transfer income, domestic remittances decrease by between 26 and 42% of standard deviation. The derivatives to households below the poverty line, therefore, consistently imply the altruistic motive, leading to the crowding-out of domestic remittances by public transfers. The results suggest that for the poor remittances and public transfers are substitutes. With inadequate social insurance, remittances play an important role as social security for this group. As migrants from among the poor are most vulnerable, once public transfer increases, remittances are likely to fall.

For income above the poverty line, the estimated transfer derivatives are very large and positive (1.059 in 2004, 0.786 in 2006 and 0.524 in 2008) and statistically significant at one percent. These findings suggest that remittances respond positively to changes in pre-transfer income above the poverty line, implying the exchange motive among the non-poor.

**Table 3**  
Response of domestic remittances to income using the IV estimation.

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Income of the poor	-0.397***	(0.050)	-0.419***	(0.043)	-0.264***	(0.044)	-0.459***	(0.079)	-0.553***	(0.116)	-0.316***	(0.071)
Income of the non-poor	1.059***	(0.183)	0.786***	(0.132)	0.524***	(0.113)	0.423***	(0.097)	0.587***	(0.173)	0.302***	(0.112)
Years of schooling	-0.045*	(0.024)	-0.079**	(0.027)	-0.075**	(0.029)	0.037**	(0.014)	-0.001	(0.017)	0.016	(0.013)
Female head	0.128***	(0.047)	0.083***	(0.030)	0.059**	(0.029)	0.128***	(0.024)	0.100***	(0.031)	0.129***	(0.022)
Married female head	-0.101*	(0.053)	-0.082**	(0.039)	-0.144***	(0.032)	-0.096***	(0.034)	-0.126***	(0.037)	-0.114***	(0.038)
No. of children under 1	0.007	(0.032)	-0.008	(0.030)	-0.020	(0.034)	-0.062***	(0.016)	-0.075***	(0.022)	-0.072***	(0.021)
No. of children age 1–5	-0.022	(0.021)	-0.007	(0.025)	-0.023	(0.021)	-0.101***	(0.010)	-0.093***	(0.012)	-0.090***	(0.012)
No. of children age 6–10	-0.021	(0.019)	-0.014	(0.021)	-0.025	(0.018)	-0.075***	(0.009)	-0.066***	(0.018)	-0.097***	(0.011)
No. of children age 11–14	-0.024	(0.017)	0.011	(0.022)	-0.007	(0.021)	-0.067***	(0.012)	-0.047**	(0.018)	-0.096***	(0.014)
No. of elders	0.037**	(0.018)	0.061***	(0.015)	0.036***	(0.012)	0.036***	(0.009)	0.054***	(0.014)	0.040***	(0.009)
Sick household head	0.077**	(0.030)	0.042**	(0.021)	-0.008	(0.018)	0.061***	(0.013)	0.028*	(0.016)	0.043***	(0.012)
Kinh/Hoa	0.121**	(0.047)	0.083*	(0.043)	0.025	(0.028)	0.159***	(0.023)	0.146***	(0.024)	0.106***	(0.021)
Red River Delta	-0.020	(0.052)	-0.037	(0.051)	-0.011	(0.064)	0.083***	(0.026)	0.097***	(0.031)	-0.018	(0.026)
North East	-0.065	(0.052)	-0.067	(0.048)	-0.067	(0.056)	0.091***	(0.031)	0.090**	(0.038)	-0.037	(0.025)
North West	-0.111*	(0.060)	-0.084	(0.055)	-0.088	(0.060)	-0.029	(0.033)	-0.004	(0.043)	-0.020	(0.031)
South Central Coast	-0.105**	(0.046)	-0.074	(0.051)	-0.033	(0.059)	0.042	(0.029)	0.040	(0.035)	-0.008	(0.028)
Central Highlands	-0.066	(0.058)	-0.035	(0.069)	-0.113*	(0.058)	0.029	(0.035)	0.023	(0.048)	-0.079*	(0.044)
South East	-0.254***	(0.075)	-0.097	(0.076)	-0.081	(0.083)	0.104**	(0.049)	0.043	(0.075)	0.251***	(0.069)
Mekong River Delta	-0.049	(0.059)	-0.026	(0.052)	-0.037	(0.064)	0.112***	(0.039)	0.090*	(0.047)	0.098**	(0.038)
Having major housing repair	0.264**	(0.103)	0.071	(0.086)	0.237***	(0.069)	0.266***	(0.051)	0.380***	(0.086)	0.136***	(0.032)
Having a husband/wife migrating	0.079	(0.140)	0.610***	(0.133)	0.317***	(0.070)	0.782***	(0.147)	0.551***	(0.087)	0.637***	(0.072)
Having parents migrating	0.047	(0.098)	0.176	(0.109)	0.356**	(0.144)	0.308***	(0.081)	0.117	(0.081)	0.237***	(0.061)
Constant	-0.077	(0.068)	-0.097	(0.064)	0.005	(0.074)	-0.181***	(0.032)	-0.173***	(0.035)	-0.100***	(0.031)
Observations	11,250		11,490		11,760		34,694		34,410		34,185	

Notes: (i) The instrument is percentage of households having flush toilets in a commune which are calculated from 1999 Population and Housing Census; (ii) Both remittances and income are taken in standard deviation forms; (iii) Standard errors in parentheses are clustered at the commune levels; (iv) \*\*\*  $p \leq 1\%$ , \*\*  $p \leq 5\%$ , \*  $p \leq 10\%$ .

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

Domestic remittances to rural areas (columns 4–6) show similar patterns to those of urban areas but with larger transfer derivatives. The coefficients for low income (below the poverty line) are  $-0.459$  in 2004,  $-0.553$  in 2006, and  $-0.316$  in 2008, and statistically significant at the one per cent significance level. In contrast, the coefficients for high income (above the poverty line) are positive and statistically significant at the one per cent significance level. Crowding-out effects are again found among the rural poor while exchange effects are shown within the non-poor group.

These results are in line with previous findings in other developing countries (Cox, 1987; Cox et al., 2004; Cox et al., 2004). Crowding-out, therefore, is shown among the poor, rural or urban. Poverty is severe in the rural areas of Vietnam, which, unfortunately, is largely excluded from the formal social security system. The results confirm the substituting relationship between remittances and social security.

Table 4 reports the response of international remittances to the recipient's income after controlling for other household characteristics. This model is similar to that used for domestic remittances but uses monthly international remittance per capita, in standard deviation form.

