

**ESSAYS ON VULNERABILITY TO POVERTY, MIGRATION AND GENDER IN
THAILAND AND VIETNAM**

Der Wirtschaftswissenschaftlichen Fakultät der
Gottfried Wilhelm Leibniz Universität Hannover
zur Erlangung des akademischen Grades
Doktorin der Wirtschaftswissenschaften
- Doctor rerum politicarum –

genehmigte Dissertation

von

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2015

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Tag der Promotion: 13.04.2015

ACKNOWLEDGEMENTS

First of all, I would like to express my outmost appreciation and gratitude to my first supervisor, Prof. Dr. Hermann Waibel for encouraging me and for giving me the opportunity to conduct my Ph.D. - for his guidance, comments and advice, and for nurturing my enthusiasm for Southeast Asia. From him I received constant support not only regarding research papers, but especially during my time conducting surveys. I also would like to thank my second supervisor Prof. Dr. Ulrike Grote for her constructive and helpful comments and advice during research seminars.

I enjoyed the warm working atmosphere at the Institute. Therefore, I would like to express my gratitude to the teams of the Institute of Development and Agricultural Economics and the Institute of Environmental Economics and World Trade. My special thanks goes to the coffee kitchen connection, Huon Morton, Dr. Dirk Röttgers, Beza Chichaibelu, Sabine Liebenehm, Dr. Rattiya Lippe, Dr. Anja Fasse and Rebecca Hartje, for the fruitful discussions and your patient encouragement and help whenever I was not sure how to ever finish this thesis. I also want to thank Dr. Bernd Hardeweg for his patience, as I probably learned all my excel skills from him, as well as Dr. Mulubrhan Amare, Prof. Dr. Susan Steiner and Prof. Dr. Michael Hübler for their comments and advice. Renate Nause and Christina Grundstedt made me feel welcome in the Institute from the very first moment, thank you for that.

I would like to thank all those people who made data collection a wonderful experience for me. I am thankful for the support I received from the teams from Kasetsart University and Ubon University. A special thanks goes to my partner in the field, Dr. Theda Gödecke, for all those good memories, as well as to Prof. em. Dr. Erich Schmidt for always being so encouraging and supportive. I also acknowledge the DFG for funding the project.

I cannot thank Sebastian enough for his never-ending support throughout all of my many PhD-crises and for not hesitating whenever I did. A thank you also goes out to my good friends from KöWo30, you made my dissertation a marvellous, unforgettable time.

Last but not least, I would like to thank my family: my brother Johannes for being such a good friend, and my parents, Jutta and Ralf, who always supported and encouraged me to pursue the best education I can get, and who always believed in me.

ABSTRACT

Thailand and Vietnam have made remarkable progress in reducing poverty over the last decades. One important reason for the strong poverty reduction has been economic growth. But the benefits from economic growth have been distributed unequally. Rural areas lag behind in income levels, as well as access to social security and education, making inequality a challenge for development policies. In this year's report, the Asian Development Bank (ADB, 2014) pointed again at the needs of the Asian poor and vulnerable. Many people live just above the poverty line of 1.25 \$, are highly vulnerable to shocks and have a high risk of falling back into poverty.

The economic development brought massive changes for the lives of the rural population. Migration to urban areas is a widespread livelihood strategy of rural households in Thailand and Vietnam due to better employment possibilities in the urban areas. But migration does not always lead to the expected success, as migrants from poor households are seldom able to overcome the entry barriers to high-return employment. The mobility of the rural population additionally induces massive changes to the composition of households and villages, though even more in Thailand than in Vietnam. Mainly the young and better educated tend to migrate, leaving back elderly, children and only few of working age in the villages. Villages tend to become more consumptive than productive, and the long-term development perspective of disadvantaged and vulnerable households remains unclear.

The thesis consists of four essays on vulnerability to poverty and rural development in Thailand and Vietnam. In detail the research objectives are i.) to investigate the effects of rural–urban migration on economic development in Northeast Thailand, ii.) to provide insights on investments of rural households and possible future developments of rural villages in Northeast Thailand, iii.) to contribute to a better understanding of female migrant income shares on education expenditures and iv) to analyse the link between nutrition and poverty.

The empirical analysis of the thesis is based on a panel data set of 4400 rural households from three provinces in Thailand and three provinces in Vietnam, each characterised by a high vulnerability to poverty. The survey was conducted in 2007, 2008 and 2010 and comprises detailed information on household members including migrants, composition of income and consumption as well as agricultural activities. The first essay additionally draws on a migrant tracking survey of 643 migrants from the same household sample, conducted in Bangkok.

The **first essay** investigates the effects of rural–urban migration on economic development in Thailand. The essay first estimates determinants of migration as well as the influence of migration on income growth, based on a difference-in-difference matching estimation. Second, determinants for high quality employment are estimated using instrumental variables (IV) probit and IV two stage approaches based on rural infrastructure variables as instruments. Last, the income effect of migration for rural household is estimated conditional on migrant success, i.e. gaining high quality employment. The essay offers some new findings on migration. First, the study shows that it is the poorer households that send migrants, and that the migrants are generally more educated, albeit at an overall low education level in the rural areas. Second, there is evidence of a need for better social protection for urban migrants. As most migrants do not have written employment contracts, legal protection is low. Also, since only a small proportion of the migrants have insurance contracts, health service is still an issue as it is not always clear to what extent they are covered by the government schemes given, that they are often registered in their natal village. The study shows that migration offers the benefit of income growth for rural households, but is less effective in reducing inequality and relative poverty in rural areas. The positive effect of migration on income is larger for those households with migrants in high quality employment. The message emerging from this essay is therefore that poor rural households tend to produce poor migrants which could be one of the reasons for the continuous existence of a wide rural–urban divide in welfare. The crucial importance of good quality education for migrants to achieve higher quality employment calls for more investment in education quality in rural areas.

The **second essay** provides insights into possible future developments of villages in Northeast Thailand by analysing investments of rural households. A multinomial logit model is used to analyse the determinants of different types of investments in agriculture as well as small scale enterprises. A hurdle model is applied to investigate the intensity of investments in agriculture. Results show that only 30 % of rural households undertook investments and most investments are small. Only households with larger land sizes tend to invest and wealthier households are more likely to invest larger amounts. Female headed households, those with older household heads as well as households in remote areas invest less. Access to finance increases the probability of investing in small scale enterprises, but does not influence agricultural investments. Households with larger investments in agriculture tend to not invest in non-farm activities. The essay demonstrates implications for rural development and agricultural policy in Thailand and other Asian emerging market economies. The pattern of few rural investments made by wealthy

households has implications for future wealth distribution in rural areas. While there is already a large rural-urban income gap in Thailand, a growing gap within rural areas is likely to emerge.

The **third essay** analyses the influence of female migrant employment on education expenditures. Employment of women not only increases household income, it can also change a household's expenditure pattern. This essay looks at the influence of the share of female income on education expenditures of rural households in Northeast Thailand. The share of female income has been found to positively influence education expenditures in the context of the traditional nucleus family. It is less clear whether this influence also holds true in extended families comprising migrants, since the migrant is impaired in monitoring household expenditures. This essay compares the influence of the share of female local income (i.e. income earned by nucleus household members in the village) on the share of education expenditures with the influence of the share of female migrant income. The analysis is based on a subsample of 1700 households with wage employment in Northeast Thailand. A fixed effects model is applied to control for unobserved heterogeneity and additionally a hurdle model comprising a fixed effects logit model and a fixed effect model conditional on positive education expenditures are used. This model controls for zero-inflation and allows for different mechanisms influencing the decision for education expenditures and their amounts. Results show that the share of female local income significantly increases the share of expenditures on education, while the share of female migrant income has a significant negative effect on education expenditures. Both effects are especially large for households with low off-farm (local and migrant) income. The main result of the essay is that female migration reduces education expenditures.

The **fourth essay** analyses the links between nutrition and poverty in Thailand and Vietnam. These are two emerging market economies where poverty rates are now below 10 % and are in further decline. It is not clear to what extent this success has translated into similar improvements regarding the nutritional situation of the people and especially that of children. Results of this paper show that undernutrition continues to be a problem in Vietnam, with child underweight rates at 25 %, defined to be of high severity by the World Health Organisation (WHO, 2014). In Thailand, the prevalence of 12 % of children being underweight is within the range of medium severity. Additionally, overweight becomes a new nutrition problem, with 20 % of children being overweight in Thailand and 12 % in Vietnam. Factors that influence nutrition outcomes, measured as z-scores of the weight-for-age indicator for children and as Body-Mass-Index (BMI) for adults, are investigated by using ordinary least squares (OLS) and IV regressions by country. The paper analyses whether factors correlated with nutrition change when households move away from the

poverty line by differentiating three subsamples based on income groups. Quantile regressions at quantiles corresponding to over- and underweight cut-off values differentiate influencing factors at those nutrition levels. Poverty and income are found to influence nutrition outcomes, but other factors, such as mother's height, migration and sanitation condition nutrition as well. Village conditions influence nutrition additionally. Coefficients of respective variables differ by income group. Quantile regressions show that, while adult's personal characteristics show similar coefficients over the different quantiles, other factors, such as ethnicity, are only important for nutrition at under- or overweight quantiles. All regressions support the results that non-monetary factors play into the reduction of undernutrition; monetary poverty reduction therefore is not a sufficient measure to eliminate malnutrition.

Keywords: Southeast Asia, migration, gender, vulnerability to poverty, nutrition, investment, agriculture

ZUSAMMENFASSUNG

Thailand und Vietnam konnten in den letzten Jahrzehnten beachtliche Fortschritte bei der Armutsreduktion verzeichnen. Ein wichtiger Grund für die starke Reduktion der Armutsraten war ökonomisches Wachstum. Doch trotz des Erfolges ist der Nutzen des ökonomischen Wachstums nicht allen Bevölkerungsgruppen gleichermaßen zugutegekommen. Ländliche Regionen wurden abgehängt im Einkommensniveau, aber auch bezüglich Zugang zu sozialen Sicherungsnetzen und Bildung, wodurch Ungleichheit eine große Herausforderung für die Entwicklungspolitik in diesen Ländern darstellt. In ihrem diesjährigen Bericht hat die Asiatische Entwicklungsbank (ADB, 2014) erneut auf die Bedürfnisse armer und vulnerabler Menschen in Asien hingewiesen. Viele leben knapp oberhalb der Armutsgrenze von 1,25 \$, sind hochgradig anfällig für Schocks und unterliegen einem hohen Risiko, zurück in Armut zu fallen.

Die ökonomische Entwicklung hat massive Veränderungen für das Leben der ländlichen Bevölkerung mit sich gebracht. Migration in städtische Regionen ist in Thailand und Vietnam aufgrund besserer Einkommensmöglichkeiten eine weitverbreitete Strategie ländlicher Haushalte zur Verbesserung ihrer Existenzgrundlage. Doch Migration führt nicht immer zu dem erwarteten Erfolg, da gerade Migranten aus armen Haushalten selten in der Lage sind, die Zugangsbarrieren zu gutbezahlter Beschäftigung zu überwinden. Die Mobilität der ländlichen Bevölkerung führt darüber hinaus zu großen Veränderungen in der Struktur von Haushalten und ganzen Dörfern, in Thailand mehr noch als in Vietnam. Vor allem die Jungen und besser Gebildeten migrieren und lassen die Älteren, Kinder und nur Wenige im Erwerbsalter in den Dörfern zurück. In den Dörfern wird daher mehr konsumiert als produziert, und die langfristige Entwicklungsperspektive - insbesondere benachteiligter und vulnerabler - Haushalte bleibt unklar.

Diese Dissertation besteht aus vier Essays zu Armutsanfälligkeit und ländlicher Entwicklung in Thailand und Vietnam. Die Forschungsziele sind i) die Effekte der Land-Stadt-Migration auf die ökonomische Entwicklung in Nordost-Thailand zu analysieren, ii) Einblicke in das Investitionsverhalten ländlicher Haushalte und in mögliche Entwicklungspfade von Dörfern in Nordost-Thailand zu geben, iii) zu einem besseren Verständnis für den Einfluss von Einkommen von weiblichen Migranten auf Bildungsausgaben beizutragen, iv) den Zusammenhang von Ernährung und Armut zu untersuchen.

Die empirische Analyse dieser Dissertation basiert auf einem Panel-Datensatz von 4400 ländlichen Haushalten aus je drei Provinzen in Thailand und Vietnam, die durch eine hohe Armutsanfälligkeit gekennzeichnet sind. Die Befragung wurde in 2007, 2008 und 2010 durchgeführt und umfasst detaillierte Informationen über die Haushaltsmitglieder einschließlich Migranten, die Struktur des Einkommens und der Konsumausgaben sowie über landwirtschaftliche Aktivitäten. Das erste Essay nutzt zusätzlich eine Tracking-Befragung von 643 Migranten der ländlichen Haushalte derselben Stichprobe, die in Bangkok durchgeführt wurde.

Das **erste Essay** untersucht die Effekte von Land-Stadt-Migration auf die ökonomische Entwicklung in Thailand. Zunächst werden die Determinanten der Migration sowie der Einfluss von Migration auf das Einkommenswachstum auf Basis einer Difference-in-Difference Matching Estimation geschätzt. Als zweiter Schritt werden Determinanten für eine hochwertige Beschäftigung mit einem Instrumentvariable (IV) Probit Modell sowie einem Two-Stage Ansatz mit IV geschätzt. Als Instrumente werden Variablen der ländlichen Infrastruktur genutzt. Auf dieser Basis wird der Effekt von Migration auf das Einkommen der ländlichen Haushalte geschätzt, abhängig vom Erfolg der Migranten, d.h. einer hohen Qualität der Beschäftigung des Migranten. Die Studie präsentiert einige neue Erkenntnisse über Migration. Sie zeigt erstens, dass vor allem arme Haushalte Migranten in die Stadt schicken, dass die Migranten aber, trotz eines insgesamt niedrigen Bildungsniveaus in den ländlichen Regionen, generell besser gebildet sind. Zweitens zeigt sich die Notwendigkeit eines besseren sozialen Sicherungssystems für in Städten lebende Migranten. Da die meisten Migranten keine schriftlichen Arbeitsverträge haben, ist die rechtliche Absicherung schwach. Auch ist die Gesundheitsversorgung nach wie vor ein Problem, da nur wenige Migranten über Versicherungsverträge verfügen und auch nicht immer geklärt ist, in welchem Umfang sie durch das staatliche Gesundheitssystem abgesichert werden, weil die Migranten oft noch in ihrem Heimatdörfern registriert sind. Die Studie zeigt, dass durch Migration das Einkommen der ländlichen Haushalte wächst, Migration aber weniger wirksam bei der Verringerung von Ungleichheit und relativer Armut in den ländlichen Gebieten ist. Der positive Effekt von Migration auf das Einkommen ist für Haushalte mit Migranten in einer Beschäftigung von hoher Qualität stärker. Die Botschaft dieses Essays ist daher, dass arme Haushalte tendenziell auch arme Migranten hervorbringen, was einer der Gründe für die fortwährende Existenz einer tiefen Kluft der Wohlfahrt zwischen ländlichen und städtischen Haushalten ist. Die entscheidende Bedeutung guter Bildung von Migranten für das Erreichen einer Beschäftigung von hoher Qualität betont die Notwendigkeit von Investitionen in die Qualität der Bildung in ländlichen Gebieten.

Das **zweite Essay** ermöglicht durch die Analyse des Investitionsverhaltens von landwirtschaftlichen Haushalten Einblicke in mögliche Entwicklungspfade von Dörfern in Nordost-Thailand. Mit Hilfe eines Multinomial Logit Modells werden die Determinanten verschiedener Typen von Investitionen in die Landwirtschaft sowie in Kleinunternehmen analysiert. Ein Hurdle Modell wird genutzt um die Intensität landwirtschaftlicher Investitionen genauer zu analysieren. Die Ergebnisse zeigen, dass nur 30 % der ländlichen Haushalte Investitionen getätigt haben, und dass die meisten Investitionen niedrig sind. Nur Haushalte mit größerer Landfläche neigen stärker dazu zu investieren und wohlhabenderen Haushalten ist es eher möglich größere Beträge zu investieren. Haushalte mit weiblichem oder älterem Haushaltsvorstand sowie Haushalte in abgelegenen Regionen investieren weniger. Zugang zu Finanzmitteln vergrößert die Wahrscheinlichkeit in Kleinunternehmen zu investieren, hat aber keinen Einfluss auf landwirtschaftliche Investitionen. Haushalte, die größere Beträge in die Landwirtschaft investieren, neigen dazu nicht in außerlandwirtschaftliche Aktivitäten zu investieren. Das Essay veranschaulicht die Implikationen, die dieses Investitionsverhalten für die ländliche Entwicklung und die Landwirtschaftspolitik in Thailand und anderen Schwellenländern hat. Das Muster von wenigen landwirtschaftlichen Investitionen, die vor allem von wohlhabenden Haushalten getätigt werden, beeinflusst die zukünftige Verteilung des Wohlstandes in ländlichen Gebieten. Während es bereits eine tiefe Kluft zwischen ländlichen und städtischen Einkommen in Thailand gibt, wird sich in Zukunft wahrscheinlich auch eine wachsende Kluft zwischen Arm und Reich innerhalb der ländlichen Gebiete entwickeln.

Das **dritte Essay** analysiert den Einfluss von Lohnbeschäftigung weiblicher Migrantinnen auf Bildungsausgaben. Lohnbeschäftigung von Frauen erhöht nicht nur das Haushaltseinkommen, sie kann auch die Ausgabenstruktur des Haushalts beeinflussen. Dieses Essay betrachtet den Einfluss des Anteils weiblichen Einkommens auf die Bildungsausgaben des Haushaltes in Nordost-Thailand. Frühere Studien zeigen, dass der Anteil des weiblichen Einkommens Bildungsausgaben positiv beeinflusst. Diese Studien betrachten jedoch traditionelle Kleinfamilien. Es ist dagegen weniger klar, ob dieser Einfluss auch innerhalb erweiterter Familien mit Migrantinnen bestehen bleibt, da Migrantinnen die Konsumausgaben nur beschränkt überwachen können. Dieses Essay vergleicht den Einfluss des Einkommensanteils von Frauen die im Dorf leben (also Einkommen von Mitgliedern der Kleinfamilie), mit dem Einfluss des Einkommensanteils weiblicher Migrantinnen auf den Anteil der Bildungsausgaben. Die Analyse basiert auf einer Teilstichprobe von 1700 Haushalten aus Nordost-Thailand, die Einkommen aus Lohnbeschäftigung erhalten. Um für unbeobachtbare Heterogenität zu kontrollieren, wird ein Fixed-Effects Modell angewendet.

Dieses wird ergänzt durch ein Hurdle Modell, das aus einem Fixed-Effect Logit Modell sowie einem auf positive Bildungsausgaben konditionalen Fixed-Effects Modell besteht. Dieses Modell kontrolliert für Zero-Inflation und erlaubt, dass jeweils unterschiedliche Faktoren die Entscheidung ob Bildungsausgaben getätigt werden sowie die Entscheidung über die Höhe der Ausgaben beeinflussen. Die Ergebnisse zeigen, dass der Einkommensanteil der Frauen, die im Dorf arbeiten, den Anteil der Ausgaben für Bildung signifikant erhöht, während der Einkommensanteil der weiblichen Migranten einen signifikant negativen Effekt auf den Anteil der Bildungsausgaben hat. Beide Effekte sind besonders groß für Haushalte mit einem niedrigen Lohneinkommen. Es zeigt sich somit, dass die Migration von Frauen Bildungsausgaben verringert.

Das **vierte Essay** analysiert den Zusammenhang von Ernährung und Armut in Thailand und Vietnam. In diesen Schwellenländern sind die Armutsraten inzwischen unter 10 % gesunken und sinken weiterhin. Es ist allerdings nicht klar, in welchem Maße sich dieser Erfolg auf ähnliche Verbesserungen in der Ernährungssituation der Bevölkerung und insbesondere von Kindern übertragen hat. Unterernährung ist weiterhin ein Problem in Vietnam. Die Rate untergewichtiger Kinder in unserer Stichprobe beträgt 25 %, was nach der Definition der Weltgesundheitsorganisation (WHO, 2014) in den Bereich eines hohen Schweregrades eingestuft wird. In Thailand liegt der Anteil untergewichtiger Kinder bei 12% und damit in dem Bereich mittlerer Schwere. Ein weiteres, in diesen Ländern neues Problem der Fehlernährung ist zudem Übergewicht, da 20 % der Kinder in Thailand und 12 % der Kinder in Vietnam übergewichtig sind. In diesem Essay werden mit Hilfe von ordinary least squares (OLS) und Instrumentvariablen (IV) Regressionen die Einflussfaktoren für den Ernährungszustand ermittelt, der für Kinder als z-Scores des weight-for-age Indikators und für Erwachsene als Body-Mass-Index (BMI) gemessen wird. Es wird untersucht, ob die Faktoren, die mit dem Ernährungszustand korreliert sind, sich ändern, sobald Haushalte sich von der Armutslinie entfernen. Dazu werden drei Teilstichproben basierend auf Einkommensgruppen gebildet. Quantil-Regressionen zu den Quantilen, die den Grenzwerten von Unter- und Übergewicht entsprechen, differenzieren die Einflussfaktoren die für den Ernährungszustand in der Nähe dieser Grenzwerte relevant sind. Die Ergebnisse zeigen, dass Armut und Einkommen den Ernährungszustand beeinflussen, dass aber andere Faktoren wie zum Beispiel die Größe der Mutter, Migration sowie die sanitäre Versorgung ebenfalls einen Einfluss haben. Auch die Bedingungen im Dorf sind relevant. Die Koeffizienten der Einflussfaktoren variieren je nach Einkommensgruppe. Die Quantil-Regressionen zeigen, dass einige Variablen, wie die Charakteristika der Erwachsenen, für beide Quantile ähnliche Koeffizienten aufweisen, andere Variablen, wie zum Beispiel die Ethnie, nur auf ein Quantil (des Unter- oder Übergewichtes)

Einfluss haben. Alle Regressionen unterstützen das Ergebnis, dass nicht-monetäre Faktoren eine wichtige Rolle bei der Reduktion von Unterernährung spielen; eine reine Reduktion der monetären Armut reicht daher nicht, um Fehlernährung zu beseitigen.

Schlagnorte: Südost-Asien, Migration, Gender, Vulnerabilität gegenüber Armut, Ernährung, Investitionen, Landwirtschaft

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
ATT	Average treatment effect of the treated
BDH	Bono de Desarrollo Humano (cash transfer program)
BMI	Body mass index
CIA	Conditional independence assumption
cm	Centimetre
DFG FOR 756	Deutsche Forschungsgemeinschaft Forschergruppe 756
DHS	Demographic and Health Surveys
ET2TM	Exponential Type II Tobit model
FAO	Food and Agriculture Organisation of the United Nations
FE	Fixed effects
ha	Hectare
HFA	Height-for-Age
HH	Household
HHH	Household head
HSRI	Health Systems Research Institute
IFPRI	International Food Policy Research Institute
IIA	Independence of irrelevant alternatives
IPSR	Institute for Population and Social Research
IV	Instrumental variables
LSMS	Living Standard Measurement Survey
No.	Number
NSO	National Statistical Office
ODI	Overseas Development Institute
OLS	Ordinary Least Squares
PC	Per capita
PPP\$	Purchasing Power Parity Dollars
PPS	Propensity score
PROGRESA	Programa de Educación, Salud y Alimentación
SSE	Small scale enterprise
Std.Err	Standard error
Std.Dev.	Standard deviation
TH	Thailand
THB	Thai Baht
UNDP	United Nations Development Programme
VN	Vietnam
WFA	Weight-for-Age
WFH	Weight-for-Height
WHO	World Health Organization
2SLS	Two stage least squares

1 INTRODUCTION

1.1 Background of the study

Southeast Asia has made remarkable progress in reducing poverty over the last decades; the region is a major contributor to the success of the Millennium Development Goal target of halving the share of the extremely poor until 2015. Thailand and Vietnam are no exception. In Thailand, the poverty headcount ratio went down from 58 % in 1990 to almost 13 % in 2011. In Vietnam it decreased from over 60 % in the 1990s to 17 % in 2008.¹

One important reason for the strong poverty reduction has been economic growth (UNDP, 2014; Vandemoortele & Bird, 2011). But the benefits from economic growth have been distributed unequally. While poverty reduction was particularly successful in urban areas, rural areas lag behind in income levels, as well as access to social security and education (UNDP, 2014), making inequality a challenge for development policies. In this year's report the Asian Development Bank (ADB) (2014) pointed again at the needs of the Asian poor and vulnerable. Many people live just above the poverty line of 1.25 \$ and are highly vulnerable to shocks and risks. Due to climate change and environmental degradation, agricultural shocks such as floods and droughts increase in frequency and severity. Economic crises increase the risk of job loss. The food price crisis in 2008 for example put many households under pressure, as it increased the share of income households have to spend on food. Many households that live only just above the poverty line do not have the means to cope with these shocks – they fall back into poverty.

This thesis deals with vulnerability to poverty and rural development in Thailand and Vietnam. It consists of four essays, which address income effects of migration, rural investments, influence of female migrant income on education expenditures, and nutrition and poverty.

To mitigate risks and increase agricultural incomes, rural households in Thailand and Vietnam have diversified their labour into non-farm employment (Cherdchuchai & Otsuka, 2006; Rigg et al., 2012). Migration to urban areas is a widespread livelihood strategy of rural households in Thailand and Vietnam, due to better employment possibilities in the urban areas (Ministry of Planning and Investment, General Statistical Office, 2011; Rigg, 2006). Migrant remittances

¹ Poverty data for Thailand are for the national poverty line. Poverty data for Vietnam are for the 1.25 \$ poverty line, as official data for the national poverty line are available only for very recent years (UNdata, 2014).

contribute to rural incomes, which can improve well-being and help households to overcome liquidity constraints (e.g. Stark & Levhari, 1982). But migration does not always lead to the expected success. Migrants from poor households are seldom able to overcome the high entry barriers and costs to high-return employment (Reardon et al., 2000; Rigg & Nattapoolwat, 2001). Living conditions in the city are often poor, and due to them working in the informal sector, many migrants lack access to social services (UNDP, 2014). The **first essay** (Chapter 2) of this dissertation analyses the effect of rural urban migration on the rural household incomes in Thailand, identifies factors for successful migration, and draws conclusions regarding the effect of migration on rural economic development.

The mobility of the rural population induces massive changes in the composition of households and villages, though even more in Thailand than in Vietnam. Mainly the young and better educated tend to migrate, leaving back elderly, children and only few of working age in the villages (Rigg, 2006). In Northeast Thailand, due to migration, a household's income is mainly earned outside the village, the agricultural workforce grows older, and villages tend to become more consumptive than productive (Rigg & Ritchie, 2002). To reverse this trend, households need to invest in the local economy. Rising food prices in the last years, due to the food price crises, offer new incentives for investments in agriculture, which are necessary for a structural change towards a highly productive agricultural sector (von Braun, 2008). A productive agricultural sector and a vibrant rural non-farm economy offer pathways for rural households to increase their income and to decrease inequality between urban and rural areas (World Bank, 2007). New agricultural opportunities could therefore be an incentive for young people, who tend to be more innovative and less risk-averse than older generations, to stay in the village and to attenuate the aging of the rural workforce (Bryant & Gray, 2005; Hardeweg et al., 2013). Whether structural change in farming will take place depends on the decisions and capacity of private farmers to invest, specialize and enlarge their farms. Further investment possibilities in the village exist in the rural non-farm economy. Investments in small scale enterprises, for example in the agro-industry, services or trade, enable rural households to increase their income with local employment. The investment behaviour of rural households in agriculture and small scale enterprises plays an important role for the future development of the economy in rural villages. If households will increase consumption instead of investing in local income sources and further depend on migrant remittances, villages run the risk of becoming not more than nurseries for migrants. The effect that private investments will have on poverty and inequality thereby depends on the participation of especially poor households in investment opportunities (von Braun, 2008). Investment in

agriculture and small scale enterprises of rural households in Thailand are analysed in the **second essay** (Chapter 3).

The third essay of this dissertation addresses gender questions regarding development opportunities of rural households. Women have an important role in the development process. Gender equality is a core development objective, in its own right, but also as a means to rural development and risk mitigation. As the World Development Report 2012 (World Bank, 2011) points out, the misallocation of women's skills due to, for example, discrimination in education or in the labour market causes economic losses – for the women, their households and also for society. In Thailand, women culturally have an active role in generating income – putting them in a double role of taking care of the household and supporting the family economically (Tantiwiranond, 1997). At the same time control over resources might improve their voice and bargaining power in the household, enabling them to make investment decisions that favour their children and their future well-being (Basu, 2006; Blumberg, 1988). Decisions regarding education are of special importance to rural families as they are already disadvantaged in regard to access to education (UNDP, 2014). While female income has been found to increase education expenditures in the context of the traditional nucleus family (e.g. Kusago & Barham, 2001), it is less clear whether this influence also holds true in extended families comprising migrants. In Northeast Thailand, the effects of migration on family arrangements can be observed, with grandparents taking care of the children's upbringing and making every day expenditure decisions (Funahashi, 1996) These changes can influence learning and education opportunities of children in migrant households negatively (UNDP, 2014). This problem is dealt with in the **third essay** (Chapter 4), which investigates the role of female migrant income on education expenditures in Northeast Thailand.

The fourth essay looks at nutrition in Thailand and Vietnam. Nutrition is one important dimension for long-term development of the rural population in these two countries, particularly with the background of rising food prices. Undernutrition can have long-term effects, as stunting of children is irreversible and will lead to health problems in the future (WHO Expert Committee, 1995). Malnutrition exists despite the large success in poverty reduction; it does not end when an individual crosses the monetary poverty line. Undernutrition in Thailand and Vietnam can also be found above the poverty line. As a second problem, malnutrition also encompasses overweight. With economic development, nutrition changes towards diets rich in fats, the so-called nutrition transition, leading to overweight and obesity with tremendous health effects (e.g. Popki et al.,

2012). The **fourth essay** of this dissertation (Chapter 5) takes up these topics and analyses the link between malnutrition and monetary poverty in Thailand and Vietnam.

1.2 Research objectives and contribution to the literature

The thesis focuses on rural Northeast Thailand. For the paper on nutrition and poverty, a comparison between Thailand and Vietnam is made. In detail, the essays address the following research objectives:

- (1) The **first essay** investigates the effects of rural–urban migration on economic development in Northeast Thailand. It addresses the following research questions:
 - (a) What are the underlying forces that motivate rural households to send some of their members to urban industrial centres for work?
 - (b) What determines the success of such livelihood strategies from the point of view of the rural household and from the point of view of a migrant?
 - (c) To what extent is the migrant’s success of finding quality employment supportive to the welfare of his natal household?

The essay contributes to the literature, as it links the situation of the rural household with the prospects of the migrant in the city. Most empirical studies on migration investigate either the impact on urban development or on the rural areas, since migrant tracking data are scarce. Linking both, insights on the household and on the migrant, enables us to depict a more detailed picture on the effects on migration on the household, conditional on the success of the migrant, and to take interrelations between the household and the migrant into account.

- (2) The **second essay** intends to provide insights on the economic developments of rural villages in Thailand by analysing the decision of households to invest in agriculture, small scale enterprises or to not undertake investments. Detailed research questions are:
 - (a) What factors encourage rural households to invest into different types of productive assets?
 - (b) What are the constraints to such investments?
 - (c) What factors influence the extent of investments in agricultural activities?

The essay contributes to the literature on investments and village development with a direct approach of measuring investment. This brings the opportunity to differentiate between different investment types. Additionally, while most studies are based on cross-sectional data, having panel data available enables us to include lagged variables and therefore to take the long-term nature of investment decisions into account.

- (3) The **third essay** aims at contributing to a better understanding of the role of female migrant income on education expenditures. It concentrates on education expenditures as an important form of human capital investment. The regional focus of the essay is on Thailand. The share of female income has been found in prior studies to positively influence education expenditures in the context of the traditional nucleus family. It is less clear whether this influence also holds true in extended families comprising migrants, since the migrant is impaired in monitoring household expenditures. The essay answers the following research questions:

- (a) Does the share of female local income earned in the village positively influence the share of expenditures spent on education?
- (b) Does the share of female migrant income have the same effect on expenditures for education as the income of female household members?

The essay contributes to the literature, as it links the literature on intra-household bargaining with the literature on the influence of migration on expenditure patterns. It is to my knowledge the first essay that compares the influence of migrant and local female income on education expenditures.

- (4) The general objective of the **fourth essay** is to compare nutrition in rural Thailand and Vietnam. It analyses the link between nutrition and poverty in Thailand and Vietnam and aims to identify further underlying causes. The essay provides insights to what extent the success of monetary poverty reduction in Thailand and Vietnam has translated into improvements to the nutritional situation of the people and especially that of children. Specifically, it addresses the following research questions:

- (a) Is there still an undernutrition problem in Thailand and Vietnam in spite of the progress made in poverty reduction?
- (b) Is overnutrition already a problem in Thailand and Vietnam?
- (c) What are the factors that condition the nutritional status of children and adults in rural areas of the two countries?

- (d) What are the factors that influence nutrition outcomes as households depart from the poverty line?

The essay contributes to the literature on nutrition, as it, first, concentrates on rural areas of emerging economies - a population under risk, which is neglected in research. Second, it takes account of both forms of malnutrition, under- and overnutrition, which has been done only by few studies.

Table 1.1 provides an overview on the essays included in the dissertation including former versions, presentations and publications.

Table 1.1 Overview of essays included in the dissertation

Chapter	Authors/ year	Title	Publications & Presentations
2	M. Amare L. Hohfeld S. Jitsuchon H. Waibel (2012)	Rural-Urban Migration and Employment Quality: A Case Study from Thailand	Published in: <i>Asian Development Review</i> , 29(1), 57-79. Published in: <i>ADB Economics Working Paper Series</i> No. 309, Manila: Asian Development Bank.
3	L. Hohfeld H. Waibel (2012)	Investments of Rural Household in Northeast Thailand and the Future of Small Scale Farming	Published in: <i>Quarterly Journal of International Agriculture</i> , 52(3), 217-236. Hohfeld, L. & Waibel, H. (2012). The Future of Agriculture in Rural Villages in Northeast Thailand. Presented at <i>Tropentag</i> , September 19 – 21 2012, Göttingen
4	L. Hohfeld H. Waibel (2014)	Is Female Education Good for Education of Rural Children? A Panel Data Analysis from Northeast Thailand	Hohfeld, L. & Waibel, H. (2014). Female Wage Employment and Education Expenditures in Northeast Thailand. Presented at <i>PEGnet conference</i> , September 18-19 2014, Lusaka, Zambia. Hohfeld, L. & Waibel, H. (2014). Female Wage Employment and Education Expenditures in Northeast Thailand. Presented at the <i>Doctoral Research Seminar 2014, Research Committee on Development Economics, Verein für Socialpolitik</i> , September 30- October 1 2014, Göttingen.
5	L. Hohfeld H. Waibel (2014)	Poverty and Nutrition: A Case Study of Rural Households in Thailand and Vietnam	Accepted for the <i>ADB Economics Working Paper Series</i> , Manila: Asian Development Bank. Waibel, H. & Hohfeld, L. (2014). Poverty, Vulnerability and Nutrition: The Weak Underbelly of the Asian Poverty Reduction? <i>Background Paper for the ADB Key Indicators 2014 Special Chapter: Addressing Knowledge and Statistical Gaps in Relation to Poverty Reduction, Inequality, and Inclusive Growth</i> . Manila: Asian Development Bank. Presented at the <i>GlobalFood Symposium</i> , April 25- 26 2014, Göttingen.

Note: Contributions of the author of this dissertation are as follows: Data preparation and model estimation and writing for chapter 3 to 5 were done by L. Hohfeld. For these essays, H. Waibel took a supervisory role, made suggestions and revised parts of the essays. For chapter 2, L. Hohfeld prepared the dataset, provided descriptive results, conceptual ideas and revisions. M. Amare provided econometric models, H. Waibel conceptual ideas and revisions, and S. Jitsuchon commented.

1.3 Data

This dissertation is based on a rich three year household panel data set of three provinces in Thailand and three provinces in Vietnam, as well as cross-sectional data from a migrant tracking survey. Both were collected under the DFG FOR 756 project² “Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies” (Hardeweg et al., 2013). The dissertation focuses on Thailand. For the essay on nutrition, data from Vietnam are used additionally.

1.3.1 Household data

The household survey was conducted in 2007, 2008 and 2010³ and covers 4400 households in 440 villages. In Thailand, three provinces in the poor North-eastern region were included, namely Ubon Ratchathani, Buriram and Nakhon Phanom. The sample on Vietnam comprises the provinces Ha Tinh in the Central Coast Region and Dac Lac and Thua Thien Hue in the Central Highlands (for the study area see Figure 1.1).

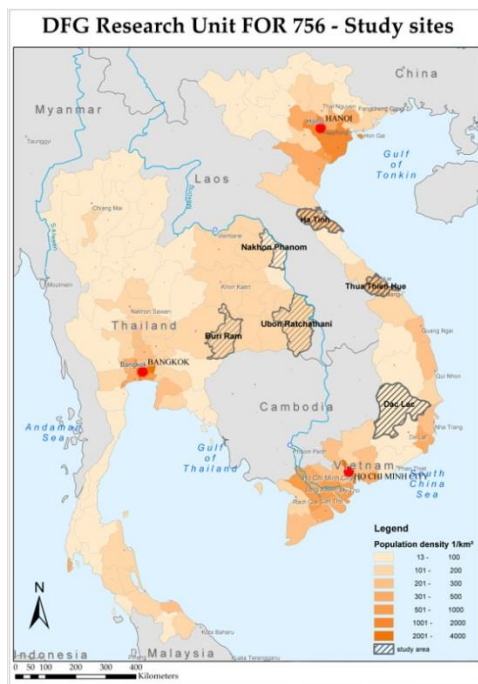


Figure 1.1 Study sites

Source Hardeweg et al., 2013, p. 58.

² www.vulnerability-asia.uni-hannover.de

³ In 2011 an additional panel survey including only one province each country was conducted, in 2013 a panel survey was conducted on the full sample. These waves are not included in this dissertation.

All provinces were purposely selected for a high vulnerability to poverty (for the sampling procedure see Hardeweg et al., 2013). They are predominantly rural, remote, and are characterized by a low per capita income. Most households in this region rely on agriculture and face certain risk factors such as poor infrastructure, especially in irrigation. The sample of 4400 households, representative for the rural areas of the six provinces, was chosen based on a three-stage cluster sampling procedure within the provinces on sub-district, village and household level. The sample excludes urban sub-districts, remaining rural and peri-urban sub-districts were sampled randomly and proportionally to size. In a second stage, two villages per sub-district were selected randomly proportionally to the size of their population. In the third stage, ten households per village were selected using a systematic random sampling procedure with equal probability of selection and implicit stratification by household size.

To reflect heterogeneous agro-ecological conditions and ethnic diversity in Vietnam, additional stratification based on agro-ecological zones was undertaken. Since a random selection proportional to size would have resulted in insufficient sample sizes for some strata, those were oversampled. Primary sampling units in Vietnam were communes, at a second stage two villages per commune were sampled proportionally to population size, at a third stage ten households per village were selected with equal probability of selection.

The survey was conducted as a panel-survey; the same sample of households identified in 2007 was therefore re-interviewed in 2008 and 2010. The attrition rate was low, between 2 % and 3 % per year.

The survey instrument was a comprehensive questionnaire, covering detailed information on household members (including anthropometric data), composition of income and consumption as well as shock experience (for a more detailed description of the questionnaire see Hardeweg et al. (2013)). In 2010, the questionnaire was complemented by an investment module, which collected recall data on farm and business investment activities for the past 5 years. In 2007 and 2010, additional information on a village level was collected using a village head questionnaire comprising questions on infrastructure and population.

Two major tasks in preparing the dataset are the definition of households and the calculation of income and consumption aggregates.

The definition of the household can have tremendous effects on poverty assessment, especially in regions with high mobility of populations, as has been shown by Gödecke (2012) and Schiff

(2008). Also, Hardeweg et al. (2013) point at the necessity of a wide household definition including migrants for vulnerability assessments, as social relations influence risks and coping strategies of a household. At the same time, a wide household definition complicates the calculation of living standards and makes a comparison with other statistical sources difficult (Deaton, 1997).

The DFG FOR 756 survey therefore applies two different household definitions. First, an open definition is used, for which the household head decided whom to include in the household. This brings the advantage of having available detailed information on characteristics and income of migrant household members. To calculate income and consumption aggregates that are comparable also to other statistical sources and that reflect the situation of the household in the village, a definition based on the number of days spent in the village was applied (for a discussion of different household definitions see Gödecke (2012)). Nucleus household members are defined as those household members spending at least 180 days per year in the household. The value of 180 days ranges in the middle of other definitions found in the literature (e.g. 90 days used in LSMS surveys of the World Bank (Grosh & Glewwe, 1995, 1998, 2000) and up to 270 days used in the Thailand Household Economic survey (NSO, 2004)). Having access to these two definitions, the data provide the flexibility to take into account migrant household members and to nevertheless provide measures of the standard of living that are comparable to other statistics.

For measuring standard of living, the dataset includes income as well as consumption aggregates. While many household surveys in the developing world forgo the collection of income data due to time and cost restrictions and use only consumption data for measuring living standards, it is of special importance to also measure income for research on vulnerability to poverty. One major argument for using consumption instead of income data is that consumption is more closely linked to household utility. While household income can be seen as a means to finance income, consumption directly provides utility to the household. Second, when interested in a household's "permanent income or long-term standard of living", as phrased in the LSMS guidebook of the World Bank (McKay, 2000, p. 84), consumption is a better measure, as temporary fluctuations are smoothed out in consumption by saving and borrowing of the household. With this argument, it becomes clear that for vulnerability research the availability of income aggregates is essential, since shocks that lead to income fluctuations and which need to be smoothed by the household are a central matter of interest (Grosh & Glewwe, 2000).

The calculation of income and consumption measures is based on the literature and LSMS guidelines (Deaton & Zaidi, 2002; Grosh & Glewwe, 2000; Grosh & Munoz, 1996; Johnson et al., 1990). Table 1.2 shows all items included in income and consumption aggregates. Variables were converted to 2005 purchasing power parity (PPP)-\$, to make them comparable to international poverty lines. Income and consumption per capita are based on the nucleus household size.

Table 1.2 Income and consumption aggregates

<u>Income aggregate</u>	<u>Consumption aggregate</u>
<u>Factor income (incl. own account production of goods)</u>	<u>Food (purchases & own account production of goods)</u>
<u>Labour income</u>	+ Rice
+ Net income from agriculture (crops & livestock)	+ Other food
+ Net income from collecting, hunting, logging	
+ Income from off-farm employment	
+ Net income from self-employment	
<u>Capital income/ costs</u>	<u>Non Food</u>
+ Capital income from lending & savings	<u>(purchases + & own account production of goods)</u>
+ Indemnity payments received	+ Health
- Cost of loans for productive assets	+ Education
	+ Other non-food (incl. transportation, communication & social obligations)
<u>Assets income/costs</u>	<u>Housing</u>
- Depreciation of productive assets (10% business/farm use, 5% mixed use)	+ Imputed rental value of owner-occupied dwelling (2%)
<u>Land & Housing</u>	<u>Assets income/costs</u>
+ Income from land rent	+ User value of durable consumption goods (10% private use, 5% mixed use)
- Cost of land rent	
+ Imputed rental value of owner-occupied dwelling (2%)	
<u>Non-Factor Income</u>	
<u>Transfers</u>	
+ Remittances from migrant (non-nucleus) household members	
+ Other private transfers	
+ Public transfers	

Source: based on DFG FOR 756 (2014).