As with domestic remittances, the non-linear effects of income on international remittances are demonstrated in both rural and urban areas for the three years studied. Effects include switches from statistically significant and negative responses to significant and positive derivatives. Estimates are consistent with the hypothesis that the altruistic motives behind international remittances are important for low-income households but exchange motives become relevant for higher-income groups. Because very few households receive international remittances, the crowding-out effect among the poor and the crowding-in effect among the non-poor are smaller than those of domestic remittances.

## 5.2. Other household characteristics

In addition to recipients' income, domestic remittances vary according to other household characteristics. Firstly, more domestic remittances are sent to ethnic majority households in both rural and urban areas (Table 3). Secondly, lower-educated households in urban areas receive more domestic remittances. Thirdly, families with young children in rural areas receive fewer domestic remittances, while those with elders in both rural and urban areas receive more domestic remittances. This could be because households with children tend to be younger, with the average age of heads being 47 years, for example, in urban areas in 2004. Meanwhile, households with elders tend to be headed by the elderly, with the average age of heads being 63 years. Domestic remittances tend to be sent from the young to the older. This suggests that they may function as old-age support.

**Table 4**

Response of international remittances to income using the IV estimation.

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Income of the poor	-0.212***	(0.039)	-0.131***	(0.029)	-0.224***	(0.067)	-0.321***	(0.089)	-0.237***	(0.067)	-0.246**	(0.100)
Income of the non-poor	0.564***	(0.149)	0.278***	(0.099)	0.262**	(0.111)	0.412***	(0.118)	0.273***	(0.097)	0.288**	(0.123)
Years of schooling	-0.038*	(0.021)	-0.041	(0.030)	-0.024	(0.026)	0.024**	(0.012)	0.025**	(0.010)	0.023	(0.015)
Female head	0.098***	(0.029)	0.031	(0.030)	0.001	(0.032)	-0.013	(0.023)	-0.042*	(0.022)	-0.022	(0.023)
Married female head	-0.051	(0.048)	0.032	(0.056)	0.012	(0.039)	0.001	(0.048)	0.010	(0.051)	-0.016	(0.035)
No. of children under 1	0.003	(0.023)	0.000	(0.021)	-0.016	(0.022)	0.003	(0.017)	0.001	(0.020)	-0.029*	(0.016)
No. of children age 1–5	-0.008	(0.014)	-0.006	(0.013)	-0.018	(0.014)	0.015	(0.011)	-0.005	(0.009)	0.011	(0.013)
No. of children age 6–10	-0.014	(0.013)	0.001	(0.017)	-0.005	(0.021)	0.000	(0.010)	-0.005	(0.009)	-0.005	(0.011)
No. of children age 11–14	0.023	(0.022)	0.003	(0.014)	0.014	(0.016)	0.028**	(0.014)	0.010	(0.014)	-0.011	(0.013)
No. of elders	-0.013	(0.012)	0.008	(0.015)	0.002	(0.014)	0.026**	(0.012)	-0.005	(0.010)	-0.010	(0.011)
Ill household head	-0.001	(0.020)	0.024	(0.031)	-0.027*	(0.016)	0.008	(0.014)	-0.002	(0.013)	-0.009	(0.012)
Kinh/Hoa	0.088***	(0.027)	0.058**	(0.023)	0.007	(0.033)	0.082***	(0.022)	0.079***	(0.019)	0.025	(0.022)
Red River Delta	-0.100**	(0.048)	-0.009	(0.030)	0.033	(0.032)	0.045*	(0.023)	0.030	(0.024)	-0.022	(0.024)
North East	-0.061	(0.047)	0.009	(0.029)	0.001	(0.024)	0.058**	(0.026)	0.093***	(0.033)	0.010	(0.029)
North West	-0.068	(0.042)	0.000	(0.029)	-0.033	(0.026)	-0.004	(0.031)	0.031	(0.030)	-0.022	(0.032)
South Central Coast	-0.038	(0.045)	0.013	(0.020)	0.025	(0.024)	0.012	(0.022)	0.024	(0.024)	-0.039	(0.024)
Central Highlands	-0.086*	(0.045)	-0.000	(0.038)	-0.040*	(0.024)	-0.020	(0.032)	-0.022	(0.033)	-0.111***	(0.040)
South East	-0.097	(0.070)	0.036	(0.034)	0.069	(0.061)	-0.011	(0.050)	0.006	(0.050)	-0.067	(0.060)
Mekong River Delta	-0.017	(0.051)	0.077**	(0.034)	0.054*	(0.031)	0.054	(0.033)	0.058*	(0.032)	0.023	(0.039)
Having major housing repair	0.026	(0.045)	-0.030	(0.041)	0.027	(0.039)	0.104*	(0.056)	0.059	(0.068)	0.045**	(0.026)
Having a husband/wife migrating	0.339**	(0.137)	0.280***	(0.089)	0.814***	(0.260)	1.061***	(0.154)	1.065***	(0.158)	0.989***	(0.125)
Having parents migrating	0.104	(0.143)	-0.072*	(0.043)	-0.070	(0.081)	0.005	(0.060)	-0.080*	(0.048)	0.001	(0.052)
Constant	-0.053	(0.054)	-0.112***	(0.034)	-0.049	(0.047)	-0.148***	(0.028)	-0.108***	(0.027)	-0.009	(0.032)
Observations	11,250		11,490		11,760		34,694		34,410		34,185	

Notes: (i) The instrument is percentage of households having flush toilets in a commune which are calculated from 1999 Population and Housing Census; (ii) Both remittances and income are taken in standard deviation forms; (iii) Standard errors in parentheses are clustered at the commune levels; (iv) \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

Fourthly, domestic remittances support household expenses at critical events. This is true for both rural and urban households. Illness and major housing repair activities attract more domestic remittances in both urban and rural areas. Households with a husband/wife migrant tend to receive higher amounts of domestic remittances. Similarly, households with only grandparents and grandchildren tend to receive more domestic remittances in both rural and urban areas. Finally, female heads tend to receive more domestic remittances in both urban and rural areas. This finding is consistent with previous studies (Clarke & Wallsten, 2004; Gubert, Lassourd, & Mesplé-Somps., 2010; Oruc, 2011).

Meanwhile, the response of international remittances to many household characteristics is insignificant in both rural and urban areas. More international remittances are sent to ethnic majority households in both areas. Rural households with better educated heads receive higher amounts of international remittances. Finally, those with migrant husbands/wives also receive more international remittances in both urban and rural areas.

### 5.3. Robustness check

To check the robustness of the relationship between remittances and recipients' income, sensitivity analysis is implemented via the application of non-parametric and semi-parametric techniques. According to the semi-parametric technique, remittances respond to income according to some unknown functional form  $g(I_r)$  (Eq. (1)), which may be either linear or non-linear, while the other covariates,  $X$ , are assumed to have linear effects on remittances. Meanwhile, the non-parametric technique is interpreted as a semi-parametric estimator after removing the partially linear portion of the model. Although these methods do not give specific measures of transfer derivatives as spline functions, they are more flexible.