The income aggregate consists of factor income and non-factor income. All components are recalled for a one-year period. Factor income is defined as (in-kind or cash) payment for supplying labour, capital or land for a productive activity, but also includes own account production of goods to account for the importance of subsistence production in the sample region (McKay, 2000). Non-factor income is transfer income received without any service or production in return. Income is always net of production costs, and is only included in household income if earned by a

nucleus household member. In detail, factor income includes labour income, capital income, asset income, and income from land and housing. Labour income covers agricultural activities, use of natural resources such as collecting, hunting and logging, wage income from off-farm employment and income from self-employment. For capital income, income (and costs) from lending and savings, i.e. income (or costs) from interest payments, are included. Loans and loan repayments on the contrary represent only transfer payments and do not change the income of the household (McKay, 2000). Assets are considered depending on whether they are for productive or private use. Since productive assets are used over several years, depreciation is included as cost in the income balance (Johnson et al., 1990). Assets are depreciated with 10 % if they are for productive use only and with 5 % if they are used both, productively and privately, as information on the exact share of private or business use is missing.⁴ While consumer durables are generally not included in the household income, the literature (Johnson et al., 1990; McKay, 2000) recommends including depreciation of the owner occupied dwelling, a capital asset, as imputed rent. This leads to two problems. First, the value of the house needs to be estimated or imputed. Second, a value of depreciation needs to be determined, in a way such that this “user value” represents an imputed rent. Households are asked for the value of their house in the questionnaire. Since this question was difficult to answer by the household members due to imperfect housing markets and the rarity of house buying, results were improved using a hedonic housing regression (Deaton & Zaidi, 2002). For this purpose an econometric model was estimated, predicting house values depending on size and quality of the house. The depreciation of this house value assigned as imputed rent is 2 %, which corresponds to the duration of use of the house of 50 years. Transfers include public transfers as well as inter-household private transfers (McKay, 2000), including those from migrants who were away for more than 180 days in the last year and therefore are non-nucleus household members.

The consumption aggregate is calculated in a way as to include all goods and services that contribute to the household’s welfare. Consumption therefore includes food and non-food consumption as well as purchases and own account production. For high frequency purchases, including food purchases and non-food purchases such as electricity, clothes and fuel, a short recall period of a usual month within the last year is chosen (Deaton & Grosh, 2000). For other non-food items (which are non-durable goods) the general recall period of the survey of one year is used. Whether education and health expenditures should be included is ambiguous in the

⁴ Depreciation of productive assets actually is a cost of production and therefore part of the agricultural and self-employment income. For a better overview, we include depreciation as additional category.

literature (Deaton & Zaidi, 2002). Both are expenditures that are lumpy and infrequent, and will only be necessary in certain points of the lifecycle, but nevertheless contribute to the welfare of the household. Following the recommendation of Deaton and Zaidi (2002), we include education expenditures and also health expenditures. For durable goods it is in general not the purchase that contributes to household welfare, it is rather the use of this good over several years (Grosh & Munoz, 1996). Therefore, a value of service is calculated for durable goods, which are defined as goods used for longer than one year and which require a large expenditure in comparison to the household income. Value of service of durable goods is calculated as depreciation of 10 % for goods that are of purely private use, and 5 % for those of mixed, private and business use. A similar approach is used for housing, and a rent equivalent as service value of 2 % of the house value is calculated for owner occupied dwellings. For this task the same approach as in the income aggregate is used.

1.3.2 Migrant data

To account for the mobility of parts of the rural population and to quantify risks and coping capacities connected with migration the household dataset was complemented by a migrant tracking survey in 2010.⁵ Planning of the migrant survey was based on observations of migration patterns in previous waves. In Thailand, the largest share of rural-urban migration is directed towards Bangkok, so that the migrant survey was limited to the Greater Bangkok region. The migrant survey started in 2010 shortly after the household survey, and was implemented by a separate interviewer team in Bangkok. Migrants were identified during the rural household interviews, based on the criteria listed in Table 1.3.

In order to track down as many migrants as possible, a first contact with the migrant was established during the household interview: The household head was asked to call the migrant and inform him or her about the interview. This measure was implemented to verify the contact details of the migrant, but also to increase the trust of the migrant in the interviewer team. Migrant lists, including contact details and basic information on the household, were sent to the interviewer team in Bangkok. In total, 1088 migrants in the Greater Bangkok Region were identified, of which 32 % could not be contacted due to missing or wrong contact information.

⁵ The migrant tracking survey was conducted in both countries, Thailand and Vietnam. Since the dissertation only uses migrant tracking data from Thailand, only these are included in the data description of this chapter.

The Bangkok team made appointments with the migrants and conducted interviews at their place of living or work. Since migrants often keep contact to other migrants from their household or village also in Bangkok, and might be better informed about their location and contact details than the household head in the village, migrant interviewers were equipped with full lists on migrants from the village and encouraged to establish contact via the peers. As expected, refusal for interviews was a larger problem in Bangkok than in the villages, due to mistrust and time restrictions. Additionally, the survey was complicated by political unrest in Bangkok, and had to be interrupted. In total, 643 migrants were interviewed, a rate of 59 % of identified migrants. 9 % of migrants refused the interview.

The survey instrument was a questionnaire on the current living, working and financial situation, migration and working history, remittances sent to and received from the household, social relations in the city and in the village, shocks and risks the migrant faces in the city and future plans. Each migrant can be linked to his household of origin in the household survey.

Table 1.3 Definition of migrants for the migrant tracking survey

The following criteria define a migrant:

- A person who is considered a household member (wider definition) by the respondent of the rural household survey (HH head or his/her representative) and
- currently not living in the household and
- living in Greater Bangkok⁶

Excluded are persons who:

- a) normally stay with the rural HH but currently only visit other HH members in Bangkok or those who left less than a month ago for the first time looking for a job.
- b) anyone living outside the Greater Bangkok area.
- c) any other persons not staying in the rural HH and whose whereabouts are not known to the respondent (e.g. divorced spouses).
- d) persons who went to the temple or became monks
- e) jailed persons

Source: based on DFG FOR 756 (2010).

⁶ This includes the provinces Bangkok, Samut Sakhon, Samut Prakan, Samut Songkhram, Nonthaburi, Nakhon Pathom, Pathum Thani, Ayutthaya, Saraburi, Nakhon Nayok, Chachoengsao and Chonburi.

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2 RURAL–URBAN MIGRATION AND EMPLOYMENT QUALITY: A CASE STUDY FROM THAILAND

This chapter is a modified version of Amare, M., Hohfeld, L., Jitsuchon, S. and Waibel, H. (2012). Rural–Urban Migration and Employment Quality: A Case Study from Thailand. In: Asian Development Review, 29(1), 57-79.

Abstract

This study investigates the effects of rural–urban migration on economic development in Thailand. It draws upon a panel database of 2000 rural households collected from 2008 to 2010 in three provinces from Northeast Thailand and a survey of 650 migrants in the Greater Bangkok area conducted in 2010. The study offers some new findings on migration in Thailand. First, there is evidence that there is a need for better social protection for urban migrants. Second, the study shows that migration offers the benefit of income growth for rural households but is less effective in reducing inequality and relative poverty in rural areas. Generally, migrants are more educated albeit at an overall low education level in the rural areas. The message emerging from this paper is that poor rural households tend to produce poor migrants which could be one of the reasons for the continuous existence of a wide rural–urban divide in welfare. The crucial importance of good quality education for migrants to achieve higher quality employment calls for more investment in education quality in rural areas.

2.1 Introduction

The movement of rural people out of agriculture in order to find jobs in urban centres is a major ingredient of the development process especially in emerging market economies. Thailand is a particularly good example not only because of its long history of rural–urban migration, high rates of economic growth, and good records of poverty reduction, but also because of its experience with economic and political shocks and a still large share of the population living in rural areas. The country has developed social protection policies for the poor, but empirical evidence on their success is still sparse.

Migration has profound consequences for the rural areas, i.e., the migrants' natal villages. For a household in a rural village, temporary out-migration is a labour-diversification-based livelihood strategy, as migrants send remittances to their natal household. For migrants, the rural household remains the nucleus. Mostly, migrants are still members of the rural household regardless of their duration of absence, frequency of home visits, or place of official registration. However, not all migration decisions lead to the expected success. Sometimes migrants end up in so-called "bad employment" including prostitution and child labour. Policy makers tend to accept these negative externalities as an unavoidable by-product of development with the notion that it is still better to be "poor in the city" than "poor in the village".

The aggregate effect of migration can have strong implications for the institutional and social conditions in the village. When the younger and economically more active population moves out of agriculture a decline in production and productivity can result unless structural change and agricultural modernization is facilitated. Most empirical studies on migration investigate either the impact on urban development or on the rural areas (e.g. Brown & Jimenez, 2008; Gödecke & Waibel, 2011; Shen et al., 2010). Hence, there is a need for more empirical evidence of the effects of migration on both the rural village and on the prospects of the migrants in their urban environment.

Both aspects are addressed in this paper by asking the following three questions. First, what are the underlying forces that motivate rural households to send some of their members to urban industrial centres for work? Second, what determines the success of such livelihood strategies from the point of view of the rural household and from the point of view from of a migrant? The third question is to what extent the migrant's success of finding quality employment is supportive to the welfare of her natal household.

The empirical basis of this study is a rural household panel database that includes over 2,000 rural households from three provinces in Northeast Thailand combined with a migrant tracking survey carried out in the Greater Bangkok area. The database is unique as it combines comprehensive household level data and information on migrant household members.

The paper proceeds as follows. In Chapter 2.2, a brief review of the migration literature in the context of economic development is provided. This allows establishing some hypotheses for this study. In Chapter 2.3 the database used for the descriptive and econometric analysis is introduced. Chapter 2.4 describes the methodology including the econometric models, while Chapter 2.5 presents the results of the study including the factors that determine migration and migration success. Chapter 2.6 concludes and identifies remaining gaps.

2.2 Conceptual framework

Quantitative modelling of migration processes date back to Harris and Todaro (1970) who emphasized the wage differential hypothesis. Microeconomic models of migration (e.g. Sjaastad, 1962; Todaro & Maruszko, 1987) consider migration as an investment in human capital. Traveling costs, costs of job search and training, and also psychological costs are included on the cost side. On the benefit side, the expected wage differential as well as nonmarket benefits of migration such as better access to health are considered. In later papers, e.g. Taylor and Fletcher (2007) and Hagen-Zanker (2008), migration is seen as a measure of ex ante risk mitigation and ex post coping, hypothesizing that the risks in rural areas are mostly uncorrelated or negatively correlated with those in urban areas. The net benefits of migration are also influenced by social network variables (Massey, 1990), e.g. interpersonal relationships among as well as between migrants and their natal household. Lucas (2004) in a seminal article has proposed thinking of rural–urban migration in terms of “life learning”. In his models, urban areas are places where migrants can accumulate the skills required by modern production technologies. Thus, he introduces the notions of a skills differentiation with high skills jobs available for people who migrated some time ago and low skills jobs for new arrivals. He also points to the aspect of timing and speed on migration with returns to the migrant’s human capital investment as a major factor.

Models of migration provide a good benchmark for the factors that can determine the success of migration. However, few studies have established the impact of migration on rural households and the impact of the migrant’s employment quality on migration success. In theory, if migration is successful after several decades of migration one should be able to observe a declining gap in

welfare between rural and urban areas. However, as shown in the 2008 World Development Report (World Bank, 2007), this is not the case, and Thailand remains among the countries with a very high rural–urban divide.

Inequality as a result of economic growth of poor countries was first postulated by Kuznets (1955). It has been shown that industrialization and urbanization change the distribution of income in a developing economy. Urbanization through rural–urban migration raises the gap in per capita income between the urban and the rural population as productivity in urban areas grows faster than in rural areas. During the first stages of industrialization, urbanization pursued by the migration process inherently raises inequality. Invariably, this process has implications for poverty. As the population moves from rural to urban areas, a change in aggregate poverty incidence will occur even if respective poverty incidences for rural and urban areas remain constant. Overall poverty is expressed as the shares in population and poverty incidence between rural and urban areas

$$P^P = \frac{N_P}{N} = \frac{N_P^R + N_P^U}{N} = \alpha^R P^R + \alpha^U P^U \quad (2.1)$$

where P^P is the share of the poor in the population N , R stands for the rural population and U for the urban population, P^R and P^U are the shares of the rural/urban population in the total population, while α is the proportion of the poor in these groups.

Consequently, a change in the poverty (dP^P) of a country can be viewed subject to the change in population shares and the changes in the relative rates of poverty and can be decomposed as the change in rural poverty and the change in urban poverty. The reduction in poverty is adjusted by the movement of populations from rural to urban areas and is weighted by the difference in poverty. Kuznets hypothesized that migration will benefit the rural population and eventually close the gap in poverty between urban and rural areas. However, Lipton (1980) has pointed out that rural–urban migration tends to increase inter-household inequality within and between villages. Rodriguez (1998) found that migration increases inequality in the Philippines while Brown and Jimenez (2008) showed that remittances helped to decrease poverty in Fiji and Tonga with little impact on reducing inequality.

Rural–urban linkages have received considerable attention in Thailand and have been explicitly mentioned in the Ninth Development Plan of Thailand. Official data are problematic however. For example in 2000, only some 20% of the population of Thailand resided in urban areas according to

United Nations data (Yap, 2002). The problem was that many migrants residing in urban areas did not change their civil registration and were therefore counted as part of the rural population. Many studies on female labour migration in Thailand focus on the country's sex industry (e.g. Phongpaichit, 1998). Mills (1999) complements this line of research with a study of female migrants working in less visible occupations such as factories and sweatshops in the Bangkok metropolis. To our knowledge, none of the studies on migration in Thailand has explicitly addressed the question of employment quality as a means to assess long-term migrant success from an economic point of view. This paper therefore provides an empirical test for this hypothesis by comparing rural households with migrants and without migrants from three provinces in Thailand.

In the next chapter we describe the data that we used in the analysis of migration and migration success both for the migrant and the rural household.

2.3 Description of the data

We use data from the 2008 and 2010 panel waves of a household survey carried out in the context of the DFG FOR 756 Research Grant project “Vulnerability to Poverty in Thailand and Vietnam” which also includes interviews with the village headmen and a migrant survey in 2010.⁷ Initially, 2200 rural households were selected in a three-stage sampling process. The sample was designed in such a way that it is representative of the target population and would allow drawing conclusions for the vulnerability of rural households in the selected provinces and areas with similar conditions. The sampling procedure consists of a three-stage cluster sampling design with district, subdistrict, and village classifications. The ultimate cluster size of 10 households in a village was chosen based on organizational aspects of the survey. The primary sampling unit was the subdistrict, assuming homogeneity within a province, which is quite reasonable for the North-eastern region of Thailand especially with regards to the natural resource conditions.

The survey was conducted in three provinces, namely Buriram, Nakhon Phanom, and Ubon Ratchathani. All three provinces belong to the Northeastern region, still considered the “poverty pocket” of Thailand (Healy & Jitsuchon, 2007). In all three provinces, income from agriculture and natural resources is less than from other income sources including nonfarm wage employment,

⁷ See Chapter 1.3.1

self-employment and remittances (Hardeweg et al., 2013). This suggests that migration is an important component of the livelihood strategies of these households.

The migrant survey applied in this study followed the concept of tracking surveys such as those carried out in the Nang Rong project in Thailand (Rindfuss et al., 2004) and in World Bank health studies in Tanzania (Beegle et al., 2008). Based on national statistics (NSO, 2008) over 80 % of migration from the Northeastern region of Thailand is directed to Bangkok or its surrounding areas. This general pattern of migration was also confirmed by the results of the second panel in 2008 of the rural household survey in the three provinces. Hence, in our migrant database, the survey was limited to the Greater Bangkok metropolitan area including the surrounding provinces of Samut Sakhon, Samut Prakan, Samut Songkhram, Nonthaburi, Nakhon Pathom, Pathum Thani, Ayutthaya, Saraburi, Nakhon Nayok, Chachoengsao, and Chonburi. For the tracking survey, migrants were already identified during the parallel household interviews based on the information provided by the respondent. The survey took place during the height of a political crisis, which nearly paralyzed parts of Thailand’s capital city during May to July 2010. This severely constrained the implementation of the survey and therefore restricted the number of interviews to 643 out of nearly 1100 migrants in the database.

2.4 Methodology

To address the research objectives, we have developed two models. We use a difference-in-difference matching estimator to examine the drivers of rural–urban migration and estimate the impact of migration on rural household wellbeing. Furthermore, we establish the relationship between household and migrant characteristics and finding better employment in urban areas. Finally, we quantify the impact of finding better employment on rural household well-being. This triangulation method will help to articulate who benefits from migration and clarify the implication for inequality.

2.4.1 Empirical model 1: Determinants of migration and its impact on the well-being of rural households

In the first model we investigate the factors that influence the decision of a rural household in rural Thailand to send one or more members to the Greater Bangkok area for employment. To choose the variables to be included in the model, one can refer to the review of the micro economic migration theories as summarized in Chapter 2.2. In the migration literature, the

decision of a rural household to send one or several of its members to an urban centre for employment is driven by the expectation of increasing welfare for the entire household. The literature summarizes that demographic characteristics (household level human capital and demographic variables), economic indicators (wealth and income), location (access to information), and risk diversification are the main drivers of migration.

One problem of assessing the impact of migration on the well-being of rural households is a potential selection bias, which stems from the fact that we cannot measure the well-being of households with migrants in comparison to their situation without a migrant. In complete experimental designs, the outcome of non-migrant households can serve as a good counterfactual. However, if migrant households' characteristics differ from those of non-migrant households, the comparison of the outcome between the two groups will be biased. One way to minimize this problem is to use a difference-in-difference propensity score matching estimator. The estimator constructs a plausible comparison group by matching migrant households to similar non-migrant households using a large set of control variables.

Our main interest to assess the average treatment effect (migration) on the treated (*ATT*), i.e., the rural households with migrants, which can be written as:

$$ATT = E(P_1 - P_0 | D = 1) = E(P_1 | D = 1) - E(P_0 | D = 1) \quad (2.2)$$

where D is the indicator variable equal to 1 if the household receives treatment and 0 otherwise. P_1 and P_0 are the outcome variables for treated and untreated outcomes. Since we cannot observe both $E(P_1 | D=1)$ and $E(P_0 | D=1)$ at the same time in the data, we employ the propensity score matching method. Here, a plausible comparison group is established by matching migrant households to similar non-migrant households using a set of covariates comparing the outcomes of the migration decisions across these two groups before and after migration. The propensity of migration decision is presented as:

$$MD_i^* = F(HHC_{2008}, IF, DD, WI_{2008}, Shocks) \quad \text{with} \quad (2.3)$$

$$MD_i = \begin{cases} 1 & \text{if } MD_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

The propensity score matching presented in matches migrant and non-migrant households based on observable factors used in the analysis. These can be divided into five categories: household background variables (HHC_{2008}) at 2008, infrastructure facilities (IF), district dummies (DD), wealth

indicators (WI_{2008}) 2008, and shock experience (*Shocks*). We expect households with more adults and educated members to have a higher probability of sending a household member away, while it is also argued that better-off households will have a lower propensity to send a member to the urban labour market. Migration decisions are also affected by existing institutional and structural labour market conditions and geographic disparities in economic opportunities and services (Bilsborrow, McDevitt, Kossoudji, & Fuller, 1987). However, the relationship between migration and rural service improvements is ambiguous. Improving access to input and output markets, for example, has the potential to increase agricultural productivity, and might therefore reduce the household’s dependency on income from migration, while new economic and other opportunities may smooth rural–urban information flow and facilitate migration to urban areas (Wouterse, 2010).

The primary assumption underlying matching estimators is the conditional independence assumption (CIA). This assumption states that, given a set of observable characteristics X , non-migrant households have the same mean outcomes as migrant households would have if they had not been engaged in migration as well as those of a carefully defined group of individuals unaffected by migration after conditioning on the vector X (Heckman & Navarro-Lozano, 2004; Rosenbaum & Rubin, 1983).

If both groups differ on unobserved variables which affect simultaneously the assignment to treatment and the outcome variable a “hidden bias” might arise. However, due to the panel nature of our data the matching difference-in-difference estimators can be assumed to be robust (Smith & Todd, 2005). Thus, equation (2.2) can be improved through propensity score matching, by subtracting the outcome of interest based on the baseline dataset between migrant households and the matched comparison group of non-migrant households. This measure estimates the difference in income between migrants and non-migrants in 2008, minus the difference in their income in 2010. We rewrite equation (2.2) as:

$$ATT = [Y_{2010}^1 - Y_{2008}^1 | X_{2008}, D = 1] - [Y_{2010}^0 - Y_{2008}^0 | X_{2010}, D = 0] \quad (2.4)$$

where ATT denotes the average treatment effect and the subscripts 2008 and 2010 denote baseline income 2008 and income 2010 respectively. The propensity score is estimated by a simple binary choice model. Based on the propensity scoring results, the sample is split into equally spaced intervals of the propensity score. Treated and control households are matched on the basis of their scores in order to identify for each household the closest propensity score for both treated and control using the kernel matching and neighbourhood methods. A household is

considered a treatment household if it has at least one member who migrated to another province for at least one month for employment or educational purposes in 2010. A household is considered a comparison group household if it has no migrant member for education or employment outside the province in 2010.

2.4.2 Empirical model 2: Quality of migrant employment and its impact

Another main issue that this paper attempts to address is how rural–urban migration opens up more opportunities for the rural population to get into more productive employment opportunities. In this paper, we specifically attempt to investigate determinants of finding better employment opportunities in urban areas conditional on migration decision. In this framework, endogeneity is the main concern since unobservable heterogeneities may be correlated with each other and affect both the migration decision and obtaining a better quality job. In this case, the use of standard logit or probit models yields biased and inconsistent estimates (Cameron & Trivedi, 2010). The probit estimate of the maximum likelihood estimators may also be inconsistent if one of the regressors is endogenous. To correct for endogeneity, an instrumental variable (IV) probit for a subjective indicator of quality employment and two-step sequential estimates using an index of quality employment in urban areas are used in this study. Both models define a residual for the equation of the employment quality model and use the IV estimator based on the originality of instruments and this residual. Following Cameron and Trivedi (2010), we consider the following linear model, where the first-stage (migration decision) equation is specified as

$$MD_i = \beta + \alpha HHC_{i2008} + \delta IF_{i2010} + \lambda DD + \lambda WI_{i2008} + \mu Shocks_{i2010} + \varepsilon_i \quad (2.5)$$

The second-stage equation (for quality employment determinants) is specified as:

$$QIE_i = \eta + \kappa MD_i + \pi MIC_{i2010} + \theta HCC_{i2008} + \rho WI_{i2008} + \sigma Shocks_{i2010} + v_i \quad (2.6)$$

where QIE is the outcome indicator of quality employment of a migrant, MIC_i presents migrant characteristics such as age and education, and IF denotes infrastructure facilities (access to public services, market, health, and telecommunication).

The infrastructure facilities are used as IVs that can be excluded from equation (2.5) as they do not directly affect the quality employment indicator. Identification requires the assumption that (ε_i, v_i) are jointly normally distributed. To assess the impact of migration on quality employment, we run the job outcomes equation (2.6) of a migrant conditioning on the migration decision

equation (2.5) which serves as a source of identifying instruments with a number of variables on migrant characteristics. Other variables are defined as before.

While developing a measure for quality employment is a complex issue, one can start with using proxies. In a first approximation, we considered the migrant's subjective assessment regarding the improvement in her job. The migrant was asked if working conditions improved or not (including getting worse) since she changed her job. Here, we consider two categories, 0 if the conditions did not improve (or got worse) and 1 if they did.

Second, we construct a simple index that lists a variety of indicators that describe employment quality. For each parameter, a value of 1 was assigned if the response was positive and 0 otherwise. Eight indicators were identified as follows: (1) general improvement of the migrant's working situation since the last job, (2) living conditions improved since the departure from the village, (3) migrant feels better off than in the previous year, (4) migrant has a written contract of employment, (5) migrant reports a stable income, (6) migrant's income is above average, (7) migrant has accumulated savings, and (8) migrant has one or more insurance contracts.

2.5 Results and discussion

In the following, the results of our analysis using the rural household panel database and the corresponding migrant survey are presented. As a first step, a descriptive analysis from the 2010 migrant survey is presented. In the second part of the chapter, the econometric results are discussed.

2.5.1 Descriptive results on various aspects of migration

The selected descriptive statistics in this chapter illustrate important characteristics of the migrants and the migration process that can support some of the underlying hypotheses of the study and further qualify variables for the later modelling exercise. Summary statistics comparing migrant and non-migrant households are presented in Table 2.1. Some important variables which are used in the model estimates in the later chapter show statistically significant differences in mean values. Migrant households have more educated household members. This supports the notion of human capital drain from rural to urban areas. Income from remittances (in 2008) was higher for households engaged in migration than for households that did not engage in migration in 2010. This may indicate that remittance income motivates households to participate in

migration insistently. Total income (in terms of PPP\$ in 2010) is significantly higher for migrants compared to non-migrant households. Health shocks occur more frequently in non-migrant households, which may suggest that household members stay behind because of caregiving for those with ill health.

Table 2.1 Summary statistics of households by migration status

Variable Description	Unit	Migrant Households	Non-Migrant Households	Difference (Significance)
Household size	No.	3.95	4.13	ns
Female headed	%	0.28	0.26	ns
Household head age	years	53.11	54.48	ns
Mean age of the household	years	36.26	37.48	ns
Household head schooling	years	4.68	5.34	**
Households members below primary school	No.	1.70	1.61	ns
Households members who completed primary school	No.	2.66	2.11	**
Households members who completed secondary school	No.	1.13	0.67	***
Households members who completed above secondary school	No.	0.29	0.17	***
Dependency ratio		1.67	1.61	ns
Land per capita	ha	0.60	0.57	ns
Households who experienced demographic shocks	%	0.21	0.20	ns
Households who experienced health shocks	%	0.35	0.39	*
Households who experienced agricultural shocks	%	0.48	0.46	ns
Households who experienced economic shocks	%	0.31	0.28	ns
Total income per capita in 2010	\$ PPP	161.41	123.26	***
Time to reach the hospital	minutes	21.55	20.41	ns
Time to reach the market	minutes	20.13	18.34	ns
Distance to other public infrastructure	minutes	14.2	13.8	ns

Note: Household demographics, income, assets, and remittances are from 2008 unless otherwise specified.

Source: Own calculations based on household survey 2008 and 2010.

For describing the migration process, we asked the migrants their main reasons for migrating (Table 2.2). While it is recognized that the decision to migrate is not necessarily an independent decision of the migrant herself, the answer categories provide some insight for the push and pull factors of migration. As expected, the most frequent reason was employment, which may also be a part of the other remaining categories of answers. Quite obviously, pull factors are dominant.

Table 2.2 Why do people migrate?

Reasons for migration (N=643)	Percent
Job opportunity	46.81
Follow family	17.88
Lack of money/ food/ debt	12.29
Family/ friend wanted me to go	11.35
Education	11.35
Others	0.31
Total	100.00

Source: Own calculations based on migrant survey 2010.

Table 2.3 shows the earnings per day of migrants with wage employment (which is the majority). Almost 70 % earn less than 300 Baht (around \$ 8) and only about 2 % of the migrants would earn around \$ 20 per day, which would roughly correspond with the level of the new Asian middle class. Around 20 % earn less than the minimum wage for Bangkok.

Table 2.3 Daily wage income of migrants

Daily wage income (THB)	Percent
<200	19.4
201-300	48.8
301-400	16.0
401-600	11.1
601-800	2.5
>800	2.3
Median of wage income	264.29
Mean wage income	350.45
Minimum wage, Bangkok area, 2010	206

Source: Own calculations based on migrant survey 2010.

Table 2.4 presents the results regarding the employment quality proxy and the employment quality index. It shows that over 77 % of the migrants judged that their working conditions had improved since their last job. Looking at the index, migrants at first glance seem to have improved their conditions since they left their village. However, the picture is bleaker when looking at some indicators of social protection. For example, almost 70 % of migrants do not have any written work contract and only less than one-fourth have an unlimited written contract. Also, only 21 % have a private insurance contract in addition to the government provided health schemes.

Table 2.4 Employment quality proxy and employment quality index: Selected indicators for migrants' working conditions

Number	Indicator	Percent
Employment Quality Proxy		
I.	Working conditions improved since last job	80
Employment Quality Index		
I.	Working conditions improved since last job	80
II.	Living conditions improved since leaving the rural area	67
III.	Feels better off than last year	59
IV.	Written and unlimited contract	24
V.	Migrant reports stable income	60
VI.	Income above mean	40
VII.	Have savings	80
VIII.	Private insurance contract	21

Source: Own calculations based on migrant survey 2010.

Table 2.5 presents the mean and standard deviation of the variables used in the models for assessing employment quality of migrants in Bangkok.

Table 2.5 Definition and summary statistics of the variables used in the migrant quality employment model

Variable description	Unit	Mean	Std. Dev.
<i>Migrant characteristics</i>			
Age of migrant	years	31.03	8.73
Hours working per day	hours	8.91	2.77
Months stayed in current job	months	53.02	62.56
Government support	yes = 1	0.21	0.41
Insurance	yes = 1	0.59	0.49
Owning land	yes = 1	0.80	0.40
Years of schooling of migrant	years	9.19	3.51
Female migrants	female= 1	0.54	0.50
Daily wage income	\$ PPP	16.50	23.77
Debt of migrant	yes = 1	0.40	0.49
<i>Household characteristics</i>			
Households experienced agricultural shock	yes = 1	0.57	0.66
Households experienced economic shock	yes = 1	0.30	0.46
Household head schooling years	years	4.40	2.42
Household size	persons	4.01	1.91
Mean age of household members	years	33.25	7.92
Income per capita per month 2008	\$ PPP	140.10	249.20
Land per capita	ha	0.54	0.68
Wealth per capita in 2008	\$ PPP	5899.11	891

Source: Own calculations based on household survey 2008 and 2010.

2.5.2 Econometric results

To better understand the factors behind rural households' decision to send away one or more of its household members for employment in the Greater Bangkok area and to assess the impact of that migration decision on the welfare of the rural households, a counterfactual group using propensity score matching had to be established as described in Chapter 2.4. To construct the propensity score of the migrant households, we use a broad set of covariates, including household characteristics, economic indicators, and infrastructure facilities.

Table 2.6 shows the results of the probit estimates. The overall results are robust and most coefficients show the expected signs. Since we use panel data and a rich set of covariates we consider the endogeneity problem to be insignificant. The model confirms some of the hypotheses that were derived from theory. Foremost, the education variables show that if a household has better educated members, there is a higher probability of migration. On the other hand, households with a low dependency ratio are less likely to engage in migration. This confirms the typical age pyramid found for rural households in the three provinces with a gap in the age group comprising those 20 to 35 years old (Hardeweg et al., 2013). The household income variable *log total income* is significant and negative, which suggests that one of the motivating factors for migration is poverty. Community variables such as the time needed to reach district or provincial infrastructures are included to assess the push factors that can motivate migration. Two infrastructure variables are negative and significant, one is positive. For example, access to markets and other infrastructures is negative, while access to health care (hospital) is positive. This may indicate that, on one hand, remoteness is not a push factor for migration as such households may have less incentives to leave, while on the other, the prospects of better health care in urban areas could be a pull factor for migration.

Table 2.6 Determinants of the migration decision (probit estimates)

Variables	Coef.	Std. Err.
Female headed	0.09	(0.07)
No. of HH mem who completed primary school	0.14***	(0.01)
No. of HH mem who completed secondary school	0.05***	(0.00)
No. of HH mem with above secondary education	0.09***	(0.02)
Mean age of the household	-0.30***	(0.03)
Household head schooling	0.02	(0.04)
Dependency ratio	-0.09***	(0.03)
Income per capita (log)	-0.05***	(0.02)
Income from remittances	0.28***	(0.08)
Time to reach the hospital	0.13**	(0.06)
Time to reach the market	-0.23*	(0.13)
Distance to other public infrastructure (log)	-0.27***	(0.09)
Ubon province	0.09	(0.10)
Buriram province	-0.05*	(0.03)
Land per capita	0.03	(0.04)
Wealth per capita (log)	-0.01	(0.08)
Household experienced demographic shock	-0.15**	(0.06)
Household experienced health shock	-0.02	(0.06)
Household experienced agricultural shock	0.04	(0.07)
cons	-0.38	(0.61)
LR chi2(24)	501.58	
Log likelihood	-1178.54	
R ²	0.18	
N	2096	

Note: Household demographics, income, asset and remittance are from 2008 unless otherwise specified
 ***, **, * significant at the 1% level, 5% level and 10% level.

Source: Own calculations based on household survey 2008 and 2010.

The migration model suggests that generally it is the poorer households who tend to have migrants. However, migrants tend to have better formal education, which is consistent with the results of Cherdchuchai and Otsuka (2006).

The next question is whether migrants are successful in urban settings and will be able to support their native household.

2.5.3 Effects of migration on rural household well-being

As discussed in Chapter 2.2, from the point of view of the rural household, migration is a livelihood strategy that uses labour diversification as means to increase household welfare, as an ex post coping strategy to respond to shocks as well as an ex ante measure to insure against risk. The next step therefore is to empirically assess the impact of a migration decision on future household income. As explained in the methodology chapter, the estimation of such impact is problematic in the absence of a perfect experimental design, i.e., a “double difference” dataset. While we have a dataset from 2008 and 2010 that allows distinguishing between households with

and without migrants in 2008 and their household income in 2010, mean separation tests suffer from the non-comparability of the two subsamples and the possibility that other covariates have an influence. To overcome these problems to the extent possible, we use difference-in-difference matching estimates on the basis of their scores for kernel and neighbourhood methods comparing households with and without migrants (Table 2.7). Based on our quality of employment index, we compare households with successful migrants versus those with less successful migrants.

Table 2.7 shows that on average migration has a significant impact on rural household income growth. The estimated treatment effect for two propensity score methods are 17% for the kernel method and 22 % for the neighbourhood method. Comparing provinces, we find that the impact of migration is more pronounced in Ubon and Buriram, while there is no significant difference in Nakhon Phanom, which is the poorest among the three provinces.

Table 2.7 Impact of migration on rural household income growth for two propensity score matching methods

Income growth (%)	PPS method	With migrant	Without migrant	Difference
All provinces	Kernel	1.28	1.10	0.17*** (2.87)
All provinces	Neighbourhood	1.28	1.06	0.22*** (2.88)
Ubon province	Kernel	1.90	1.43	0.47** (2.15)
Buriram province	Kernel	1.02	0.67	0.35* (1.93)
Nakhon Phanom province	Kernel	0.61	0.26	0.35 (1.52)

Note: ***, **, * significant at the 1% level, 5% level and 10% level
Absolute value of t-statistics in the parentheses, bootstrapped standard errors using 1000 replications of the sample.

Source: Own calculations based on household survey 2008 and 2010 and migrant survey 2010.

Taking income growth as criteria, migration on average is a beneficial livelihood strategy for rural households. However, as we can observe from the descriptive analysis above, not all migrants will be engaged in employment activities that enable them to contribute to the well-being of their natal households. Therefore the next question is to assess the impact of a migrant's employment quality on income growth of her rural household.

2.5.4 Determinants of employment quality

In addressing the question of employment quality we first identify the factors that are responsible for a migrant's employment quality. We have used two indicators to describe employment quality—first, the migrant's subjective assessment on the change of her working conditions as a proxy for employment quality; and second, an employment quality index based on the eight criteria described above.

The first column in Table 2.8 shows the results of the model for the employment quality proxy, while the second column presents the results for the model for the employment quality index. The first model is an IV probit model. The dependent variable takes the value 1 if the migrant perceives her condition to have improved and 0 otherwise. The second model is a two-stage sequential estimation for the index of quality of employment of migrants. In the first stage, the migration model is estimated and the predicted values for migration are used in the second stage. In Table 8 only the second stage estimates are presented.

For the IV probit model, we can show that the following migrant characteristics significantly increase the chances for better quality employment conditional on migration: the level of migrant's education, if they have a job with longer working hours per day, and if they received government support. Indebtedness, meanwhile, negatively influences employment quality. Also, characteristics of the natal household observed in 2008 affect the chances of a migrant for better quality employment. Households with relatively higher income have higher odds of migrants finding better employment, while economic shocks have the opposite effect. However, a gender effect could not be detected. The significant positive coefficients of the two provincial dummies suggest that there are regional differences in the probability of finding quality employment.

The model results suggest that migration in 2008, which was the year of the financial and economic crisis, nevertheless was still a good strategy for some households, as migrants were able to find quality employment. This might suggest that the crisis was less severe than initially expected, and that government support might have absorbed some of the negative effects of the crisis.

For the two-step sequential estimate model using the employment index as dependent variable (second column in Table 2.8), the results of the probit model are largely confirmed except for a few variables. Overall, one could say that if a rural household has a migrant, there is a chance that he will move up the social ladder based on the criteria chosen for quality of employment. However, one important additional variable in this model is the wealth status of the rural household, which is significant and positive. This reinforces the conclusion that relatively better rural households make better migrants, which might be one possible explanation for the Kuznets paradox of rising inequality in the rural areas described in Chapter 2.2.

Table 2.8 Results of the employment quality models

Variables	IV probit		IV two-stage	
	IV probit model		Two-stage estimation model	
Migration	3.451**	(1.54)	0.192***	(0.09)
<i>Migrant characteristics</i>				
Age of migrant (years)	-0.006	(0.01)	0.008	(0.01)
Owning land dummy (yes/no)	-0.247	(0.18)	-0.177	(0.20)
Hours working per day	0.055**	(0.03)	0.076***	(0.03)
Months stayed in current job	-0.001	(0.00)	0.006***	(0.00)
Years of schooling of migrant	0.046*	(0.02)	0.114***	(0.02)
Female migrant (yes/no)	0.047	(0.11)	-0.071	(0.13)
Government support (yes/no)	0.258*	(0.15)	0.741***	(0.13)
Debt of migrant (yes/no)	-0.276**	(0.12)	0.033	(0.14)
Average of years of schooling of household members	-0.020	(0.02)	-0.120	(0.22)
<i>Household characteristics</i>				
Household size	-0.014	(0.09)	-0.19	(0.67)
Total income per capita per month in 2008	0.133***	(0.05)	0.082**	(0.10)
Land per capita	0.018	(0.07)	0.021	(0.23)
Log wealth per capita in 2008	0.029	(0.08)	0.190***	(0.07)
Households experienced agricultural shock	0.132	(0.22)	0.208	(0.39)
Households experienced economic shock	-0.321*	(0.38)	-0.818*	(0.48)
Ubon province	0.342**	(0.17)	-0.031	(0.20)
Buriram province	0.266*	(0.16)	-0.028	(0.19)
cons	-3.918***	(1.46)	0.264	(1.35)
rho	-0.669***	(0.24)		
sigma	0.174***	(0.02)		
N	545		545	
Wald chi2	72.96			
Log pseudo likelihood	-77.80			
R ²	0.18		0.21	
Test of endogeneity			4.45**	

Note: Household demographics, income, asset and remittance are from 2008 unless otherwise specified. ***, **, * significant at the 1% level, 5% level and 10% level. Absolute value of standard errors in parentheses.

Source: Own calculations based on household survey 2008 and 2010 and migrant survey 2010.

2.5.5 Impact of quality employment on rural household well-being⁸

The final question of whether migrant success measured in terms of quality employment and good living conditions can further augment the positive income effect from migration is answered in Table 2.9. The estimated differential gain in income growth of households with migrants with quality employment and those with migrants without quality employment is obtained using a

⁸ In this chapter, we first estimated the determinants of finding better employment opportunities in urban areas conditional on migration. Before examining the impact of finding employment opportunity on the well-being of the household, we checked whether tracked migrants were not systematically different from non-tracked migrants using household characteristics. The results showed that there was no systematic difference between them. This supports the robustness of our impact estimation.

two-stage difference-in-difference propensity score matching model. We introduce a threshold for index values of 4 and above from our employment quality index to obtain a binomial dependent variable. In the first stage, we use a probit model to predict the probability of quality employment. The main purpose of the propensity score estimation is to balance the observed distribution of covariates across the two groups of migrant households. We check the appropriateness of the matching procedure, i.e. whether the matched comparison group can be considered a plausible counterfactual. We have conducted several types of balancing tests, including a test for standardized differences, a test for equality of means before and after matching, and common support graphs to evaluate whether the assumptions are valid for our dataset. All results were found satisfactory.

Both the neighbourhood and kernel estimates of the average income growth impact are presented in Table 2.9. The results presented show a statistically significant impact of employment quality of migrants on household income per capita growth between 2008 and 2010. Households with migrants that have better quality employment have higher income growth than households with migrants without quality employment—by 40% under the kernel method and 46% under the neighbourhood method.

Table 2.9 Impact of quality employment on rural household income growth using two propensity score matching methods

Outcome variable (PPS method)	PPS method	Migrants with quality employment	Migrants without quality employment	Difference
Average income	Kernel	1.54	1.13	0.40*** (2.47)
Average income	Neighbourhood	1.51	1.06	0.46** (2.08)

Note: Absolute value of t-statistic in parentheses, bootstrapped standard errors using 1000 replications of the sample ***, **, * significant at the 1% level, 5% level and 10% level.

Source: Own calculations based on household survey 2008 and 2010 and migrant survey 2010.

2.6 Conclusions and policy recommendations

This study presents empirical evidence on the effects of rural–urban migration for economic development in Thailand using a panel database of some 2,000 rural households in three provinces from Northeast Thailand and a migrant tracking survey in the Greater Bangkok area conducted in 2010.

The data were analysed by means of selected descriptive statistics from the migrant survey and two econometric models. The descriptive statistics provide some information on the reasons for migration and their living and employment conditions. A probit model was developed to help

identify the factors that make rural households in Thailand decide in favour of or against the migration of one or more of their household members. We also built a model that specifically looks at the quality of employment of migrants, identifying the factors behind a migrant's relative success in terms of employment quality and living conditions. To achieve this objective, we have defined two different variables—a binary variable that measures short-term improvements in migrant conditions over their previous employment and an employment quality index consisting of eight indicators. Finally, a difference-in-difference treatment effects model with a propensity score matching estimator was used to assess the income effect of migration and migration success on the welfare of rural households.

Summarizing the results of this study, a number of interesting points are found that can improve our understanding on the role of migration for development:

- (i) The decision of a rural household in Northeast Thailand to send one or more members for work or education to the Bangkok metropolitan area is strongly related to household characteristics. Generally, it is rural households with lower resource endowments that send mostly younger family members away for work in the Greater Bangkok area. Also, there seem to be strong push factors of migration embedded in poor access to social and physical infrastructure at district or provincial levels. Most importantly and consistent with previous studies, education is an important factor. Clearly, it is the more educated people who migrate, though this must be judged against the overall low quality of education among most of the rural population in Thailand.
- (ii) Employment quality and relative improvement in migrants' conditions are affected by both characteristics of the migrant and of the native household. Once again, education of the migrant along with economic conditions of the rural household is decisive. The two models set up to explain migration success rather consistently show that it is in the better rural households with the relatively better educated migrants where migrants' chances of obtaining better quality employment are higher.
- (iii) In general, migration is positive for the well-being of the rural household. The income of rural households with migrants grows faster than that of households without migrants. We find significant average treatment effects of migration on the growth of per capita income of the rural household ranging from 17% to 22%. Disaggregating the results by province reveals that for the poorest province, the effect of migration is insignificant.
- (iv) Migrant success also means stronger positive welfare effects for natal rural households. The impact on income growth between 2008 and 2010 was 40% higher if the migrant had

been above average in terms of an index that includes eight indicators of employment quality and living circumstances in the urban environment.

- (v) The information obtained from the migrant survey also provides some evidence that there is a need to review social protection policies for urban migrants. As most migrants do not have written employment contracts, legal protection is low. Also, since only a small proportion of the migrants have insurance contracts, health service is still an issue as it is not always clear to what the extent they are covered by the government schemes given that they are often registered in their natal village.

The study prompts some conclusions that might be useful for policy design and implementation. Most but not all rural households in Northeast Thailand do have migrant members. There is a certain profile that one can attribute to migrant households. They tend to be the ones who rely on remittances and therefore, are not likely to see much future in developing agricultural sources of livelihood. They tend to send the more educated household members away, though this must be seen against the background of generally poor quality education in the rural areas. Among households with migrants, the better ones tend to have more successful migrants, such that migration ultimately has a tendency to increase inequality. In fact, this may provide some explanation for why the decline of poverty in some rural areas is unequal within the rural areas and overall much slower in rural than in urban areas (Warr, 2001). In other words, migration seems to do little to narrow the urban–rural divide. The fact that the impact among the three provinces differs, with the poorest province not significantly gaining, underlines this fact. Additional geographic or administrative differentiation might further sharpen this picture.

In terms of policy recommendations, two aspects seem to emerge from these results. First, the Thai government should pay more attention to education quality in the rural areas. Based on anecdotal evidence, the current scheme of adult education, which is popular among the poor since eventually everyone can get a high school degree (M-6 level), raises some doubts regarding its quality. The second recommendation runs along the same lines as the first one. On paper, the Thai government may have introduced health insurance, pension schemes, allowances, etc., but the question is to what extent these are really implemented. For example, if a person is not formally employed (e.g., in a household or a small or medium-sized enterprise) and not backed by a legally binding written contract, then social protection schemes may not be as effective as intended.