Fig. 5 graphs the response of remittances to income, using the non-parametric technique. Fig. 6 demonstrates a semi-parametric technique. In each figure, there are six diagrams for urban and rural areas in the three years studied. In each diagram, the solid line demonstrates domestic remittance derivatives, while the dashed line presents the response of international remittances to recipients' income. The vertical line shows the poverty line, which is different between urban and rural areas.

Our lines trace non-linear relationships between remittances and recipients' income and show the turning points at which the lines switch from negative slopes to flat. Similar patterns describe both international and domestic remittances. For both kinds of remittances, turning points are always around the poverty lines, supporting the use of poverty lines as single knots in the spline income function. Crowding-out effects are again shown among the poor. These results support those of the spline-specified regressions and the theoretical framework.

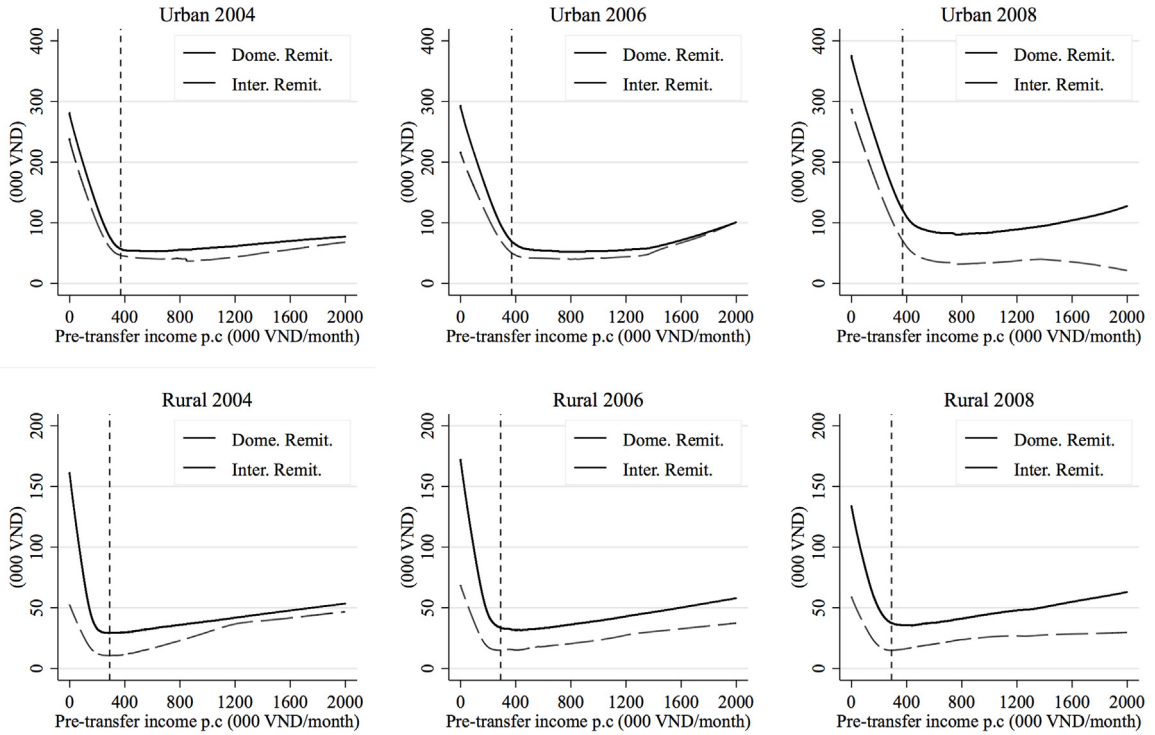


Fig. 5. Remittance response to income using nonparametric technique.

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

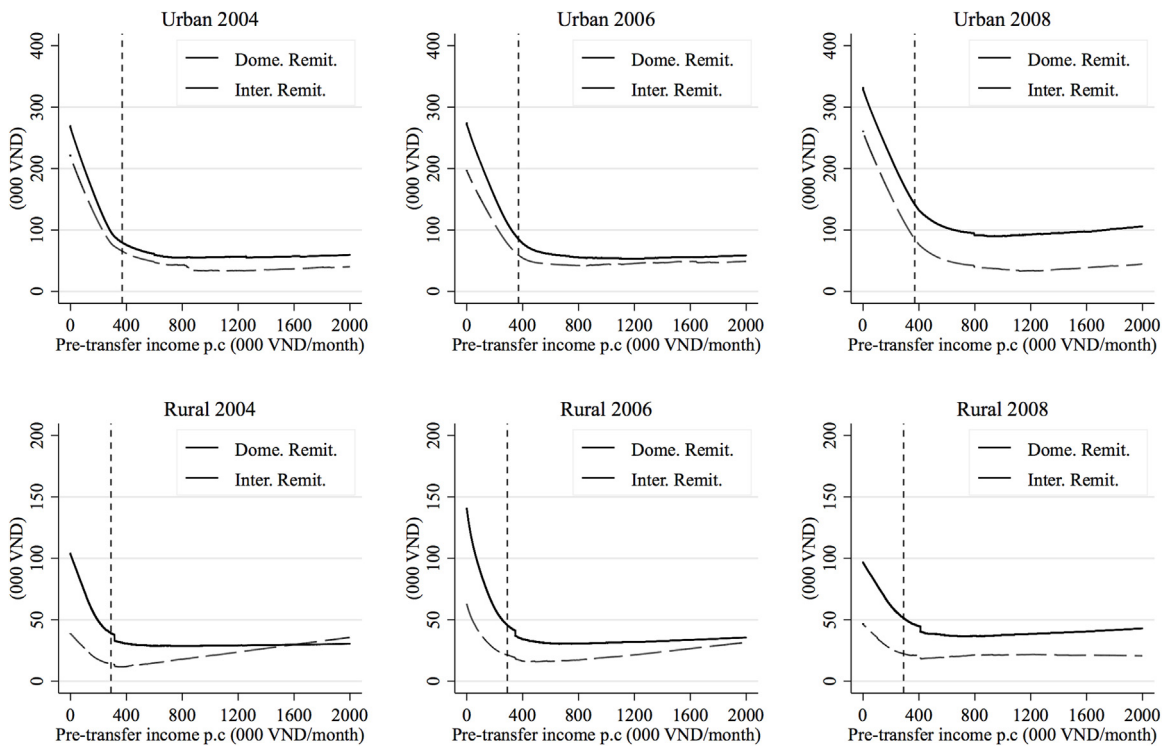


Fig. 6. Remittance response to income using semi-parametric technique.

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

**Table 5**  
Response of domestic remittances to income by sub-samples using the IV estimation.

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Large households	-0.166***	[-0.245,-0.086]	-0.157***	[-0.227,-0.087]	-0.091**	[-0.166,-0.016]	-0.160***	[-0.270,-0.049]	-0.223**	[-0.397,-0.048]	-0.0860**	[-0.161,-0.011]
Small households	-0.435***	[-0.555,-0.316]	-0.466***	[-0.565,-0.367]	-0.281***	[-0.376,-0.186]	-0.541***	[-0.714,-0.367]	-0.600***	[-0.854,-0.346]	-0.436***	[-0.648,-0.224]
Lower educated HH heads	-0.757***	[-1.220,-0.294]	-0.633***	[-0.870,-0.397]	-0.428***	[-0.688,-0.169]	-0.732***	[-1.038,-0.425]	-0.658***	[-1.045,-0.271]	-0.632**	[-1.195,-0.070]
Higher educated HH heads	-0.390***	[-0.508,-0.272]	-0.400***	[-0.498,-0.302]	-0.217***	[-0.282,-0.151]	-0.260***	[-0.390,-0.130]	-0.533***	[-0.818,-0.248]	-0.262***	[-0.386,-0.137]
Elder HH heads	-0.530***	[-0.766,-0.294]	-0.599***	[-0.767,-0.432]	-0.347***	[-0.491,-0.203]	-0.694***	[-0.942,-0.445]	-0.777***	[-1.116,-0.439]	-0.608***	[-1.003,-0.212]
Younger HH heads	-0.303***	[-0.390,-0.217]	-0.286***	[-0.393,-0.180]	-0.158***	[-0.226,-0.090]	-0.205***	[-0.324,-0.086]	-0.370**	[-0.676,-0.063]	-0.158***	[-0.269,-0.048]
Female HH heads	-0.491***	[-0.664,-0.319]	-0.465***	[-0.601,-0.330]	-0.277***	[-0.403,-0.152]	-0.531***	[-0.782,-0.279]	-0.850***	[-1.353,-0.346]	-0.635***	[-1.084,-0.186]
Male HH heads	-0.310***	[-0.403,-0.217]	-0.359***	[-0.450,-0.268]	-0.224***	[-0.298,-0.150]	-0.344***	[-0.475,-0.213]	-0.338***	[-0.463,-0.213]	-0.215***	[-0.317,-0.114]
HH without children	-0.484***	[-0.636,-0.331]	-0.502***	[-0.617,-0.386]	-0.308***	[-0.422,-0.194]	-0.547***	[-0.765,-0.329]	-0.754***	[-1.104,-0.404]	-0.623***	[-0.933,-0.314]
HH with children	-0.239***	[-0.320,-0.159]	-0.242***	[-0.334,-0.150]	-0.136***	[-0.204,-0.067]	-0.235***	[-0.357,-0.113]	-0.223***	[-0.345,-0.102]	-0.066*	[-0.133,0.000]
Ill household heads	-0.645***	[-0.897,-0.393]	-0.465***	[-0.608,-0.323]	-0.234***	[-0.329,-0.139]	-0.456***	[-0.612,-0.301]	-0.488***	[-0.684,-0.292]	-0.343***	[-0.584,-0.102]
No ill HH heads	-0.262***	[-0.331,-0.193]	-0.368***	[-0.463,-0.273]	-0.270***	[-0.384,-0.155]	-0.388***	[-0.568,-0.207]	-0.515***	[-0.840,-0.190]	-0.317***	[-0.513,-0.121]
HH with social welfare	-0.329	[-0.870,0.213]	-0.497***	[-0.705,-0.290]	-0.287**	[-0.508,-0.066]	-0.510**	[-0.849,-0.172]	-1.163	[-3.511,1.185]	-0.890*	[-1.782,0.001]
HH without social welfare	-0.393***	[-0.492,-0.295]	-0.399***	[-0.486,-0.312]	-0.273***	[-0.366,-0.181]	-0.403***	[-0.543,-0.262]	-0.496***	[-0.636,-0.355]	-0.276***	[-0.379,-0.173]
HH without pension	-0.415***	[-0.524,-0.305]	-0.412***	[-0.498,-0.325]	-0.250***	[-0.337,-0.164]	-0.425***	[-0.569,-0.282]	-0.493***	[-0.689,-0.296]	-0.329***	[-0.486,-0.171]
HH with pension	-0.278***	[-0.475,-0.080]	-0.474***	[-0.802,-0.147]	-0.599***	[-0.953,-0.245]	-0.197	[-0.589,0.196]	-0.800**	[-1.544,-0.056]	-0.379	[-1.008,0.250]
Northern regions	-0.507***	[-0.750,-0.264]	-0.347***	[-0.479,-0.216]	-0.213***	[-0.308,-0.118]	-0.262***	[-0.453,-0.071]	-0.410***	[-0.606,-0.215]	-0.471***	[-0.760,-0.181]
Southern regions	-0.344***	[-0.443,-0.244]	-0.437***	[-0.541,-0.333]	-0.290***	[-0.410,-0.170]	-0.511***	[-0.686,-0.337]	-0.609***	[-0.936,-0.282]	-0.231*	[-0.463,0.001]

Notes: (i) Each line shows the coefficient associated with the variable of income of the poor for urban and rural areas, respectively, in 2004, 2006 and 2008; (ii) The instrument is percentage of households having flush toilets in a commune, which are calculated from the 1999 Population and Housing Census; (iii) Both remittances and income are taken in standard deviation forms; (iv) 95% Confidence intervals in brackets; (v) \*\*\* p ≤ 1%, \*\* p ≤ 5%, \* p ≤ 10%.

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.