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3 INVESTMENTS OF RURAL HOUSEHOLDS IN NORTHEAST THAILAND AND THE FUTURE OF SMALL SCALE FARMING

This chapter is a modified version of Hohfeld, L. & Waibel, H. (2012). Investments of Rural Household in Northeast Thailand and the Future of Small Scale Farming. In: Quarterly Journal of International Agriculture, 52(3), 217-236.

Abstract

This paper analyses investments of some 2000 farm households in rural villages in three provinces of Northeast Thailand. We use a multinomial logit model to analyse the determinants of different types of investments in agriculture as well as small scale enterprises and a hurdle model to investigate the intensity of investments in agriculture. Results show that only 30 % of rural households undertook investments and most investments made are small. Only households with larger land sizes tend to invest and wealthier households are more likely to invest larger amounts. Female headed households, those with older household heads as well as households in remote areas invest less. Access to finance increases the probability of investing in small scale enterprises, but does not influence agricultural investments. Households with larger investments in agriculture tend to not invest in non-farm activities. The paper demonstrates implications for rural development and agricultural policy in Thailand and other Asian emerging market economies.

3.1 Introduction

A major downside to the impressive economic growth of many emerging market economies in Asia is the growing income gap between rural and urban areas. For a long time, development policy has been geared towards rapid industrialization, encouraging the transfer of cheap rural labour to urban industrial centres (Puntasen & Preedasak, 1998) and less attention was given to development in rural areas. As a result, rural households have paid less attention to agriculture and instead have diversified out of agriculture through temporary and seasonal migration of younger household members. Hayami (2007a) has pointed at the possible negative consequences of this process on agricultural productivity growth and food prices. Furthermore, in Thailand, the neglect of the rural class has resulted in social and political conflicts as demonstrated by the so-called “Red Shirt crisis” in 2010 (Siamwalla & Jitsuchon, 2012).

The continuous diversification out of agriculture by small scale farmers in Northeast Thailand poses a development challenge. In many cases, migration of household members does not automatically lead to prosperity of their natal households in the village. Migrant household members are often in low quality and vulnerable employment conditions with little social protection (Amare et al., 2012). Therefore, rural households hold on to their land as an ex-ante coping strategy (Hayami, 2007a) and as a result, structural change in agriculture is slow and the development of larger and more efficient farms is impaired (Leturque & Wiggins, 2011; Poapongsakorn, 2006). This can lead to a low supply response of small scale farmers even with significantly higher output prices during the 2008 food price hike as shown in a case study of Völker et al. (2012). Hence, the conditions in the rural villages in Thailand appear not to be favourable for investment. However, so far little empirical evidence exists on the extent of small scale farmers’ investments in productive assets⁹ and the determinants of such investments.

Past studies that looked at agricultural investments in developing countries focus on specific investments, e.g. wells (Hayes et al., 1997), livestock (Rosenzweig & Wolpin, 1993), or fruit trees (Huang et al., 2009). Other studies concentrate on investments in certain agricultural sectors such as the dairy sector (Tubetov et al., 2012). Also most of past studies use cross section data, which limits the conclusions with regards to longer term development impacts. This paper contributes to the existing literature by analysing agricultural investments of small scale farm households in three provinces in Northeast Thailand. In addition we also include investments in non-agricultural

⁹ We define productive assets as all assets that are mainly used for income generating activities.

activities, i.e. in small scale enterprises (SSE) such as village shops, transport businesses or food processing enterprises. We actually include three investment options, namely agriculture, non-agriculture or a combination of both because households in Northeast Thailand may follow different livelihood strategies that may include either option in addition to not undertaking any investment.

As empirical base we use a unique panel data set from 2007 and 2010 to investigate the extent and the determinants of investments in agriculture and small scale enterprises (SSEs). In this paper we ask three questions:

- (1) What factors encourage rural households to invest into different types of productive assets?
- (2) What are the constraints to such investments?
- (3) What factors influence the extent of investments in agricultural activities?

Our main findings are that only a small share of households invests in agriculture or non-farm SSEs. Those who undertake investments are wealthier households and wealth increases the probability to invest larger amounts. Female headed households and those with older household heads as well as households located in remote areas tend to invest less. Access to finance increases the probability of investing in SSEs, but does not have an influence on agricultural investments. Households that invest in agriculture tend to be specialized. Income from off-farm employment is rather consumed and does not increase the probability to invest.

3.2 Theoretical background and literature review

We derive our hypotheses from household theory assuming an agricultural household with the objective of maximizing utility in terms of level and stability of consumption as well as leisure (e.g. Ellis, 2000; Reardon et al., 1994). Investments are undertaken with the purpose of increasing future utility. The choice of investment requires a dynamic framework, demanding at a minimum a two-period model. In such a model, in the first period income can be consumed or invested to generate additional income in the next period. The extent of investment depends on the household's time preferences for consumption and its investment possibilities which determine the rate of return on investment. In perfect market conditions optimal investment is where the marginal rate of return to investment equals the marginal rate of substitution of consumption over time (Hirshleifer et al., 2005). Since households in Northeast Thailand face imperfect capital markets (Paulson & Townsend, 2004), investment and consumption decisions are interdependent

(Ellis, 2000). Therefore, an analysis of investment decisions needs to take into account the households' capabilities, preferences and incentives (Binswanger et al., 1993; Reardon et al., 2000).

Households' capabilities to invest are influenced by external conditioning variables, such as the institutional environment (land and capital markets), technology and location-specific variables as demonstrated for example for China by Feder et al. (1992). Landownership reduces risk and therefore provides incentives for long term investments (Fenske, 2011; Place, 2009). Small farms face less favourable conditions for investments than larger farms who tend to achieve higher levels of investment efficiency (Hayami, 2007b) and have better access to credit markets (Fan & Chan-Kang, 2005).

Household demographics have an influence on household preferences. In the literature, female headed households and households with older and less educated heads have been found to be more risk averse and therefore tend to have a lower probability to invest (Bryant & Gray, 2005; Hardeweg et al., 2013).

Imperfect credit markets influence households' liquidity position; therefore household wealth increases the financial capacity to invest (Reardon et al., 2000). One possibility to overcome liquidity limitations for financing farm investments is off-farm income (Davis et al., 2009; Hertz, 2009). However, off-farm employment and non-farm investment possibilities can compete with agriculture for labour and capital (Huang et al., 2009; Reardon et al., 2000). As Kilic et al. (2009) emphasize, the net impact of off-farm income on agriculture is complex and difficult to assess a priori, especially, because it might differ depending on farm household types and their activities as well as the agricultural potential and institutions of the area.

By including different investment alternatives, namely farm investments, small scale enterprise investments (SSEs), and a combination of the two, we include a wide range of investment options which may differ in their rates of return and risk, and therefore offer different incentives to the households.

Combining situation analysis, household theory and review of literature we develop the following four hypotheses regarding investment decisions of rural households:

- (1) Households with better endowments are more likely to invest.
- (2) Household demographics and location factors are important determinants for investments.
- (3) Access to finance facilitates larger investments.
- (4) Labour allocation is a determinant for investments.

In our analysis, we differentiate investments in agricultural activities (e.g. tractors, irrigation equipment, and livestock) from those in SSEs, which include small retail shops, processing facilities or transportation businesses. We define investments as items with a service life of more than one year. We also defined a threshold of 5000 Thai Baht (275 PPP\$) excluding any item below this value. To meet the realities of investments in rural villages in Thailand, we also included those items which are used for both, productive and consumptive purposes. For example, a motorbike is used to transport several rice bags to the market but also to take children to school.

3.3 Empirical model

To answer the research questions we applied two empirical models. First, to estimate the influence of determinants on the decision to invest in agriculture and non-agriculture productive activities, we use a multinomial logit model. In a second step, we apply a hurdle model to analyse agricultural investments in more detail and identify the determinants for an investment decision as well as the amount of investment.

Both models are reduced forms of the conceptual household model outlined in the theory section. The dynamic element is incorporated by drawing upon the panel data base including two periods. For the explanatory variables we use the baseline of 2007 as lagged variables and we take the cumulative number of investments asked in 2010 for the last four years. With including investments from a longer period, we are in a better situation to measure the investment behaviour of rural households since investments are lumpy and infrequent, i.e. households will not invest every year. A shorter period would therefore reduce the number of investment observations and would classify more households as non-investors that actually follow an investment strategy (Elhorst, 1993).

In model 1, we analyse households who undertake: (1) farm investments, (2) investments in small scale enterprise (SSE) and (3) both type of investments in comparison to households with no investment. We add SSE as a separate investment alternative to reflect the ongoing commercialization and diversification process in Thailand. These investment decisions can be demonstrated by a nominal (unordered) choice model (Long, 1997). We use a multinomial logit model to estimate the probability that a certain investment alternative is chosen. In this model, individual i can choose alternative m which maximizes her utility, consisting of average utility μ and error ε (McFadden, 1974).

$$u_{im} = \mu_{im} + \varepsilon_{im} \quad (3.1)$$

The probability of choosing alternative m is therefore the probability of the utility of alternative m being higher than the utility of all other alternatives. The average utility thereby is a linear combination of an individual's characteristics:

$$\mu_{im} = x_i \beta_m \quad (3.2)$$

Important for the correct specification of the model is the assumption of independent errors ε , which results in the independence of irrelevant alternatives (IIA) assumption. The model should therefore only be applied if alternatives are distinct, which we think is given in our case (Long & Freese, 2006; McFadden, 1974). To support our view, we conducted available tests, the Hausman test, generalized Hausman (suest) test and the Small-Hsiao test¹⁰, which indicated that the IIA assumption holds for our data.

In model 2 we look at agricultural investments in more detail. The majority of households did not undertake investments; this distribution of investment with the typical pileup at the endpoint of zero is a corner solution response. Hurdle models take this situation into account and model the outcome as result of two different decisions, here the *investment decision* ($y=0$ versus $y=1$) and the *amount decision* (magnitude of y if $y > 1$). The hurdle model assumes the dependent variable y to be generated by a binary variable s and a latent variable w^* (Wooldridge, 2010),

¹⁰ We confirmed our assumption using three different tests. First, applying the generalized Hausman suest test we could not reject the null hypothesis of independent alternatives. Second, since the Small-Hsiao test randomly divides the sample into subsamples, we repeated this test several times to strengthen our results. In the majority of cases the null hypothesis was not rejected. Third, we applied the Hausman test, which did not reject the null hypothesis for some alternatives, for the remaining alternatives it resulted in negative chi2 statistics, which can be interpreted as non-violation of the IIA assumption following Hausman and McFadden (1984).

$$y = s \cdot w^* \quad (3.3)$$

While the binary variable s can be observed, since it equals the indicator $y > 0$, w^* can only be observed if $s = 1$. In the hurdle model s and w^* are assumed to be independent conditional on explanatory variables (conditional independence assumption, CIA), so that the mechanisms determining the investment and amount decision are independent.

A widely used version of the hurdle model assuming a lognormal distribution and therefore a model suitable for our investment data is Cragg's (1971) lognormal hurdle model.¹¹ It was developed for the analysis of expenditure for certain goods characterized by an excess of zeros and has also been used for investments (Aramyan et al., 2007; Elhorst, 1993). The model estimates s with a probit-model, and assumes w^* to follow a lognormal distribution,

$$y = s \cdot w^* = 1[x\gamma + v > 0] \exp(x\beta + u) \quad (3.4)$$

$$u|x \sim \text{Normal}(0, \sigma^2)$$

The observed amount of investment is y ; s and w^* are the latent variables describing the *decision to invest* and the *amount of investment decision*. γ and β are vectors of parameters and v and u are error terms. x is a set of explanatory variables, containing household and village characteristics which are the same variables as those used in model 1.

Referring to the conceptual household model as a theoretical basis, we can specify the explanatory variables (X) of models 1 and 2. Broadly, these can be categorized in household characteristics (H), village characteristics (V), and province variables (P). Household characteristics (H) include demographics (Z), labour capacity and labour allocation (L), endowment with capital and land (K) as well as capital market participation of the household (F), i.e. whether the household uses loans or experienced credit rationing.

$$X = [H, V, P] = [(Z, L, K, F), V, P] \quad (3.5)$$

Regarding demographics (Z) we include household size, female headship, age and education of the household head. These variables tend to influence risk attitudes and therefore preferences for

¹¹The hurdle model is in our case preferred to the Exponential Type II Tobit model (ET2TM), a variant of the Heckman model for corner solution responses relaxing the conditional independence assumption, since no exclusion restrictions are available. Under this condition, the ET2TM might result in poor identification of parameters (Smith, 2003; Wooldridge, 2010). The error covariance was tested to be not significant from zero, which supports the choice of the model.

investments. Smaller households with female, older and less educated heads are thereby expected to invest less (Bryant & Gray, 2005; Hardeweg, Menkhoff, et al., 2013).

Labour availability and allocation (L) influence the capability of the household to invest (Binswanger et al., 1993; Davis et al., 2009). In our models we include two sets of variables that capture labour allocation effects. First, we include dummy variables for commercial crop farming, livestock farming and perennial crop farming, as well as for off-farm and self-employment income. These measure the income structure and agricultural intensity. Second, we include variables on the number of household members with their main occupation in agriculture, off-farm and self-employment, as well as the number of migrants to urban centres. Off-farm employment and migration can positive influence investment due to the additional income, or can reduce the likelihood of investment because of labour scarcity. The result depends on the type of the household and regional conditions, such as agricultural potential or access to markets (Kilic et al., 2009).

To measure capital endowment (K) as a part of households' capabilities, we included size of own land, asset value, household income and savings. Ownership of land and land size have been found to positively influence investments, since they reduce investment risk, improve access to loans and improve investment efficiency (e.g. Fenske, 2011; Hayami, 2007b). Asset value, income and savings positively influence the household's capabilities to invest (Reardon et al., 2000). Shocks, e.g. health shocks, can reduce household capability to invest by reducing capital endowment and labour availability (Dercon & Krishnan, 2000; Gertler & Gruber, 2002). To measure the effects of different negative shocks, we included the occurrence of severe agricultural, economic and demographic shocks. Agricultural shocks mainly consist of weather shocks, which can reduce agricultural outputs and destroy assets. Economic shocks include negative price and market developments and job losses. Demographic shocks include health shocks, death and negative effects of migration or changes in the family structure.

To measure capital market participation of the households (F), we include the amount of loans and a zero-one variable that accounts for a direct credit constraint of the household and equals 1 if the household applied for a loan and did not receive it. Credit constraints were shown to be a limiting factor for smallholder investment (Fan & Chan-Kang, 2005; Reardon et al., 2000).

As Binswanger et al. (1993) show, village infrastructure influences households' capabilities and incentives to invest. To account for the effects of village characteristics (V), distance to the district town and village size (number of households) are included. Additionally and similar to clusters in

rural small-scale industries (Porter, 2000), other households in the village investing in agriculture might encourage farmers to invest due to available knowledge and the demonstration of positive outcomes. To account for this effect, the amount of investments by other households in the village is included. Dummy variables for the respective provinces control for unobserved spatial differences in the level of development. An overview of the variables included in the empirical models is shown in Table 3.5 in the Appendix.

3.4 Data

This paper is based on a unique and rich three year household panel data set of three provinces in Northeastern Thailand, which was collected under the DFG FOR 756 project on vulnerability to poverty. The survey was conducted in 2007, 2008¹² and 2010 and contains data of some 2200 households in 220 villages.¹³ The three provinces included in the survey, namely Ubon Ratchathani, Buriram and Nakhon Phanom were purposely selected on the basis of a low per capita income, the importance of agriculture, low agricultural potential and remoteness in some districts, and high potential in other districts, differing agro-ecological conditions and variation in development potential (Hardeweg et al. , 2013). Within the provinces, a three-stage cluster sampling procedure on sub-district, village and household level was employed, resulting in a household sample representative of the rural areas of the three provinces. The survey instrument was a comprehensive questionnaire covering detailed information on household members, composition of income, as well as shock experience. In 2010, the questionnaire was complemented by an investment module, which asked recall data on farm and business investment activities for the last 5 years. In 2007 and 2010 a village survey was additionally conducted.

3.5 Descriptive statistics

In the 2010 survey, households were asked about the investments they undertook during the last four years. The share of households that reported any investments during this time period is small (Table 3.1). The majority of households did not invest; households who only undertake farm

¹² The 2008 data were not used in this analysis

¹³ See Chapter 1.3

investments account for one fourth while less than 7 % invested in SSEs, and 65 households (3 %) had both.

Table 3.1 Households' participation in different investment types, 2007-2010

HHs with	Freq.	Percent
Farm investments	524	24.89
Enterprise investments	142	6.75
Farm and business investments	65	3.09
No investments	1,374	65.27
Total	2,105	100

Source: Own calculations based on household survey 2010.

In total, 1,091 investments for productive activities have been reported for the time period 05/2007 – 04/2010, with most of the investments reported in 2010. The majority of households (67 %) reported one investment in the period observed and 20 % of the households reported two items. Only about 15 % reported more than two investments.

Most agricultural investments are small investments, resulting in a positively skewed distribution with a mean of 6,165 PPP\$ and a median of 2,042 PPP\$ although we find a few cases with over 100,000 PPP\$. The overall distribution of investment amount is described in Figure 3.1.

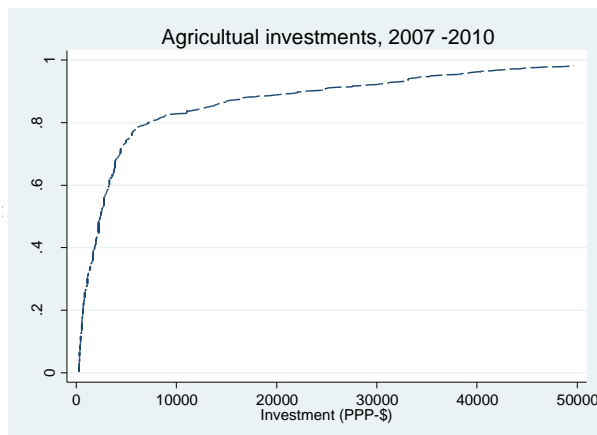


Figure 3.1 Density function of investment value per household (up to 50,000 PPP\$), 2007-2010

Source: Own calculations based on household survey 2010.

Table 3.2 shows the share of different investment types. The most frequent type of investment are transportation vehicles. This is also where households spent the highest amount on average. In exceptional cases the amount invested reached 120,000 PPP\$ for example, a household with a trading business reported the purchase of a truck for agricultural crops and another households one worth 90,000 PPP\$ for transporting livestock. Investments in farm machinery and agricultural

buildings make up for almost another third of investments. This category also includes tractors and other farm equipment. 22 % of investments go into land and land improvement (e.g. irrigation and establishment of perennial crops such as rubber). Livestock investments (10.8 %) are of lower value with a mean of 2,552 PPP\$, but include a wide range of activities like establishing a cattle herd (around 10,000 PPP\$) and a large scale chicken farm with 149,000 PPP\$.

Table 3.2 Number of investments per asset type

Investment type	Percent	Mean	Std. Dev.	Min.	Max.
Transportation equipment	32	8907	14841	276	126408
Farm equipment, machines & buildings	27.21	6240	11192	276	66240
Land and land improvements	21.87	4794	9190	276	62100
Livestock	10.77	2558	12871	276	149040
Non-farm equipment	8.14	3592	9194	276	63480
Total	100	6165	12334	276	149040

Source: Own calculations based on household survey 2010.

The purposes of investments are several but most households stated that they invest to make their work easier (49 %), or to increase (30 %) and diversify income (10 %). Reducing income risks (7 %) and improving food security (3 %) are less frequent motives.

3.6 Model results

3.6.1 Determinants of different investment types

Our multinomial logit model allows us to assess the probability of rural households to undertake different types of investments, namely in agriculture, in small-scale enterprises (SSEs) and in both. The base group is all households that do not invest hence independent variables indicate the relative importance of a particular factor to influence either type of investment. Direction and strength of influence of the explanatory variables can be compared across the three types of investments.

Results show (Table 3.3) that household size significantly increases the probability of investing in all three investment alternatives. As expected, age of household head discourages investments. This reflects role of the demographic conditions in rural villages in Thailand where often only children and the elderly stay behind. Similarly, female headed households significantly reduce the likelihood of agricultural investments.

Labour allocation corresponds with type of investment, i.e. households who have most of their labour in agriculture tend to invest in agriculture only. This suggests that households may follow different development paths with a focus on either agriculture or SSE. Households with off-farm wage employment are less likely to invest at all, which hints towards the existence of the “lost labour effect” of off-farm employment, as found by Huang et al. (2009) and Reardon et al. (2000). Households with more persons working in SSEs tend to invest less in agriculture but tend to expand their non-farm business. These households are pursuing an exit strategy out of agriculture, suggesting that some rural based industry development is taking place in some villages.

Households with higher income in 2007 invested more in agriculture while asset endowments positively influence all types of investments. The effect is strongest for households that undertake combined investments, i.e. in agriculture and SSEs, which suggests that wealthier households diversify more. The positive coefficient of the variable “land owned” for agricultural investments and its negative sign for SSEs once again suggest that households differ in terms of their livelihood strategy. Agricultural shocks do not affect either investment type, but seem to be relevant for those households that undertake both investments. It is possible that households may forego either type of investment as a coping strategy if such events occur.

Access to finance is not a factor for agricultural investments but is significant for SSE investments. Perhaps, rural lending institutions favour business investments over agriculture. Households investing in agriculture tend to be better endowed with land and have higher incomes and rely on own financial sources.

The overall investment intensity in the village and the socio-economic conditions of the province significantly influence all investment types. Relative to the base province Ubon Ratchathani, investment is stronger in the province of Nakhon Phanom, which is the poorest among the three provinces in terms of income per capita. This may suggest that some “catching up” takes place in poorer provinces. Village remoteness, measured by the distance to town, has a negative effect on agricultural investments, suggesting the growing market orientation of agriculture.

In summary, the results from model 1 allow to extract some important messages. First, household wealth positively influences investments. Second, agricultural investments tend to be undertaken by larger households with higher labour capacity and comparatively larger landholdings. Third, for small scale businesses investments, access to credit is an important factor, while this does not play a role for agricultural investments. Fourth, households engaged in off-farm wage

employment are less likely to invest in either option. These tend to be the poorer households who do not generate enough capacity to invest and who may have to reduce consumption in case of severe shocks. Fifth, shocks are not a significant factor for investments, which can be explained by the fact that only wealthier households invest who are in a better position to cope with shocks. Sixth, there is a geographic dimension to investments; the remoteness of a village is a constraint for investments in agriculture. This shows that connectivity to markets is a key factor for agricultural development. In the next section we undertake a more in-depth analysis of agricultural investments.