**Table 6**  
Response of international remittances to income by sub-samples using the IV estimation.

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Large households	-0.0898 <sup>***</sup>	[-0.179,-0.000]	0.021	[-0.0821,0.124]	-0.114 <sup>**</sup>	[-0.219,-0.008]	-0.439 <sup>**</sup>	[-0.801,-0.0768]	-0.230 <sup>***</sup>	[-0.378,-0.082]	-0.206 <sup>**</sup>	[-0.391,-0.0208]
Small households	-0.204 <sup>***</sup>	[-0.286,-0.122]	-0.154 <sup>***</sup>	[-0.224,-0.0841]	-0.238 <sup>***</sup>	[-0.385,-0.090]	-0.247 <sup>***</sup>	[-0.412,-0.0820]	-0.240 <sup>***</sup>	[-0.393,-0.086]	-0.266 <sup>**</sup>	[-0.509,-0.0226]
Lower educated HH heads	-0.309	[-0.684,0.064]	-0.251 <sup>**</sup>	[-0.459,-0.0424]	-0.0423	[-0.142,0.0579]	-0.328 <sup>**</sup>	[-0.598,-0.0575]	-0.298 <sup>*</sup>	[-0.625,0.0286]	-0.357 <sup>*</sup>	[-0.778,0.0637]
Higher educated HH heads	-0.191 <sup>***</sup>	[-0.266,-0.117]	-0.138 <sup>***</sup>	[-0.219,-0.0558]	-0.316 <sup>***</sup>	[-0.504,-0.127]	-0.340 <sup>***</sup>	[-0.560,-0.119]	-0.299 <sup>***</sup>	[-0.468,-0.130]	-0.281 <sup>***</sup>	[-0.485,-0.0772]
Elder HH heads	-0.232 <sup>***</sup>	[-0.362,-0.103]	-0.0592	[-0.153,0.0349]	-0.142 <sup>***</sup>	[-0.214,-0.069]	-0.453 <sup>***</sup>	[-0.743,-0.163]	-0.475 <sup>***</sup>	[-0.765,-0.185]	-0.192	[-0.427,0.0437]
Younger HH heads	-0.158 <sup>***</sup>	[-0.242,-0.074]	-0.176 <sup>***</sup>	[-0.275,-0.0774]	-0.347 <sup>**</sup>	[-0.621,-0.073]	-0.247 <sup>**</sup>	[-0.474,-0.0193]	-0.192 <sup>**</sup>	[-0.355,-0.029]	-0.315 <sup>***</sup>	[-0.552,-0.0786]
Female HH heads	-0.254 <sup>***</sup>	[-0.393,-0.114]	-0.206 <sup>***</sup>	[-0.311,-0.100]	-0.312 <sup>***</sup>	[-0.516,-0.107]	-0.326 <sup>**</sup>	[-0.613,-0.0388]	-0.199 <sup>**</sup>	[-0.398,-0.000]	-0.288 <sup>*</sup>	[-0.581,0.00478]
Male HH heads	-0.137 <sup>***</sup>	[-0.210,-0.065]	-0.0655 <sup>**</sup>	[-0.131,-0.0004]	-0.0977 <sup>***</sup>	[-0.167,-0.028]	-0.301 <sup>***</sup>	[-0.484,-0.117]	-0.252 <sup>***</sup>	[-0.401,-0.102]	-0.230 <sup>**</sup>	[-0.412,-0.0478]
HH without children	-0.231 <sup>***</sup>	[-0.325,-0.137]	-0.158 <sup>***</sup>	[-0.230,-0.0863]	-0.261 <sup>***</sup>	[-0.436,-0.086]	-0.299 <sup>***</sup>	[-0.505,-0.0928]	-0.234 <sup>**</sup>	[-0.418,-0.049]	-0.251	[-0.554,0.0521]
HH with children	-0.107 <sup>**</sup>	[-0.190,-0.023]	-0.0573	[-0.146,0.0311]	-0.136 <sup>***</sup>	[-0.231,-0.040]	-0.329 <sup>**</sup>	[-0.595,-0.0616]	-0.259 <sup>***</sup>	[-0.400,-0.117]	-0.245 <sup>**</sup>	[-0.435,-0.0547]
Ill household heads	-0.193 <sup>**</sup>	[-0.341,-0.045]	-0.0734 <sup>*</sup>	[-0.144,-0.0023]	-0.0779 <sup>**</sup>	[-0.145,-0.010]	-0.296 <sup>***</sup>	[-0.498,-0.0940]	-0.223 <sup>***</sup>	[-0.381,-0.064]	-0.354 <sup>***</sup>	[-0.624,-0.0848]
No ill HH heads	-0.176 <sup>***</sup>	[-0.244,-0.107]	-0.152 <sup>***</sup>	[-0.235,-0.0687]	-0.309 <sup>***</sup>	[-0.504,-0.113]	-0.326 <sup>***</sup>	[-0.560,-0.0916]	-0.244 <sup>***</sup>	[-0.411,-0.076]	-0.187 <sup>*</sup>	[-0.374,0.00063]
HH with social welfare	-0.101	[-0.245,0.042]	0.00231	[-0.0408,0.045]	-0.00712	[-0.0843,0.070]	-0.204	[-0.587,0.178]	0.0173	[-0.390,0.425]	-0.301	[-0.748,0.145]
HH without social welfare	-0.188 <sup>***</sup>	[-0.261,-0.115]	-0.140 <sup>***</sup>	[-0.206,-0.0740]	-0.268 <sup>***</sup>	[-0.420,-0.115]	-0.323 <sup>***</sup>	[-0.515,-0.131]	-0.278 <sup>***</sup>	[-0.417,-0.139]	-0.253 <sup>**</sup>	[-0.473,-0.0323]
HH without pension	-0.204 <sup>***</sup>	[-0.285,-0.123]	-0.122 <sup>***</sup>	[-0.185,-0.0593]	-0.226 <sup>***</sup>	[-0.359,-0.092]	-0.295 <sup>***</sup>	[-0.483,-0.107]	-0.223 <sup>***</sup>	[-0.349,-0.096]	-0.228 <sup>**</sup>	[-0.417,-0.0401]
HH with pension	-0.0425	[-0.153,0.067]	-0.127	[-0.388,0.133]	-0.0526	[-0.168,0.063]	-0.654	[-1.453,0.145]	-0.833 <sup>*</sup>	[-1.732,0.0666]	-0.483	[-1.133,0.168]
Northern region	-0.0485	[-0.154,0.057]	-0.0592	[-0.186,0.0678]	-0.165 <sup>**</sup>	[-0.320,-0.010]	-0.386 <sup>*</sup>	[-0.782,0.00996]	-0.289 <sup>**</sup>	[-0.514,-0.063]	-0.206 <sup>**</sup>	[-0.408,-0.0026]
Southern region	-0.258 <sup>***</sup>	[-0.355,-0.161]	-0.154 <sup>***</sup>	[-0.219,-0.0892]	-0.252 <sup>***</sup>	[-0.429,-0.075]	-0.291 <sup>***</sup>	[-0.464,-0.118]	-0.220 <sup>***</sup>	[-0.377,-0.064]	-0.291	[-0.667,0.0852]
Large households	-0.0898 <sup>**</sup>	[-0.179,-0.000]	0.021	[-0.0821,0.124]	-0.114 <sup>**</sup>	[-0.219,-0.008]	-0.439 <sup>**</sup>	[-0.801,-0.0768]	-0.230 <sup>***</sup>	[-0.378,-0.082]	-0.206 <sup>**</sup>	[-0.391,-0.0208]

Notes: (i) Each line shows the coefficient associated with the variable of income of the poor for urban and rural areas, respectively, in 2004, 2006 and 2008; (ii) The instrument is percentage of households having flush toilets in a commune, which are calculated from the 1999 Population and Housing Census; (iii) Both remittances and income are taken in standard deviation forms; (iv) 95% Confidence intervals in brackets; (v) <sup>\*\*\*</sup>  $p \leq 1\%$ , <sup>\*\*</sup>  $p \leq 5\%$ , <sup>\*</sup>  $p \leq 10\%$ .

Source: Authors' calculation from VHLSS 2004, 2006 and 2008.



#### 5.4. Sub-samples

Evidence from the literature suggests that crowding-out effects vary across demographic groups. This section explores whether crowding-out is sensitive to socio-demographic characteristics: household size, gender, household components (whether a household has children or elders), education, special events (illness), entitlements to social security and regions. Sub-sample regressions for different characteristics, therefore, are estimated. Stage-one results of the IV estimations confirm the strong instrument that we adopt.<sup>11</sup> Final results are reported in Table 5 (for domestic remittances) and Table 6 (for international remittances). The first column names the sample group. Transfer derivatives for income below the poverty line are listed in both tables.<sup>12</sup>

The responses of domestic remittances to recipients' income are first checked. For each sub-sample in Table 5, the estimated income effect follows the same pattern as those of Table 3: a negative and statistically significant transfer derivative for income below the poverty line. In addition, crowding-out effects are more likely among small households, female-headed households, households with elders and without children, lower-educated households, household's whose head is ill. Crowding-out also occurs with international remittances in a similar pattern but at a smaller scale (Table 6).

### 6. Conclusion and policy implications

The paper studies the crowding-out effects of remittances in Vietnam, a developing country recently experiencing a significant increase in remittances, both domestic and international. In line with Cox et al. (2004), this paper uses the income spline specification. To address the potential endogenous pre-transfer income, we adopt an IV model. The econometric analysis demonstrates statistically significant and negative derivatives for both international and domestic remittances to income below the poverty line in Vietnam. For every standard deviation increase in pre-transfer income, domestic remittances decrease about 0.26–0.42 standard deviation in urban areas or around 0.32–0.46 standard deviation in rural areas during 2004–2008. This is consistent with an altruistic motive, leading to a crowding-out of domestic remittances by public transfers. This crowding-out effect is shown again for international remittances but on a smaller scale.

For income beyond the poverty line, the estimated derivatives are large and statistically significant for both kinds of remittances, suggesting an exchange motive. Hence, these findings suggest a non-linear relationship between remittances and income in which, at the poverty line, the motive of remittances switches from altruism to an exchange motive. These results are in line with previous findings in other developing countries (Cox 1987; Cox et al., 2004; Cox et al., 2004). Additionally, crowding-out effects of remittances among the poor are shown consistent and robust across different socio-demographic characteristics.

The crowding-out effects of remittances in Vietnam found in this paper have important policy implications. The expected effect on income distribution of social security system may be reduced if the 'crowding out' effects of private remittances is ignored in designing policies of public transfers. As a result, the economic well-being of the poor remain unchanged or even reduced, creating deadweight losses to the government. Hence, the government should take into account the 'crowding-out' effect when developing its social public policy.

The results do not imply that the government should withdraw from its obligation to provide universal social security. Rather, the fact that significant crowding-out effects are observed particularly among the poor population reveals a major problem associated with the current social insurance services in Vietnam: the poor have limited access to the social safety net, which results in their heavy reliance on remittances. A high reliance on remittances accordingly leads to the high crowding-out effects observed among the poor. As migrants are vulnerable themselves, it is likely that they reduce remittances when their originating households receive additional income from other sources.

This study therefore calls for strengthened government efforts in reforming the social insurance system by expanding the coverage of the rural and urban poor. Since its establishment in 1947, the social insurance system in Vietnam has undergone a range of reforms. Nevertheless, low coverage remains the greatest challenge in the informal sector, and among the unemployed and the rural elderly (Giang & Pfau, 2009). Among the rural population, our study confirms that the most vulnerable group, including the elderly and the ill, rely the most on remittances. They should be the top priority in targeted programs for social health and social insurance.

Overall, the government needs to improve the efficiency and equity of the formal social security system and government assistance should be sufficiently large to both help households overcome shocks and exit poverty sustainably in the long run. In that sense, cash transfers can be suitable in the case of sudden shocks but should be designed to assist households towards earning an income.

### Appendix A.

See Table A1.

<sup>11</sup> Stage-one results of the IV estimations for sub-samples are omitted to save space but available upon request.

<sup>12</sup> The transfer derivatives to income beyond the poverty line are statistically insignificant in all sub-samples.