Table 3.3 Determinants of different investment decision types: Multinomial logit model

	Agricultural investments	Enterprise investments	Farm and enterprise investments
HHsize	0.150*** (0.041)	0.078 (0.078)	0.223** (0.108)
AgeHHH	-0.011** (0.005)	-0.030*** (0.009)	-0.020 (0.013)
FemHHH	-0.297** (0.131)	-0.005 (0.213)	-0.309 (0.371)
EduHHH	0.018 (0.022)	-0.017 (0.035)	0.079* (0.043)
Crop	0.331** (0.133)	0.139 (0.226)	1.016*** (0.369)
Livestock	0.322*** (0.115)	0.125 (0.215)	0.505* (0.298)
Perennial	0.064 (0.208)	-0.180 (0.396)	-0.667 (0.490)
Migrant	-0.023 (0.030)	0.021 (0.050)	-0.126 (0.085)
Enterprise	-0.296* (0.156)	0.649*** (0.228)	0.877*** (0.301)
WageEmpl	-0.303** (0.121)	-0.414* (0.213)	0.077 (0.301)
NumberAgri	0.027 (0.061)	0.019 (0.110)	0.126 (0.170)
NumberSSE	-0.264* (0.136)	0.247 (0.158)	0.168 (0.193)
NumberWage	-0.048 (0.061)	-0.057 (0.102)	-0.078 (0.157)
IncomePC (log)	0.442** (0.223)	0.637 (0.418)	0.054 (0.322)
Savings (log)	0.020 (0.021)	0.011 (0.038)	-0.041 (0.054)
LandsizePC	0.118* (0.063)	-0.372** (0.171)	0.028 (0.110)
AssetValuePC (log)	0.177*** (0.061)	0.187* (0.102)	0.592*** (0.143)
AgriShock	-0.213 (0.133)	0.201 (0.220)	-1.347*** (0.415)
EconomShock	0.048 (0.173)	-0.543 (0.378)	0.079 (0.443)
DemogrShock	-0.154 (0.149)	-0.212 (0.268)	-0.300 (0.393)
Loan	-0.003 (0.022)	0.125*** (0.048)	0.093 (0.061)
CreditRationing	-0.069 (0.185)	-1.134** (0.447)	0.039 (0.445)
InvestmentVill ¹	0.000** (0.000)	0.000 (0.000)	0.000*** (0.000)
VillageSize	-0.000 (0.001)	-0.003** (0.002)	-0.005** (0.003)
DistanceTown	-0.016** (0.007)	-0.012 (0.011)	0.013 (0.016)
Buriram	-0.527*** (0.128)	-0.552** (0.254)	-1.432*** (0.426)
NakhonPhanom	0.644*** (0.153)	0.998*** (0.252)	1.344*** (0.329)
_cons	-4.758*** (1.369)	-6.493*** (2.482)	-9.185*** (2.137)
N	2050		

Note: Base outcome: no investment. * p<0.1, ** p<0.05, *** p<0.01. Log likelihood: -1643.24. Standard errors in parentheses are robust. Model is robust to the exclusion of income and loan. Data are of 2007 if not remarked otherwise. ¹2007 – 2010. This table presents coefficients. Relative risk ratios in Table 3.6 in the appendix.

Source: Own calculations based on household survey 2010.

3.6.2 Determinants of investment in agriculture

We use a hurdle model for our in-depth analysis of investments in agriculture. The purpose of this analysis is to explore the agricultural development potential of rural households in Northeast Thailand, which belongs to the less favourable environments but which may become important for future supply of agricultural commodities in the course of a growing global demand for food. The dependent variables of our model 2 are a binary variable for the investment decision and a continuous variable for the amount invested covering the period between 2007 and 2010. Independent variables are based on the 2007 observations with exception of the level of investment in the village and a dummy controlling for SSE investments, which are measured from 2007 to 2010.

Column 1 in Table 3.4 shows the results of the agricultural investment decision using a probit regression (part 1 of the hurdle model, marginal effects). The counterfactual are households that do not invest in agriculture but who may invest in non-farm productive activities. In column 2 results of part 2 of the hurdle model are shown, where the dependent variable is the amount of the investment. Here, only households that had invested in agriculture between 2007 and 2010 are included.

Household characteristics show a significant influence on both decisions. First, consistent with model 1, larger households are more likely to invest in agriculture, and second, the amount which they invest rises with their household size. Additionally, age of the household head and female headship are negatively related to investments while education has a significant and positive sign.

Labour allocation variables have a significant influence on investments. Households with commercial crop or livestock enterprises are more likely to be agricultural investors. At the same time, being in off-farm employment or being engaged in non-farm self-employment reduces the probability to invest in agriculture. The same effect can be observed for households that have a high number of persons engaged in non-farm businesses. The number of household members working in agriculture positively influences the amount of investment. Wealthier households with a higher income in 2007, with larger landholdings and a higher asset value invest in agriculture, and the amount of investment rises with land size, asset value and savings.

Agricultural shocks negatively influence the decision to invest, but do not have a significant effect on the amount invested. One reason might be that larger investments are undertaken by wealthier households, which are better able to cope with shocks. Investment intensity in the

village positively, and remoteness of the village negatively, influence the decision to invest in agriculture. A provincial effect can only be observed for the decision to invest in agriculture but not for the invested amount.

To summarize the results of model 2 we can derive that households who undertake small investments are different from those who invest large amounts. First, potentially marginalized households with female and older household heads have a lower probability to invest in agriculture, while larger investments are undertaken by households where the household head has higher education levels. Second, land ownership and wealth are important for both, the decision for and the amount of investment in agriculture. Third, labour availability in agriculture facilitates larger investments, while at the same time off-farm employment in general has a negative effect on the decision to invest. Fourth, external finance does not play a role for farm investments, instead higher income positively influences the decision to invest and higher savings favor larger investments. Fifthly, regarding a more regional perspective, at least for smaller investments a cluster effect can be observed. This suggests that the village conditions can favour or discourage agricultural investment.

Table 3.4 Determinants of investment and amount decision for agricultural investments:
Lognormal hurdle model

	Part 1: Investment Decision	Part 2: Amount of Investment Decision
SSEINVD 1	-0.023 (0.035)	-0.131 (0.182)
HHsize	0.029*** (0.008)	0.109** (0.046)
AgeHHH	-0.002* (0.001)	-0.002 (0.005)
FemHHH	-0.056** (0.024)	-0.061 (0.131)
EduHHH	0.006 (0.004)	0.060*** (0.023)
Crop	0.072*** (0.024)	-0.168 (0.122)
Livestock	0.066*** (0.021)	0.001 (0.111)
Perennial	0.013 (0.038)	0.172 (0.202)
Migrant	-0.007 (0.005)	-0.036 (0.026)
Enterprise	-0.047* (0.027)	-0.026 (0.150)
WageEmpl	-0.045** (0.022)	0.032 (0.117)
NumberAgri	0.008 (0.011)	0.112* (0.060)
NumberSSE	-0.041** (0.020)	0.003 (0.125)
NumberWage	-0.007 (0.011)	0.093 (0.061)
IncomePC (log)	0.059* (0.035)	-0.032 (0.227)
Savings (log)	0.003 (0.004)	0.044** (0.021)
LandsizePC	0.025** (0.011)	0.193*** (0.044)
AssetValuePC (log)	0.038*** (0.011)	0.195*** (0.061)
AgriShock	-0.057** (0.024)	0.071 (0.130)
EconomShock	0.018 (0.032)	-0.002 (0.180)
DemogrShock	-0.025 (0.027)	-0.146 (0.140)
Loan	-0.001 (0.004)	0.017 (0.021)
CreditRationing	-0.002 (0.034)	-0.013 (0.180)
InvestmentVillage ¹	0.004** (0.004)	0.000 (0.000)
VillageSize	-0.000 (0.000)	-0.001** (0.000)
DistanceTown	-0.002* (0.001)	0.002 (0.006)
Buriram	-0.108*** (0.024)	-0.036 (0.139)
NakhonPhanom	0.107*** (0.028)	0.041 (0.126)
_cons		5.428*** (1.378)
sigma: _cons		1.266*** (0.033)
N	2050	

Note: * p<0.1, ** p<0.05, *** p<0.01. Log likelihood -2081.69. Standard errors in parentheses are robust. Data are of 2007 if not marked otherwise. ¹ Investment Data, 2007 – 2010. Model is robust to the exclusion of income and loan. A reduced model showed robust results. Checked for multicollinearity. Column 1 presents marginal effects of probit estimation.

Source: Own calculations based on household survey 2010.

3.7 Summary and conclusions

This paper analyses the factors influencing the decision of rural households to invest in agriculture and non-agricultural activities and the amount of their investments in agriculture. Two models were used to explore the three questions posed in section 1 and the four hypotheses established in section 2 of the paper. First, a multinomial logit model was used to analyse households' behaviour with regards to different investment options namely in agriculture, non-farm enterprises or both. Second, a hurdle model was used for a more in-depth analysis of agricultural investments.

We have four hypotheses regarding the decision for and amount of rural households' investments: (1) households with better endowments are more likely to invest, (2) household demographics and location factors are important determinants of investments, (3) access to finance facilitates especially the larger investments, (4) labour diversification influences investments of rural households.

Our results supported the first hypothesis: Wealth and assets influence both, the probability to invest in all types of productive assets and the amount invested in agriculture. Also, the second hypothesis on the influence of household characteristics and location factors can be confirmed. Potentially marginalized households with female and older household heads, as well as households in remote areas, invest less. Results on the third hypothesis regarding access to finance are mixed. While loans and credit rationing do not have significant effects on either the decision or the amount of agricultural investments, they increase the probability to invest in SSEs. Large agricultural investments on the contrary are favored by high savings. For the last hypothesis, the influence of labour diversification on investments, we found a lost labour effect of off-farm employment.

Returning to our initial research questions, we find that wealth and a specialization on agriculture favour investments in general, while remoteness, age of the household head and female headship hinder them. Large agricultural investments are additionally favored by land and labour availability in agriculture, savings and education.

Some conclusions on the future development of agriculture and of rural villages in Northeast Thailand can be drawn from these results. First, it is remarkable that only one third of households report any investment during a three year period, which includes two post crisis years where the general conditions for growth were positive also due to higher prices for agricultural products. Consistent with other literature (Gödecke & Waibel, 2011; Rozelle et al., 1999) many rural

households rely on wage labour as the main source of income and therefore tend to pay less attention to increase their productive assets. Many households may invest in consumptive assets like house or hold other forms of savings. Resource endowments and infrastructure play important roles for investments. Hence, from a geographic perspective productive investments tend to cluster in the villages with better conditions and among the wealthier households. Poorer households seem to rely on existing levels of resource endowments to sustain their income and consumption levels. The relatively small extent of investments has implications for the distribution of wealth in rural areas in the future. While there is already a large rural-urban income gap, a growing gap within rural areas is likely to emerge. This may have consequences for the social coherence of village societies and may lay the ground to enlarge already existing conflicts. Finally, our results point to constraints for investments that may give room for government intervention. For example, improving physical infrastructure, offering higher quality education and improving job security in the non-farm sector may facilitate structural change and allow agriculturally oriented farms to grow and modernize.

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Appendix

Table 3.5 Overview of variables included in the model: Comparison of households with and without agricultural investments

Variable name	Description	Unit	Non- Investing HHs		Investing HHs		Diff. of means
			Mean	Std.Dev.	Mean	Std.Dev.	
AgINV	Agricultural investments, 2007 -2010	PPP\$	0	0	7676.69	16741.47	-
SSEINVD	Household invested in SSE, 2007- 2010	1 = yes	0.09	0.29	0.11	0.31	ns
<i>Household characteristics</i>							
HHsize	Household size	No.	3.95	1.74	4.21	1.72	***
AgeHHH	Age household head	years	55.32	13.39	53.31	12.65	***
FemHHH	Female headed household	1 = yes	0.32	0.47	0.23	0.42	***
EduHHH	Education of household head	years	4.71	2.88	5.21	3.03	***
<i>Labor allocation</i>							
Crop	Crop Farmer	1 = yes	0.58	0.49	0.71	0.45	***
Livestock	Livestock Farmer	1 = yes	0.41	0.49	0.53	0.50	***
Perennial	Perennial Crop Farmer	1 = yes	0.07	0.25	0.11	0.31	***
Migrant	Migrant members in Bangkok	No.	1.41	2.38	1.15	2.11	**
Enterprise	Household has enterprise	1 = yes	0.25	0.43	0.25	0.43	ns
WageEmpl	Household has wage employment	1 = yes	0.55	0.50	0.52	0.50	ns
NumberAgri	Members with main occupation agriculture	No.	1.60	1.26	1.98	1.30	***
NumberSSE	Members with main occupation own enterprise	No.	0.26	0.69	0.19	0.57	**
NumberWage	Members with main occupation wage employment	No.	1.10	1.27	0.96	1.13	**
<i>Capital endowment</i>							
IncomePC	Income per capita per month	PPP\$	128.87	239.03	165.95	320.12	***
Savings	Amount of household savings	PPP\$	726.31	3499.65	1356.98	5055.92	***
LandsizePC	Land owned per capita	ha	0.64	1.06	0.91	1.47	***
AssetValuePC	Asset value per capita	PPP\$	2174.49	3907.37	2972.05	5172.92	***
AgriShock	Household experienced severe agricultural shock	1 = yes	0.24	0.43	0.22	0.42	ns
EconomShock	Household experienced severe economic shock	1 = yes	0.11	0.32	0.11	0.32	ns
DemogrShock	Household experienced severe demographic shock	1 = yes	0.20	0.40	0.16	0.37	**
<i>Capital market participation</i>							
Loan	Amount of loan HH received	PPP\$	2596.79	5597.00	3176.54	6256.28	***
CreditRationing	Experienced credit rationing	1 = yes	0.10	0.30	0.10	0.29	ns
<i>Village infrastructure</i>							
InvestmentVill	Agricultural investments of other HH in the village, 2007- 2010	PPP\$	16882.14	29676.62	23196.08	36733.53	***
VillageSize	Number of HH in the village	No.	150.72	90.03	147.53	125.51	***
DistanceTown	Distance to district town	minutes	13.55	8.02	13.32	8.64	ns
Buriram	Located in Buriram province	1 = yes	0.42	0.49	0.28	0.45	***
NakhonPh	Located in Nakhon Phanom province	1 = yes	0.15	0.36	0.25	0.44	***
<i>n</i>			1516		589		

Note: Values are for 2007 on balanced panel, if not remarked otherwise.

Difference of means is tested with Wilcoxon rank sum test for continuous and chi-square test for dummy variables, SSE: Small scale enterprise.

Source: Own calculations based on household survey 2007 & 2010.

Table 3.6 Determinants of different investment decision types: Relative risk ratios

	Agricultural investments	Enterprise investments	Farm & enterprise investments
HHsize	1.610*** (0.048)	1.081 (0.084)	1.250** (0.134)
AgeHHH	0.989** (0.005)	0.971*** (0.009)	0.980 (0.013)
FemHHH	0.743** (0.098)	0.995 (0.212)	0.734 (0.272)
EduHHH	1.018 (0.022)	-0.983 (0.034)	1.082* (0.046)
Crop	1.393** (0.185)	1.150 (0.260)	2.763*** (1.021)
Livestock	1.380*** (0.158)	0.133 (0.244)	1.658 (0.494)
Perennial	1.066 (0.221)	0.835 (0.331)	0.513 (0.251)
Migrant	0.977 (0.029)	1.021 (0.051)	0.882 (0.075)
Enterprise	0.744* (0.116)	1.913*** (0.437)	2.404*** (0.724)
WageEmpl	0.738** (0.089)	0.661* (0.140)	1.080 (0.325)
NumberAgri	1.027 (0.063)	1.019 (0.112)	1.135 (0.193)
NumberSSE	0.768* (0.105)	1.280 (0.202)	1.183 (0.228)
NumberWage	-0.953 (0.058)	0.945 (0.096)	0.925 (0.145)
IncomePC (log)	1.555** (0.347)	1.890 (0.790)	1.055 (0.340)
Savings (log)	1.020 (0.020)	0.011 (0.038)	0.959 (0.052)
LandsizePC	1.126* (0.071)	0.678** (0.118)	1.028 (0.113)
AssetValuePC (log)	1.940*** (0.073)	1.206* (0.123)	1.808*** (0.258)
AgriShock	0.808 (0.108)	1.223 (0.270)	0.260*** (0.108)
EconomShock	1.049 (0.182)	0.581 (0.220)	1.082 (0.479)
DemogrShock	0.857 (0.128)	0.809 (0.217)	0.741 (0.291)
Loan (log)	0.997 (0.022)	1.134*** (0.055)	1.097 (0.067)
CreditRationing	0.933 (0.173)	0.322** (0.144)	1.040 (0.463)
InvestmentVill ¹	1.000** (0.000)	1.000 (0.000)	1.000*** (0.000)
VillageSize	1.000 (0.001)	0.997** (0.001)	0.995** (0.003)
DistanceTown	0.984** (0.007)	0.998 (0.011)	1.013 (0.017)
Buriram	0.590*** (0.076)	0.576** (0.146)	0.239*** (0.102)
NakhonPhanom	1.904*** (0.292)	2.713*** (0.684)	3.835*** (1.261)
_cons	0.009*** (0.012)	0.002*** (0.004)	0.000*** (0.000)
N	2050		
Log likelihood	-1643.24		

Note: Base outcome: no investment. * p<0.1, ** p<0.05, *** p<0.01. Relative risk ratios describe the relative probability of investing in a particular alternative rather than not investing. Standard errors in parentheses are robust. Model is robust to the exclusion of income and loan. Data are of 2007 if not remarked otherwise. ¹ Investment data, 2007 – 2010

Source: Own calculations based on household survey 2007 & 2010.

4 IS FEMALE MIGRATION GOOD FOR EDUCATION OF RURAL CHILDREN?

A PANEL DATA ANALYSIS FROM NORTHEAST THAILAND

An earlier version of this paper was presented at the PEGnet conference, September 18-19 2014 in

Lusaka, Zambia

Abstract

Employment of women not only increases household income, it can also change a household's expenditure pattern. This paper looks at the influence of the share of female income on education expenditures of rural households in Northeast Thailand. The share of female income has been found to positively influence education expenditures in the context of the traditional nucleus family. It is less clear whether this influence also holds true in extended families comprising migrants, since the migrant is impaired in monitoring household expenditures. This paper compares the influence of the share of female local income (i.e. income earned locally by nucleus household members in the village) on the share of education expenditures with the influence of the share of female migrant income. The analysis is based on a three years panel data set of 1700 households with wage employment in Northeast Thailand. We apply a fixed effects model to control for unobserved heterogeneity and additionally a hurdle model comprising a fixed effects logit model and a fixed effect model conditional on positive education expenditures. With this model we are able to control for zero-inflation and allow for different mechanisms influencing the decision for education expenditures and its amount. Results show that the share of female local income significantly increases the share of expenditures on education while the share of female migrant income has a negative significant effect on education expenditures. Both effects are especially large for households with low off-farm (local and migrant) income. The main result of the paper is that female migration reduces education expenditures.

4.1 Introduction

Employment of women not only increases household income and wealth, it can also change the household's expenditure pattern. Earning money increases the intra-household bargaining power of women and allows her to make expenditure decisions based on her own preferences, which tends to benefit to children (Basu, 2006; Blumberg, 1988). Several studies in developing countries have found women's income or assets to positively influence households' expenditures for education (Kusago & Barham, 2001), health care (Engle, 1993) and food (Hoddinott & Haddad, 1995). While most of these empirical affirmations were confirmed in the context of a "traditional" nucleus family residing together, it is not clear, whether the positive influence still holds true when the woman is a migrant worker living outside the village.

Migration changes the traditional structures of rural farm households and consequently might influence expenditure patterns. In many developing countries, the younger generation now moves to the cities to support their families, while older members stay in the village to take care of the farm and of the children of the migrant worker. Boundaries of the household are therefore not limited to the village, as temporary and long-term migrants are still part of the extended household (Stark & Lucas, 1988). With the geographical distance of the migrant a principal-agent problem emerges: Since the migrant is not able to monitor expenditures, her bargaining power might be reduced and her preferences for expenditures might not be realized (Göbel, 2013). It is therefore not clear, whether income of female migrant workers is spent for the same purposes as income of females working in the village.

To investigate this question, we use a representative panel data set of 2200 households in three provinces of the poor North-eastern regions of Thailand, covering the years of 2007, 2008 and 2010. The data includes detailed information on household composition and expenditures. It provides information on education, employment and income on an individual level, making it well suited for the analysis of gendered income.

Northeast Thailand is a relevant study area for topics related to female (migrant) employment as women make up a relatively high share of the work force and the prevalence of rural-urban migration is large. One reason for the high share of women in the off-farm labour market is the cultural pressure on Thai women to contribute to the family's income. While young men traditionally can meet their family obligations and show respect to their parents by being a monk for a short time, women are expected to support their families in monetary terms (Tantiwiranond, 1997). Many young women, motivated by better employment possibilities,

migrate to the cities, especially Bangkok; the remittances they send back contribute a large share to rural household incomes (De Jong et al., 1996). With the out-migration of the younger generation to Bangkok, new family arrangements emerge. Often, children stay with the grandparents in the village, a family arrangement which is called *lieng lan* (“taking care of grandchildren”, Funahashi, 1996). Traditionally, it is the mother who makes decisions and guides the children regarding education in Thailand. If she is a migrant and does not stay with her children in the village, it is even more important that she is able to influence education expenditure decisions in favour for her children (UNICEF Office for Thailand & TDRI, 2012).

We model the influence of female income shares in household income on expenditure patterns based on the Working-Leser model (Leser, 1963; Working, 1943) using expenditure shares on education. To highlight the role of migration we divide female wage income into local (i.e. earned by nucleus members) and migrant income in order to see differences in the influence on education expenditure shares. Results of a fixed effects model and a fixed effects hurdle model show that the share of female local income positively influences the share of expenditures spent on education. The share of migrant female income on the contrary has a negative significant effect on the share of education expenditures. Both effects are especially large for households with low off-farm income. Differences between the coefficients on local and migrant female income are significant in all models. We can therefore confirm that the share of female local income has a stronger positive influence on the share of education expenditures than the share of female migrant income. Female migrant income reduces education expenditures shares of the rural household.