**Table A1**  
Domestic remittance response to income using the OLS model.

	Urban 2004	Urban 2006	Urban 2008.	Rural 2004	Rural 2006	Rural 2008
Income of the poor	-0.158*** (0.019)	-0.194*** (0.018)	-0.117*** (0.013)	-0.122*** (0.010)	-0.159*** (0.010)	-0.109*** (0.017)
Income of the non-poor	0.013 (0.016)	0.021 (0.016)	0.031 (0.025)	0.004 (0.006)	0.014* (0.008)	0.021* (0.011)
Years of schooling	0.087*** (0.016)	0.074*** (0.012)	0.053*** (0.015)	0.042*** (0.008)	0.032*** (0.006)	0.025*** (0.007)
Female head	0.172*** (0.043)	0.152*** (0.025)	0.129*** (0.024)	0.184*** (0.019)	0.189*** (0.021)	0.167*** (0.021)
Married female head	-0.116*** (0.049)	-0.136*** (0.036)	-0.155*** (0.028)	-0.130*** (0.030)	-0.161*** (0.027)	-0.136*** (0.035)
No. of children under 1	-0.076*** (0.027)	-0.106*** (0.021)	-0.065*** (0.030)	-0.095*** (0.012)	-0.119*** (0.012)	-0.094*** (0.015)
No. of children age 1–5	-0.076*** (0.015)	-0.071*** (0.018)	-0.074*** (0.019)	-0.111*** (0.007)	-0.121*** (0.007)	-0.107*** (0.010)
No. of children age 6–10	-0.080*** (0.011)	-0.062*** (0.017)	-0.077*** (0.014)	-0.091*** (0.006)	-0.093*** (0.010)	-0.113*** (0.007)
No. of children age 11–14	-0.104*** (0.010)	-0.092*** (0.013)	-0.072*** (0.015)	-0.106*** (0.007)	-0.104*** (0.007)	-0.123*** (0.007)
No. of elders	0.062*** (0.012)	0.058*** (0.011)	0.041*** (0.010)	0.051*** (0.010)	0.082*** (0.007)	0.049*** (0.008)
Ill household head	0.043* (0.023)	0.020 (0.016)	-0.010 (0.015)	0.049*** (0.012)	0.034*** (0.012)	0.039*** (0.011)
Kinh/Hoa	0.121*** (0.026)	0.101*** (0.033)	0.066*** (0.021)	0.116*** (0.013)	0.142*** (0.017)	0.112*** (0.015)
Red River Delta	0.135*** (0.041)	0.082** (0.037)	0.093* (0.050)	0.043** (0.019)	0.067*** (0.020)	-0.002 (0.021)
North East	0.031 (0.039)	0.002 (0.038)	-0.022 (0.049)	0.016 (0.019)	0.018 (0.021)	-0.052*** (0.020)
North West	-0.062 (0.044)	-0.040 (0.044)	-0.037 (0.050)	-0.012 (0.020)	0.027 (0.025)	-0.018 (0.023)
South Central Coast	-0.000 (0.035)	0.014 (0.038)	0.021 (0.052)	0.000 (0.021)	-0.001 (0.022)	-0.009 (0.025)
Central Highlands	0.053 (0.039)	0.085 (0.064)	-0.040 (0.048)	0.042* (0.022)	0.082*** (0.041)	-0.012 (0.024)
South East	0.151*** (0.038)	0.225*** (0.049)	0.174*** (0.061)	0.199*** (0.032)	0.228*** (0.037)	0.353*** (0.045)
Mekong River Delta	0.133** (0.053)	0.100** (0.041)	0.061 (0.050)	0.120*** (0.027)	0.141*** (0.021)	0.136*** (0.023)
Having major housing repair	0.286*** (0.098)	0.120** (0.060)	0.265*** (0.065)	0.298*** (0.045)	0.422*** (0.082)	0.152*** (0.029)
Having a husband/wife migrating	0.290*** (0.070)	0.585*** (0.130)	0.297*** (0.058)	0.852*** (0.142)	0.616*** (0.074)	0.656*** (0.069)
Having children migrating	0.086 (0.075)	0.236** (0.105)	0.367*** (0.138)	0.386*** (0.079)	0.263*** (0.059)	0.286*** (0.056)
Constant	-0.220*** (0.043)	-0.203*** (0.047)	-0.130** (0.055)	-0.119*** (0.019)	-0.173*** (0.025)	-0.119*** (0.022)
Observations	11,250	11,490	11,760	34,694	34,410	34,185
Adjusted R2	0.048	0.065	0.038	0.066	0.076	0.070
F-statistics	13.49	17.63	14.42	47.32	61.83	66.22
Prob > F-statistics	0.000	0.000	0.000	0.000	0.000	0.000

Notes: (i) Both remittances and income are taken in standard deviation forms; (ii) Standard errors in parentheses are clustered at the commune levels; (iii) \*\*\*  $p \leq 1\%$ , \*\*  $p \leq 5\%$ , \*  $p \leq 10\%$ .

Source: Authors calculation from VHLSS 2004, 2006 and 2008

## Appendix B.

See Table B1.

**Table B1**  
International remittance response to income using the OLS model.

	Urban 2004	Urban 2006	Urban 2008	Rural 2004	Rural 2006	Rural 2008
Income of the poor	-0.072*** (0.014)	-0.060*** (0.014)	-0.114*** (0.033)	-0.041*** (0.010)	-0.045*** (0.008)	-0.041** (0.016)
Income of the non-poor	0.008 (0.013)	0.007 (0.008)	0.030 (0.026)	0.030*** (0.011)	0.027** (0.014)	0.003 (0.005)
Years of schooling	0.030*** (0.009)	0.015 (0.014)	0.030*** (0.012)	0.035*** (0.006)	0.035*** (0.007)	0.033*** (0.008)
Female head	0.123*** (0.027)	0.054* (0.028)	0.044* (0.024)	0.031* (0.017)	0.003 (0.014)	0.016 (0.016)
Married female head	-0.063 (0.048)	0.016 (0.055)	-0.006 (0.035)	-0.023 (0.045)	-0.014 (0.050)	-0.038 (0.033)
No. of children under 1	-0.042* (0.021)	-0.035* (0.018)	-0.039** (0.018)	-0.030** (0.012)	-0.017 (0.017)	-0.053*** (0.011)
No. of children age 1–5	-0.037*** (0.012)	-0.029** (0.012)	-0.044*** (0.011)	0.004 (0.008)	-0.015** (0.007)	-0.007 (0.009)
No. of children age 6–10	-0.044*** (0.012)	-0.016 (0.019)	-0.030* (0.017)	-0.017*** (0.007)	-0.014** (0.007)	-0.021*** (0.007)
No. of children age 11–14	-0.018 (0.015)	-0.034** (0.013)	-0.017 (0.016)	-0.010 (0.007)	-0.013 (0.010)	-0.039*** (0.007)
No. of elders	0.002 (0.008)	0.006 (0.016)	0.008 (0.012)	0.037*** (0.010)	0.011 (0.008)	-0.003 (0.008)
Ill household head	-0.019 (0.019)	0.016 (0.028)	-0.027* (0.016)	-0.004 (0.012)	0.003 (0.012)	-0.013 (0.011)
Kinh/Hoa	0.084*** (0.019)	0.067*** (0.023)	0.022 (0.029)	0.053*** (0.012)	0.071*** (0.016)	0.033** (0.016)
Red River Delta	-0.019 (0.036)	0.034* (0.020)	0.078*** (0.024)	0.017 (0.022)	0.009 (0.023)	-0.004 (0.023)
North East	-0.012 (0.038)	0.035 (0.025)	0.019 (0.020)	0.001 (0.020)	0.052* (0.030)	-0.003 (0.024)
North West	-0.044 (0.036)	0.018 (0.023)	-0.013 (0.018)	0.019 (0.023)	0.037 (0.024)	-0.018 (0.023)
South Central Coast	0.018 (0.039)	0.044*** (0.015)	0.052** (0.020)	-0.016 (0.020)	-0.003 (0.022)	-0.039* (0.021)
Central Highlands	-0.024 (0.034)	0.043 (0.032)	-0.005 (0.016)	0.007 (0.022)	-0.011 (0.020)	-0.042** (0.018)
South East	0.116*** (0.043)	0.151*** (0.033)	0.184*** (0.040)	0.094*** (0.031)	0.070*** (0.027)	0.039 (0.029)
Mekong River Delta	0.078 (0.056)	0.123*** (0.027)	0.098*** (0.024)	0.078*** (0.025)	0.066*** (0.023)	0.064** (0.028)
Having major housing repair	0.035 (0.041)	-0.011 (0.033)	0.039 (0.036)	0.139*** (0.051)	0.072 (0.064)	0.062*** (0.023)

**Table B1** (Continued)

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Having a husband/wife migrating	0.457***	(0.118)	0.269***	(0.087)	0.821***	(0.267)	1.116***	(0.151)	1.102***	(0.157)	1.007***	(0.124)
Having children migrating	0.133	(0.135)	-0.057	(0.038)	-0.038	(0.071)	0.065	(0.055)	-0.002	(0.037)	0.048	(0.037)
Constant	-0.124***	(0.042)	-0.152***	(0.027)	-0.110***	(0.033)	-0.104***	(0.021)	-0.099***	(0.024)	-0.030	(0.023)
Observations	11,250		11,490		11,760		34,694		34,410		34,185	
Adjusted R2	0.016		0.008		0.035		0.028		0.025		0.025	
F-statistics	5.81		5.14		5.02		9.73		9.50		9.49	
Prob > F-statistics	0.000		0.000		0.000		0.000		0.000		0.000	

Notes: (i) Both remittances and income are taken in standard deviation forms; (ii) Standard errors in parentheses are clustered at the commune levels; (iii) \*\*\* p ≤ 1%, \*\* p ≤ 5%, \* p ≤ 10%.

Source: Authors calculation from VHLSS 2004, 2006 and 2008

## Appendix C.

See Table C1.

**Table C1**

First-stage results of the IV estimations for the whole sample.

	Urban 2004		Urban 2006		Urban 2008		Rural 2004		Rural 2006		Rural 2008	
Percentage of HHs having flush toilets in the commune	0.371***	(0.041)	0.459***	(0.043)	0.445***	(0.044)	1.134***	(0.149)	0.942***	(0.113)	0.696***	(0.103)
Year of schooling of household heads	0.163***	(0.010)	0.229***	(0.014)	0.287***	(0.015)	0.216***	(0.007)	0.209***	(0.008)	0.193***	(0.006)
Female head	-0.022	(0.019)	-0.005	(0.019)	0.023	(0.028)	-0.104***	(0.015)	-0.083***	(0.013)	-0.081***	(0.013)
Married female head	0.052***	(0.019)	0.043***	(0.021)	0.087***	(0.031)	0.164***	(0.027)	0.220***	(0.026)	0.147***	(0.026)
No. of children under 1	-0.081***	(0.021)	-0.115***	(0.023)	-0.062**	(0.029)	-0.163***	(0.016)	-0.112***	(0.019)	-0.135***	(0.016)
No. of children age 1–5	-0.048***	(0.016)	-0.089***	(0.018)	-0.095***	(0.016)	-0.131***	(0.008)	-0.100***	(0.008)	-0.094***	(0.008)
No. of children age 6–10	-0.068***	(0.012)	-0.059***	(0.017)	-0.099***	(0.015)	-0.131***	(0.007)	-0.119***	(0.008)	-0.102***	(0.008)
No. of children age 11–14	-0.093***	(0.011)	-0.124***	(0.014)	-0.123***	(0.018)	-0.153***	(0.008)	-0.141***	(0.009)	-0.129***	(0.008)
No. of elders	-0.015	(0.012)	-0.043***	(0.012)	-0.032***	(0.011)	-0.064***	(0.007)	-0.074***	(0.007)	-0.082***	(0.008)
Ill household head	-0.032*	(0.017)	-0.042**	(0.017)	-0.001	(0.019)	-0.076***	(0.011)	-0.065***	(0.011)	-0.060***	(0.011)
Kinh/Hoa	0.063***	(0.023)	0.045	(0.027)	0.060*	(0.031)	0.188***	(0.020)	0.167***	(0.021)	0.171***	(0.019)
Red River Delta	0.080***	(0.027)	0.076**	(0.034)	0.121***	(0.045)	0.166***	(0.021)	0.182***	(0.019)	0.187***	(0.020)
North East	0.177***	(0.033)	0.183***	(0.034)	0.156***	(0.044)	0.237***	(0.022)	0.217***	(0.021)	0.179***	(0.022)
North West	0.110***	(0.025)	0.158***	(0.046)	0.157**	(0.065)	0.289***	(0.033)	0.274***	(0.028)	0.252***	(0.027)
South Central Coast	0.033	(0.024)	0.039	(0.036)	0.009	(0.043)	0.208***	(0.024)	0.211***	(0.024)	0.148***	(0.021)
Central Highlands	0.113***	(0.036)	0.171***	(0.040)	0.093*	(0.055)	0.473***	(0.035)	0.496***	(0.038)	0.362***	(0.037)
South East	0.358***	(0.039)	0.360***	(0.044)	0.443***	(0.052)	0.705***	(0.041)	0.701***	(0.044)	0.657***	(0.037)
Mekong River Delta	0.203***	(0.026)	0.200***	(0.033)	0.208***	(0.047)	0.573***	(0.024)	0.559***	(0.024)	0.459***	(0.023)
Having major housing repair	0.069**	(0.029)	0.112	(0.072)	0.078	(0.050)	0.277***	(0.049)	0.224***	(0.062)	0.125***	(0.021)
Having a husband/wife migrating	0.089	(0.107)	-0.134***	(0.039)	-0.168***	(0.061)	-0.120**	(0.050)	-0.190***	(0.048)	-0.182***	(0.040)
Having children migrating	-0.120***	(0.040)	-0.159***	(0.040)	-0.171***	(0.043)	-0.195***	(0.034)	-0.255***	(0.025)	-0.228***	(0.021)
Constant	-0.327***	(0.031)	-0.334***	(0.038)	-0.396***	(0.050)	-0.282***	(0.025)	-0.303***	(0.024)	-0.277***	(0.023)
Observations	11,250		11,490		11,760		34,694		34,410		34,185	
Adjusted R2	0.069		0.114		0.153		0.154		0.144		0.125	
F-statistics	33.65		41.43		34.92		132.69		124.01		134.35	
Prob > F-statistics	0.000		0.000		0.000		0.000		0.000		0.000	

Note: (i) Income is taken in standard deviation forms; (ii) Standard errors in parentheses are clustered at the commune levels; (iii) \*\*\* p ≤ 1%, \*\* p ≤ 5%, \* p ≤ 10%

Source: Authors calculation from VHLSS 2004, 2006 and 2008

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