4.2 Literature review and hypotheses

This paper links the literature on intra-household bargaining with the literature on the influence of migration on expenditure patterns.

The household bargaining literature emphasizes the question of how to model household decisions. Two possible approaches are discussed: The unitary household model assumes that households pool their income, maximizing a single household utility function, since household members share preferences (Becker, 1981). In these models the share of income earned or controlled by men and women should not influence the allocation of household expenditures. In contrast, collective household models assume different preferences of household members, especially of men and women (see Donni & Chiappori, 2011). Depending on their bargaining

power, these preferences are realized in household expenditure patterns including the share on education.

Research suggests that with increased control of women over resources women obtain bargaining power in household decisions (Blood & Wolfe, 1960; Doss, 1996; Lopez-Ekra, 2011). Speaking in terms of statistical analysis, women's bargaining power has to be proxied since it cannot be observed directly. Widely used proxies for bargaining power are variables on control over resources, such as share of earned or unearned (transfer) income of female household members or share of assets like land owned by women (Doss, 2013). Several papers look at the influence of resource control on household and child welfare. The common finding is that with higher control of resources by women, expenditures for education, health, food or children's clothing increase, while alcohol and tobacco expenditures decrease. This result is seen as a confirmation of women having higher preferences for these goods. Since differences in preferences is the main assumption of collective household model, this result is generally regarded as a confirmation of the collective household model over the unitary household model (Quisumbing, 2003).

While this strand of literature concentrates on an analysis within the nucleus household in the village, the other strand of the literature we include in this paper investigates how migration changes expenditure patterns. These papers build on the New Economics of Labour Migration (NELM, e.g. Stark & Bloom, 1985; Stark & Lucas, 1988), which regard migration not as an individual but a household decision, with the purposes of additional income generation and risk reduction. This theory accounts for an understanding of the household, where households also include members not permanently living in the village. This is especially relevant in countries where temporal migration is an important part of rural livelihoods (Gödecke, 2012).

The main question in this strand of literature is on the use of additional income generated by migration and the resulting changes in expenditure patterns. In general, there is consensus that migration changes expenditure patterns, the direction of changes however is less clear (e.g. Adams & Cuecuecha, 2010; Yang, 2008; Chami et al., 2005; Taylor, 1999). Yang (2008) finds an exogenous increase in international remittances to increase education expenditures in the Philippines. Guzmán et al. (2008) look at remittances in Ghana. They detect an impact of the gender of the migrant on expenditure patterns (when controlled for relationship to the household head and frequency of sending) and find remittances from female migrants to increase the share of household health expenditures. Remittances from internal female migrants decrease education expenditures. Göbel (2013) finds international remittances in Ecuador to increase expenditures on

education, health and housing, while gender effects are rather small. LaFave and Thomas (2013) find transfers of extended family members increasing expenditures for child-wellbeing, especially in times of shocks and crises in Indonesia.

This paper links those two strands of literature as it investigates whether migration of females reduces their bargaining power, and therefore changes expenditures patterns. In detail, it compares the impact of female local and migrant income shares on education expenditures.

Our **research questions** are, first, whether the share of female local income earned in the village positively influences the share of expenditures spent on education and second, whether the share of female migrant income has the same effect on expenditures for education as the locally earned income of female household members. Based on the literature review above, we assume a collective household model (see Donni & Chiappori, 2011); male and female household members have different preferences on how to spend the household income. Females are assumed to have higher preferences for investments favouring their children, including education (Blumberg, 1988). This view is strengthened by cultural gender roles in Northeast Thailand, which oblige female household members to support the family economically, while for males personal consumption expenditures are regarded as appropriate by the society (Mills, 2005). These points of argument lead to our first hypothesis:

H1: A higher share of female local income (earned by household members in the village) increases the share of expenditures on education.

Migrants have better income possibilities and higher wages than females in the village, which should lead to an increase in their bargaining power. On the other hand, the migrant faces asymmetric information since she is impaired in monitoring the actual use of remittances. If the woman has different preferences about the use of income than the decision maker in the household, a principal-agent problem emerges. As monitoring of household expenditures for the migrant is imperfect, the household decision maker might spend the income not on education as intended by the migrant, but based on his own preferences (Chen, 2006; Göbel, 2013; Schmeer, 2005). A second point why female migrant income might have a weak influence on decisions of education expenditures is that migrants face new urban living styles. In the Thai society, urban lifestyles are often seen as superior to and more desirable than the simple rural living style. Facing every day the comfortable urban lifestyle, which attaches great importance to consumption, might influence preferences, create consumption desires and change remittance behaviour in favour for consumption goods (Mills, 2005). These ideas lead to our second hypothesis:

H2: The share of female migrant income has a weaker effect on the education share in expenditures than the share of female local income.

4.3 Data

This paper is based on a unique and rich household panel data set of three provinces in Northeast Thailand, which was collected under the DFG FOR 756 project on vulnerability to poverty (see Chapter 1.3.1). The survey was conducted in 2007, 2008 and 2010 and contains data of 2200 households in 220 villages. The three provinces included in the survey, namely Ubon Ratchathani, Buriram and Nakhon Phanom, were purposely selected on the basis of a low per capita income, a high importance of agriculture for household income despite a low agricultural potential, and variation in development potential (Hardeweg et al., 2013). Within the provinces, a three-stage cluster sampling procedure on sub-district, village and household level was employed, resulting in a household sample representative of the rural areas of the three provinces. The survey instrument was a comprehensive questionnaire covering detailed information on household members and composition of income and expenditures. Individual and therefore gender disaggregated data is available for education, off-farm employment and migration and includes the nucleus family living in the village as well as the extended family, i.e. migrants living away from the household more for than 180 days per year. This unique feature of the dataset enables us to address a research gap, since data sets containing detailed gender disaggregated data on extended family members are very rare (LaFave & Thomas, 2013).

Calculating female and male contributions to the household income with the data available poses some challenges and makes some simplifications and assumptions necessary. Not all parts of household income in our data can be attributed to a male or female earner, as for example agricultural income depends on common labour input and therefore is always pooled.

We therefore concentrate on wage income, which is reported on an individual level and can be assigned to male and female household members. Consequently, we draw a subsample and

include only those households that earn a share of their income through wage employment, which applies to 78 % of the sample households.¹⁴

Since wage income is available on an individual basis, a differentiation between migrant and village household members is possible. Migrant income is defined as the wage income of members who have been away (out of the district) for more than 180 days; local income earned in the village is the wage income of members who have been in the village for at least 180 days.¹⁵

4.4 Empirical model

Following Aslam and Kingdon (2008), Doss (2013) and Göbel (2013), our analysis builds on the Working-Leser Model (Leser, 1963; Working, 1943) of Engel curves to describe family expenditure decisions. The Working-Leser Model (equation (4.1)) defines the share of expenditures¹⁶ of household j spent on a certain good in year t as a function of log of per capita expenditures ($\frac{x_{jt}}{n_{jt}}$), log of household size (n_{jt}), and a vector of household characteristics (z_{jt}). We are especially interested in the influence of the share of female local income $femL_{jt}$ and female migrant income $femM_{jt}$ on the share of education expenditures w_{jt} , controlling for the (log) amount of total local and migrant income (La_{jt} , Ma_{jt}). To allow for non-linear effects we include continuous-by-continuous interaction terms between female local income share and total local income as well as migrant income share and migrant income.

¹⁴ We also exclude self-employment for two reasons: First, only 1 % of households have migrant self-employment. Second, family-business often employs more than the person named as head of the business. It is therefore not clear whether the income can be attributed to the women, or whether it is pooled. We nevertheless made robustness checks of our models (presented in the Appendix in Table 4.12), which supported our view on self-employment.

¹⁵ There is no common definition of household members and migrants in the literature. With defining nucleus household members as those spending at least 180 days per year in the household we follow the definition of Klasen & Waibel (2013). The value of 180 days ranges in the middle of other definitions found in the literature (e.g. 90 days used in LSMS surveys of the World Bank (Grosh & Glewwe, 1995, 1998, 2000) and up to 270 days used in the Thailand Household Economic survey (NSO, 2004)). Independently of the cut-off value, those definitions may exclude migrant household members who live in the city, but are nevertheless connected to the household. Gödecke (2012) therefore proposes a definition independent of the minimum days in the village, which is especially appropriate in countries with a high rural-urban migration rate. Combining this and the 180-days definition, we include all persons who stayed in the household for more than 180 days as nucleus (village) household members, and those persons who lived for more than 180 days outside the district as migrant household members. Persons who lived more than 180 days outside the household but in the same village or district and left the household permanently are dropped, as these are assumed to have founded an own household. For a discussion of different household definitions see Gödecke (2012).

¹⁶ To account for the developing country context, household expenditures are not only cash expenditures, but household consumption as defined in Chapter 1.3.1.

To facilitate a meaningful interpretation, included variables are centred. The coefficient of $femL_{jt}$ and $femM_{jt}$ therefore give the marginal effects at the mean of local and migrant income, respectively (Aiken & West, 1991; Brambor et al., 2006). As a last point to explain, panel data allow us to divide the error term v_{jt} of the regression into an individual specific (time constant) error c_j and an idiosyncratic error u_{jt} for each household j and period t (equation (4.2)).

$$w_{jt} = \alpha + \beta_{Ljt} femL_{jt} + \gamma_{Ljt} La_{jt} + \varepsilon_{Ljt} femL_{jt} * La_{jt} \quad (4.1)$$

$$+ \beta_{Mjt} femM_{jt} + \gamma_{Mjt} Ma_{jt} + \varepsilon_{Mjt} femM_{jt} * Ma_{jt}$$

$$+ \varepsilon_{jt} \log \frac{x_{jt}}{n_{jt}} + \sigma_{jt} \log n_{jt} + \theta_{jt} z_{jt} + v_{jt}$$

$$v_{jt} = c_j + u_{jt} \quad (4.2)$$

Endogeneity of the variables on female income share is a possible problem in our model. Meaningful instruments for female income shares are difficult to obtain (Masterson, 2012). But since the role of the women in the household will, except from her resources, depend on constant variables such as personality and attitudes of the household head and the women herself, a fixed effects model is applied to correct for endogeneity. In a fixed effects model, the individual error term (the individual fixed effect c_j) is treated as an unobserved random variable that is potentially correlated with the regressors and captures the time-invariant omitted variable bias. The Heckman-test supported this correlation for our data. Using the fixed effects estimator, the individual fixed effect c_j (equation (4.2)) is eliminated by subtraction from the individual mean for consistent estimation. As a result, only within-variation (variation within one individual over time) is made use of, which allows for consistent identification of the marginal effect despite unobserved heterogeneity (Cameron & Trivedi, 2010).

We apply two different fixed effects models. The classical approach to the Working-Leser model is a linear estimation. Our first model is therefore a linear fixed-effects model. Kingdon (2005) and Aslam and Kingdon (2008) point to a weakness of this simple linear approach when analysing education expenditure shares. The linear approach does not correct for a large share of households having zero education expenditures, leading to a bias in the estimation. One might instead think of two different mechanisms determining the outcome. First, households have to decide whether to spend anything on education at all (*participation decision*), and secondly, how much to spend conditional on a positive amount spent (*amount decision*). Since both mechanisms might be determined by different factors, a linear approach might conceal the influence of female bargaining power on education expenditure shares if the effect appears in one decision only, or if

effects stand in opposite directions. Hurdle models offer a possibility to estimate both decisions separately (Cameron & Trivedi, 2005):

$$f(w|\mathbf{x}) = \begin{cases} \Pr(d = 0|\mathbf{x}) & \text{if } w = 0 \\ \Pr(d = 1|\mathbf{x}) f(w|d = 1, \mathbf{x}) & \text{if } w > 0 \end{cases} \quad (4.3)$$

where d is a binary indicator with $d = 1$ for participants (education expenditure share $w > 0$) and $d = 0$ for non-participants (education expenditure share $w = 0$). For participants, $f(w | d = 1)$ describes the density of w , conditional on $w > 0$. We estimate the first part of the model, the *participation decision* as a fixed effects logit model. The logit model offers, in comparison to the alternative probit model, the advantage of unbiased results using panel data and fixed effects, since it relies on conditional maximum likelihood estimation. In the second part of the model we use a linear fixed effects model, conditional on a positive value of the education expenditure share w . To ensure positive values a lognormal distribution of the dependent variable *education expenditure share* is assumed (Cameron & Trivedi, 2010). A disadvantage of the fixed effects hurdle model is a reduced sample size. In the fixed effects logit model, only household with changes in the binary outcome variables are included, in the conditional fixed effects model only households with positive education expenditures are included. We therefore also present the linear fixed effect model, as this makes use of a larger sample size. As a robustness check we include the fixed-effects model as well as the conditional fixed-effects model also for log education expenditures as dependent variable.

To analyse whether the share of female local income and of female migrant income have the same (or a different) influence on education expenditure shares, we use an F-test (Aslam & Kingdon, 2008). We also test for the difference of the amount of female local income and female migrant income. The null hypotheses for both tests are:

$$\begin{aligned} \beta_{Ljt} &= \beta_{Mjt} \\ \gamma_{Ljt} &= \gamma_{Mjt} \end{aligned} \quad (4.4)$$

Control variables are chosen based on the Working-Leser Model of the Engel curve. First, we include female and male education. Education of the household members has been found to positively influence education expenditures (Masterson, 2012). The influence of log total expenditures on the share of education expenditures depends on the expenditure elasticity of

education expenditures g , $\partial \log(g(x, z)) / \partial \log(x)$.¹⁷ Whether education is a necessity good (expenditure elasticity between zero and one) or a luxury good (elasticity above one) depends on the country context, e.g. whether schooling is free. It might also be influenced by the current school levels of household members, since tertiary education will be more expensive than primary education (Aslam & Kingdon, 2008; Guzmán et al., 2008). Household composition influences the share of education as it determines the number of persons in the usual age for education (Hoddinott & Haddad, 1995). We include the proportion of household members in age groups following educational stages: proportion of children below 6, in the age range of primary school (6-11), of secondary school (12-17) and of tertiary education (18-23). For adults, we additionally control for the share of males and females; we include the proportion of female adults 25-45 and 46-65, and male adults 25-45 and 46-65. The last variable on household composition is the proportion of elderly above 65. Since these variables would add to 1 and create a multicollinearity problem, we exclude the first category, children below 6 from our models. The share of children in school age is expected to positively influence education expenditures, and especially to determine the decision whether to spend any amount on education. We control for the proportion of male and female adults, as this might influence the female bargaining power in the household, and therefore the share of education expenditures. These variables also control for differences in the household composition that might influence the decision to migrate. To control for a different role of the female migrant in the household, we include a dummy on whether at least one of the female migrants is married, as we do not have any information about motherhood. Additional variables that have been found to influence expenditure shares are occupational choices and assets (Lewbel, 2008). We therefore include dummies on whether the household has income from self-employment and agriculture, as well as the size of owned land.

4.5 Descriptive Results

The following chapter provides descriptive results on migration and off-farm employment in Northeast Thailand. First, it shows the importance of wage-income and migration for rural livelihoods. Second, it provides details on wage employment of female villagers and migrants, and details on expenditure patterns. Third, a general descriptive table of the variables used in the model is presented.

¹⁷ The vector z is a general vector of household characteristics here. It includes in this equation also all those household characteristics, that have been mentioned explicitly in equation (4.1).

Table 4.1 shows the composition of rural incomes. Wage employment is the income source with the highest mean in 2007, followed by own farm income, self-employment income and remittances from migrants. In 2010 the relative importance changes, self-employment income becoming the position with the largest mean, followed by wage employment, own farm employment and remittances. Income from self-employment and own agriculture increase strongly from 2007 to 2010, which might be due to higher food prices; local and migrant wage incomes are still of high importance for rural households.

Table 4.1 Composition of household income

Income source (per capita, month, PPP\$)	2007		2010	
	Mean	Std. dev.	Mean	Std. dev.
Own farm income	31.03	151.30	49.51	333.58
Wage employment	44.13	117.02	50.00	117.63
Self-employment	25.10	157.70	52.54	250.47
Remittances from migrants	20.09	63.08	23.98	67.29
Public transfers	2.84	15.03	11.95	18.10
Remittances from others	19.80	62.59	23.65	66.92
House (&land rent) income	11.23	34.11	4.23	26.44
Other income	2.05	17.95	2.99	23.59
Total income	155.70	286.29	218.86	559.23
N	2186		2105	

Source: Own calculations based on households surveys 2007 & 2010.

The importance of migration for rural households becomes clear when looking at the demographic situation in the village (Figure 4.1). The population structure including all household members follows the general projection of the Thai population, with long life expectancy and slowly contracting birth rates. Excluding migrants (defined as all household members living less than 180 days outside the household), a gap of both, males and females, emerges in the age cohorts between 20 and 40 years. This reinforces the observation of new family arrangements with grandparents taking care of the children, while the parents work in the city.

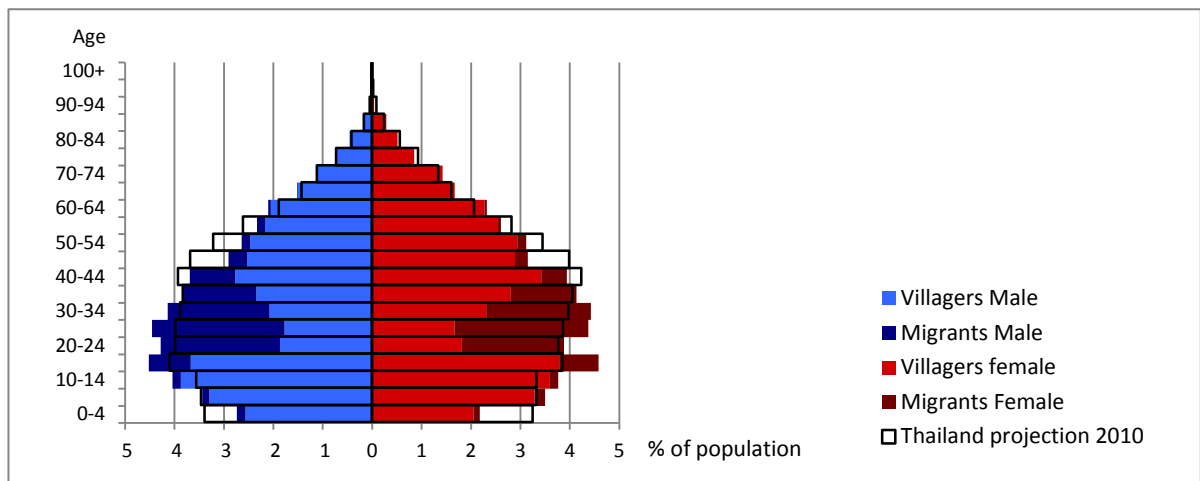


Figure 4.1 Age structure of rural population and migrants

Source Own calculations based on households surveys 2010, projection based on HSRI & IPSR (2003).

Table 4.2 shows characteristics of female migrant and local wage workers. It shows that local workers are almost 10 years older than migrant workers, and have around 2 years more education. As expected, migrants earn almost double the income in one month than do local workers. Comparing 2007 and 2010, the average income of migrants decreases, while that of local workers increases. In the majority of cases migration is directed to Bangkok¹⁸. Also the living situation of villagers and migrants is different: In both groups only few live in households with only one generation. Around 50 % of the local workers live in households with two generations, fewer, around 40 % live in households with three generations. For migrants, more workers (around 60 %) live in three generation households, and fewer in two generation households. This reflects newly emerging household arrangements where grandparents take care of the migrants' children.

¹⁸ Greater Bangkok Area, which is also a main destination of migrants, is not included in these numbers. Including Greater Bangkok would increase the numbers strongly.

Table 4.2 Female wage workers' characteristics

	2007				2010			
	Local	(Std. dev)	Migrants	(Std. dev)	Local	(Std. dev)	Migrants	(Std. dev)
Age (years)	37.70	(12.40)	28.40	(7.62)	38.93	(12.34)	29.94	(7.83)
Education (years)	7.08	(4.11)	9.47	(3.81)	7.85	(4.58)	9.81	(3.71)
Wage (PPP\$ per av. month)	180.41	(263.41)	414.17	(262.4)	231.98	(268.91)	397.08	(317.9)
Share of HH with 1 generation	0.05	(0.22)	0.02	(0.13)	0.04	(0.19)	0.02	(0.13)
Share of in HH with 2 gener.	0.52	(0.50)	0.41	(0.49)	0.49	(0.50)	0.34	(0.47)
Share of in HH with 3 gener.	0.40	(0.49)	0.56	(0.49)	0.45	(0.50)	0.63	(0.48)
Migration to Bangkok (share)			0.59	(0.49)			0.55	(0.49)
N	725		563		633		755	

Source: Own calculations based on households surveys 2007 & 2010.

Within the group of off-farm employed persons, differences in the sectors between female local and migrant workers can be observed (Table 4.3). Around one third of local workers, but only a very small share of migrants is employed in agriculture. In 2007 more than half of migrants works in industry, but this share is shrinking to 40 % in 2010. Also in the rural areas, the share of industry workers is shrinking from 22 % to 16 %. Service work of migrants increases from around 20 % in 2007 to almost 40 % in 2010. Further employment possibilities for females in the village are construction and mining, and public sector work. Only few persons in the village and in the city have white collar employments.

Table 4.3 Off-farm occupation of female wage worker

Occupation (%)	2007		2010	
	Local	Migrants	Local	Migrants
Agricultural labourer	33.33	2.14	30.42	4.76
Factory/ industry worker	21.85	52.14	15.53	40.00
Construction & mining	15.21	8.21	11.49	6.43
Service worker	19.64	27.86	21.84	38.04
White collar	1.24	4.11	2.59	4.06
Public sector worker	8.71	5.54	18.12	6.71
N	723	563	633	755

Source: Own calculations based on households surveys 2007 & 2010.

On a household level (see Table 4.4), female household members earn around one third of total wage income. From 2007 to 2010 there is a slight increase in female income shares. Nucleus female household members in 2007 contribute with 20 % slightly more to the household income than female migrants. In 2010, the contribution of female migrant workers is larger with 23 %.

Table 4.4 Share of male and female wage income in household wage income

	2007			2010		
	Total	Local	Migrants	Total	Local	Migrants
Male	0.63	0.38	0.25	0.60	0.31	0.29
Female	0.37	0.20	0.17	0.40	0.17	0.23
Total		0.58	0.42		0.48	0.52
N	1648			1628		

Note: Only household with off-farm employment included.

Source: Own calculations based on households surveys 2007 & 2010.

Table 4.5 shows the expenditure pattern of rural households in 2007 and 2010, since the share of education expenditures is the dependent variable in our model. Households in rural Northeast Thailand in 2007 spent half of their expenditures on food, this share increased in 2010 to 63 %. The second largest share is on non-food expenditures such as clothes, transportation and communication. Education expenditures are the third largest category, accounting for 4.7 % in 2007 and 5.9 % in 2010. In Thailand education is compulsory up to the lower secondary education (age 17, after 9 years schooling). The education system offers 12 years of free education, up to higher secondary education. Costs of tertiary education are shared between public sector and the private households, as there are tuition fees, in their size depending on the university, but also loan programmes. The public education system is complemented by private schools and universities. Still, private education expenditures are an important part of education financing in Thailand. Cresswell (1999) specified the costs incurred by private households in Thailand as two thirds of public spending. Those costs include tuition fees (for private schools), as well as complements such as books, transportation, or uniforms. Although a large share of these costs are incurred in private schools (mainly in urban areas), also poorer households are facing education expenditures. Cresswell (1999) estimates, that in the lowest income group, costs of public schooling can make up to 20 % of total household expenditures. Also a study of UNICEF Office for Thailand and TDRI (2012) confirms that poor Thai families often struggle to provide their children with learning materials such as books. Education expenditures in our sample (2010 data) are costs on school fees (13 %), but especially complements such as lunch and pocket money (54 %), transportation (5 %), and uniforms (5 %).

Table 4.5 Composition of household expenditures

Share of expenditures (%)	2007		2010	
	Mean	Std. dev.	Mean	Std. dev.
Food	50.15	15.97	63.86	16.74
Education	4.70	7.89	5.92	9.23
Health	1.79	4.12	1.17	3.46
Non-food expenditures	41.03	15.28	27.2	14.56
Rent	2.33	3.26	1.82	1.70
Total expenditure (PPP\$, p.c. & month)	110.61	69.67	179.85	130.60
N	2102		2105	

Source: Own calculations based on households surveys 2007 & 2010.

A summary of variables included in the empirical model is given in Table 4.6. Only households with wage employment are included, in total (2007 – 2010 pooled) these are 4237 households. Female local income is 16 %, female migrant income 21 % of total wage income. Male household members have around half a year more education than females, average male education is 7.2 years. Households are diversified in their income sources, as 24 % of household with wage employment additionally have income from self-employment, 88 % from agriculture.

To summarize, the descriptive results show the high importance of rural-urban migration as well as local wage income for rural households in Northeast Thailand. The demographic situation and therefore household arrangements change, as a large share of the young generation migrates to urban areas. Regarding expenditure patterns, despite the provision of generally free education by the state, education expenditures are the third largest category in household expenditures.

Table 4.6 Overview of variables included in the econometric models

Variable	Variable description	Mean	Std. dev.
Share_education	Share of education in expenditures	0.06	0.10
Share fem local inc	Share of wage income earned by nucleus female HH members	0.16	0.30
Total local inc	Wage income earned by nucleus HH members (PPP\$, per year)	2667.34	5091.62
Share fem migrant inc	Share of wage income earned by migrant female HH members	0.21	0.34
Total migrant inc	Wage income earned by migrant HH members (PPP\$, per year)	5184.96	8150.33
Total expenditures PC	Total expenditures per capita & year (PPP\$)	1597.50	1196.81
HH size	Household size (all members)	5.39	1.95
Female education	Average education of female household members (years)	6.72	2.77
Male education	Average education of male household members (years)	7.26	2.94
% 0-5 years	Share of household members 0-5 years old	0.08	0.11
% 6-11 years	Share of household members 6-11 years old (primary school)	0.10	0.13
% 12-17 years	Share of household members 12-17 years old (secondary school)	0.11	0.14
% 18-23 years	Share of household members 18-23 years old (tertiary education)	0.18	0.12
% 24-45 years, female	Share of household members 24-45 years old, females	0.18	0.14
% 24-45 years, male	Share of household members 24-45 years old, males	0.11	0.12
% 46-65 years, female	Share of household members 46-65 years old, females	0.10	0.12
% 46-65 years, male	Share of household members 46-65 years old, males	0.06	0.12
% > 65 years	Share of household members older than 65 years	0.06	0.10
Self-employed	Dummy: HH has income from own business (yes= 1)	0.24	0.43
Agriculture	Dummy: HH has income from agriculture (yes= 1)	0.88	0.33
Land owned	Land owned (ha)	2.37	2.93
N	4657		

Note: Pooled 2007, 2008, 2010. Only household with wage employment are included in this table.

Source: Own calculations based on households surveys 2007 – 2010

4.6 Econometric Results

Table 4.7 shows the results of all three models. Column 1 displays the coefficients and standard errors of the linear fixed effects (FE) model, with the dependent variable share of education expenditures, columns 2 and 3 show the results of the hurdle model: the logit fixed effects model on a binary variable of non-zero education expenditures, and the conditional fixed effects model on the log of (non-zero) share of education expenditures.

As expected we find a positive influence of the share of female local income (at mean local income) on the education share in the fixed effects model as well as the conditional fixed effects model. Based on the collective household model, this can be interpreted as an increase in bargaining power (Blood & Wolfe, 1960; Doss, 1996; Lopez-Ekra, 2011). In the logit model, this variable is not significant. This shows that the mechanisms determining the decision for any spending and the amount of spending are different, and that the hurdle model is appropriate. Similar differences between the models can also be detected looking at the variable on the amount of (male and female) local income: it is significant only in the fixed effects and the

conditional fixed effects model. Interestingly, the sign of the variable is negative: with higher off-farm income, a smaller share of expenditure is spent on education. To control for possible non-linear effects we include an interaction term between share of female income and the amount of local income. It is significant and negative, showing that the positive effect of the female local income share decreases with increasing income. Having female members working in the village therefore increases education expenditure shares especially for households with low local off-farm income.

The second variable of main interest is the share of female migrant income. In contrast to the share of female local income, the share of migrant female income has a negative effect (at mean migrant income) on the share of education expenditures in all three models. There are two possible reasons for this effect: Migration and the implied geographical distance might reduce the bargaining power and change preferences towards more consumption. The amount of migrant income in general has a positively significant influence on the share of education in all models. The interaction term between the share of female migrant income and the amount of migrant income is positively significant, with increasing incomes the negative effect of female migrant income shares therefore reduces. Again, we find that having female migrant workers is especially relevant for households with low income from migration, as with low income negative effects are strongest.

Table 4.7 Fixed effects model and hurdle model on share of education expenditures

	(1)	Hurdle model	
		(2)	(3)
	FE:	FE-logit	Conditional FE
Dependent variable:	<i>Share of edu exp</i>	Participation decision <i>Binary variable edu exp</i>	Amount decision <i>Log share of edu exp</i>
Share fem local inc	0.022** (0.009)	0.002 (0.003)	0.354*** (0.098)
Total local inc (log)	-0.003*** (0.001)	-0.000 (0.000)	-0.053*** (0.009)
Total local inc (log)	-0.009*** (0.003)	-	-0.214*** (0.035)
# Share fem local inc			
Share fem migrant inc	-0.071*** (0.015)	-0.008** (0.014)	-1.080*** (0.285)
Total migrant inc (log)	0.003*** (0.001)	0.000 (0.001)	0.064*** (0.018)
Total migrant inc (log)	0.013*** (0.004)	+ *	0.233*** (0.075)
#Share fem migrant inc			
Total expenditures PC (log)	-0.003 (0.003)	0.002*** (0.003)	-0.411*** (0.045)
HH size (log)	0.022* (0.012)	0.007*** (0.010)	0.048 (0.225)
Female education	0.001 (0.002)	0.000 (0.000)	0.050** (0.023)
Male education	-0.000 (0.001)	-0.000* (0.001)	0.029 (0.023)
Married migrants	0.013** (0.006)	0.002 (0.003)	0.084 (0.097)
% 6 - 11 years	0.110*** (0.025)	0.029*** (0.048)	1.305*** (0.367)
% 12 - 17 years	0.130*** (0.030)	0.023*** (0.036)	2.028*** (0.444)
% 18 - 23 years	0.097*** (0.031)	0.004 (0.006)	1.979*** (0.480)
% 24 - 45 years, female	0.061* (0.036)	-0.003 (0.009)	2.549*** (0.574)
% 24 - 45 years, male	0.071** (0.030)	0.001 (0.005)	1.882*** (0.615)
% 46 - 65 years, female	0.062 (0.039)	-0.019** (0.036)	3.318*** (0.697)
% 46 - 65 years, male	0.051 (0.041)	-0.001 (0.008)	1.883** (0.754)
% > 65 years	0.078* (0.042)	-0.018** (0.035)	3.158*** (0.925)
Self-employed	-0.009 (0.006)	-0.000 (0.001)	-0.084 (0.078)
Agriculture	0.011* (0.006)	0.002*** (0.004)	-0.007 (0.095)
Land owned	-0.001 (0.001)	-0.000 (0.001)	0.005 (0.018)
_cons	-0.045 (0.042)		-2.594*** (0.624)
N	4657	1227	2991

Note: * p<0.1, ** p<0.05, *** p<0.01, variables 1-6 are centered. Total income includes female and male income. Variable and interaction term are also jointly significant in all cases. FE-Logit: reported are marginal effects. Since marginal effects for interaction terms are difficult to derive in conditional logit models, only sign and significance are reported here (Buis, 2010). Odds ratios are additionally reported in the Appendix (Table 4.10). Sample size in the FE-logit is reduced, as only within variation is used. Results do not change significantly when using a random effects logit on the full sample instead. Conditional FE: conditional on non-zero education expenditures.

Source: Own calculations based on households surveys 2007 – 2010.

Looking at the control variables, we find differences between the linear models on the amount (column 1 and 3), and the logit model on the decision (column 2), which again supports the choice of the hurdle model. Total expenditure has a positive effect in the logit model, which means that households with higher expenditure have a higher probability of a positive amount spent on education. While total expenditure is not significant in the fixed effects model, it negatively influences the share of expenditures in the conditional fixed effect model. This means that for households with non-zero education expenditures, high total expenditures lead to a smaller share of expenditures spent on education. This result could suggest that households have a low expenditure elasticity of education and therefore, with increasing total expenditures, spend decreasing rates of their expenditure on education. This finding is discussed in more detail below.

Household size significantly and positively influences the share of education expenditures in the fixed effects and the fixed effects logit model. The education level of females in the households is positively significant only in the conditional fixed effects model, while the level of education of male household members has no influence. Well educated parents, in this case the mother, might aim at high and therefore costly education of their children.

The variables on household composition show significant influence in all three models, which can be explained by the influence of household composition and household lifecycle stage on education needs. The percentage of household members in the age of primary and secondary education is a positively influencing factor for the decision on education expenditures and the amount of those. Regarding the influence of the proportion of female and male adults on the education share, most robust results are found in the conditional fixed effects model. Here, the proportion of female adults (in both age groups) has a stronger positive influence on education expenditures than the proportion of men, which can be explained by a higher bargaining power of women, if they make up for a larger share of the households. The share of elderly has a negative influence on the probability of education expenditures larger 0 (logit model), but has a positive influence in the conditional fixed effects model.

Additional income sources of the household only have a significant effect in the fixed effects model. Income from an own business leads to a decrease of the share of expenditures spent on education, agriculture leads to an increase. The land size owned does not have a significant effect.

To verify the result of a low expenditure elasticity of education, we run both linear models (fixed effects and conditional fixed effects) with log education expenditures as dependent variables. Results are presented in Table 4.8. They show that education has an expenditure elasticity of

0.543 and 0.505. Education is therefore a necessity good (elasticity below 1) for rural households in Northeast Thailand, which might be due to compulsory and free education. The model confirms also our findings on income shares, as these variables show the same direction of influence. Also regarding control variables, results are robust.

To summarize, a positive influence of female local income has been found in the fixed effects model and the conditional fixed effects model, and is therefore an influencing factor for the amount decision of education expenditures. The share of female migrant income on the contrary has a negative effect on education expenditure share in the amount decision. The amount of local income also has a negative influence on education expenditure shares in the amount decision. Total expenditure and household size have different effects on the decision whether to spend anything at all and the amount to spend. Household composition influences the share of education expenditures in all three models.

Table 4.8 Fixed effects model and hurdle model on total education expenditures

Dependent variable:	(1)	Hurdle model
	FE: <i>Log total edu exp</i>	(2) Conditional FE: (Amount decision) <i>Log total edu exp</i>
Share fem local inc	0.387** (0.176)	0.352*** (0.099)
Total local inc (log)	-0.043*** (0.016)	-0.042*** (0.009)
Total local inc (log)	-0.195*** (0.060)	-0.224*** (0.035)
# Share fem local inc		
Share fem migrant inc	-1.299*** (0.376)	-0.919*** (0.275)
Total migrant inc (log)	0.041* (0.024)	0.035** (0.018)
Total migrant inc (log)	0.267*** (0.098)	0.214*** (0.073)
#Share fem migrant inc		
Total expenditures PC (log)	0.543*** (0.074)	0.505*** (0.043)
HH size (log)	2.149*** (0.351)	0.995*** (0.224)
Female education	0.085** (0.040)	0.048** (0.023)
Male education	-0.057 (0.042)	0.030 (0.022)
Married migrants	0.244 (0.151)	-0.048 (0.099)
% 6 - 11 years	6.202*** (0.744)	1.187*** (0.365)
% 12 - 17 years	6.086*** (0.769)	1.924*** (0.435)
% 18 - 23 years	2.627*** (0.835)	1.800*** (0.453)
% 24 - 45 years, female	1.555 (1.034)	2.322*** (0.553)
% 24 - 45 years, male	1.476* (0.893)	1.594*** (0.597)
% 46 - 65 years, female	0.387 (1.049)	3.028*** (0.692)
% 46 - 65 years, male	1.377 (1.091)	1.722** (0.735)
% > 65 years	0.273 (1.139)	2.987*** (0.930)
Self-employed	-0.047 (0.128)	-0.040 (0.077)
Agriculture	0.365** (0.184)	-0.008 (0.096)
Land owned	-0.022 (0.026)	0.006 (0.017)
_cons	-6.383*** (1.156)	-1.918*** (0.613)
N	4657	2991

Note: * p<0.1, ** p<0.05, *** p<0.01, variables 1-6 are centered. Conditional FE: conditional on non-zero education expenditures. Variable and interaction term are also jointly significant in all cases.

Source: Own calculations based on households surveys 2007 - 2010.

To ensure that changes in household composition leading to migration do not drive our results, we employ robustness checks including different interactions with female migrant income share (see Table 4.11 in the Appendix). In detail, we include an interaction between the share of female migrant income and the dummy on married migrants, as well as the share of female local income and a similar dummy on married local workers. In a second specification we include the percentage of 6 to 11 and 12 to 17 year olds in interaction with the share of female migrant income. For both specifications the conditional fixed effects model is presented, results on the full fixed effects model are similar. Results are robust to the models without additional interaction terms; all additionally included interaction terms are not significant.

To analyse the differences between female local and migrant incomes, we calculated the difference in marginal effects for results of the models on education expenditure shares (Table 4.7), and tested for their significance. Results are shown in Table 4.9.

Table 4.9 Differences in marginal effects

	(1) FE	Hurdle model	
		(2) FE-logit Participation decision Binary variable edu exp	(3) Conditional FE Amount decision Log share of edu exp
<i>Dependent variable:</i>	<i>Share of edu exp</i>		
Share fem local inc -	0.093***	0.010**	1.434***
Share fem migrant inc			
Total local inc (log)-	-0.006***	0.000**	-0.117***
Total migrant inc (log)			

Notes: * p<0.1, ** p<0.05, *** p<0.01. Based on Table 4.7. Differences are (due to interaction term) at mean income. Differences are not comparable in their size between the models, due to different dependent variables. Conditional FE: conditional on non-zero education expenditures.

Source: Own calculations based on households surveys 2007 – 2010.

The difference in marginal effects of the share of income earned by village and migrant females is positive and significant in all three models. This supports our hypothesis, that the effects of the share of female local and migrant income differ, and that migrant income has a less positive influence on the education expenditures which might be due to impaired monitoring reducing bargaining power and changed preferences of migrants.

Also the difference between the amount of local income and migrant income is significant. Here we find a negative difference due to the negative effect of local off-farm income on education expenditures shares in the fixed-effects and conditional fixed effects model. In the logit model, the difference is statistically significant, but small. The comparison of marginal effects therefore underlines the differences in effects of female local and migrant income.

4.7 Summary and Conclusions

This paper investigates the influence of female income shares on education expenditures in rural households in three provinces of Northeast Thailand. First, we are interested in whether the share of female local income earned in the village positively influences the share of expenditures spent on education. Second, we analyse whether the share of female migrant income has the same effect on expenditures for education as the share of local income of female household members in the village.

The theoretical basis of the paper is a collective household model, which assumes different preferences between male and female household members. Depending on their bargaining power, these preferences are realized in household expenditures. Preferences of women thereby are assumed to be in favour of children, a higher bargaining power of women should therefore lead to a higher share of expenditures on education. While a high share of female income in general is expected to increase bargaining power, migration might weaken this effect due to a principal-agent problem and impaired monitoring of expenditures. Additionally, migration to urban areas might change preferences of women towards more consumption and less education expenditures.

Descriptive results show that mainly the younger generation migrates, resulting in a lack of young adults in the village. Many expenditure decisions therefore have to be taken over by grandparents or other persons in the household. Migrant and off-farm employment in the village are important parts of rural incomes and livelihoods.

Results from our econometric models support our hypotheses regarding female local income shares. We use a linear fixed effects model and a fixed effects hurdle model, accounting for possible differences in the decision for or against education expenditures and the decision on the amount of education expenditures. Fixed effects are used in all models to control for unobserved heterogeneity. Female income has a stronger influence on the conditional amount of education expenditures than on the participation decision. Results show a higher share of female income of village household members to increase the share of expenditures on education (H1). As the effect decreases with increasing income, this is especially relevant for households with low local income. Also, the second hypothesis (H2) is supported by the results: the share of female migrant income has a negative effect on the amount of education expenditures. Again, effects are stronger for households with low migrant income. Differences between the coefficients of local and migrant income are significant. There are two possible explanations for this effect: First, geographical

distance of the migrant can reduce the bargaining power of the women and therefore reduce income shares in human capital investments. Second, urban life might change the migrant's preferences towards higher utility of consumption goods and therefore reduce preferences for education.

Our results show that a high share of female income from migration reduces education expenditure shares, while local wage employment increases education expenditure shares. Absent female household members reduce education expenditures and therefore might weaken future opportunities of children. These results suggest that governments may consider investing more into local employment opportunities for women to strengthen education investments. Further, results may be relevant for the design of (conditional or unconditional) cash transfer programs directed at women. Based on our results, these programs should take into account migration since transfers to women might have weaker effects on education expenditures if the recipient is a migrant. To strengthen this recommendation, further research would be necessary to verify results also for income from public transfers instead of earned income as in our study.

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Appendix

Table 4.10 Marginal effects and odds ratio of FE logit model on education expenditures

Dependent variable:	(1)	(2)
	FE-logit Participation decision <i>Binary variable edu exp</i> MARGINAL EFFECTS	FE-logit Participation decision <i>Binary variable edu exp</i> ODD RATIOS
Share fem local inc	0.002 (0.003)	1.653 (1.064)
Total local inc (log)	-0.000 (0.000)	0.959 (0.037)
Total local inc (log)	-	0.847 (0.167)
# Share fem local inc		
Share fem migrant inc	-0.008** (0.014)	0.160** (0.119)
Total migrant inc (log)	0.000 (0.001)	1.078 (0.052)
Total migrant inc (log)	+ *	1.478* (0.295)
#Share fem migrant inc		
Total expenditures PC (log)	0.002*** (0.003)	1.638*** (0.233)
HH size (log)	0.007*** (0.010)	6.687*** (4.240)
Female education	0.000 (0.000)	1.076 (0.084)
Male education	-0.000* (0.001)	0.881* (0.057)
Married migrants	0.002 (0.003)	1.582 (0.475)
% 6 - 11 years	0.029*** (0.048)	4688.417*** (5973.392)
% 12 - 17 years	0.023*** (0.036)	862.089*** (1415.490)
% 18 - 23 years	0.004 (0.006)	3.641 (5.919)
% 24 - 45 years, female	-0.003 (0.009)	0.478 (0.879)
% 24 - 45 years, male	0.001 (0.005)	1.457 (2.539)
% 46 - 65 years, female	-0.019** (0.036)	0.004** (0.009)
% 46 - 65 years, male	-0.001 (0.008)	0.767 (1.595)
% > 65 years	-0.018** (0.035)	0.005** (0.011)
Selfemployed	-0.000 (0.001)	0.996 (0.224)
Agriculture	0.002*** (0.004)	1.917** (0.621)
LandOwned	-0.000 (0.001)	0.918 (0.054)
N	1227	1227

Note: * p<0.1, ** p<0.05, *** p<0.01, variables 1-6 are centered. Marginal effects are also reported in Table 4.7. See also notes of Table 4.7.

Source: Own calculations based on households surveys 2007 - 2010.

Table 4.11 Additional interaction terms in models on education expenditures

	(1)	(2)
Dependent variable:	Conditional FE: Amount decision <i>Log share of edu exp</i>	Conditional FE: Amount decision <i>Log share of edu exp</i>
Share fem local inc	0.590*** (0.225)	0.355*** (0.097)
Total local inc (log)	-0.054*** (0.009)	-0.054*** (0.009)
Total local inc (log) # Share fem local inc	-0.217*** (0.035)	-0.216*** (0.035)
Share fem migrant inc	-1.146*** (0.293)	-1.164*** (0.333)
Total migrant inc (log)	0.063*** (0.018)	0.064*** (0.018)
Total migrant inc (log) #Share fem migrant inc	0.224*** (0.075)	0.235*** (0.075)
Married migrants	0.020 (0.113)	0.086 (0.097)
Share fem migrant inc #Married migrants	0.264 (0.226)	
Married villager	-0.020 (0.070)	
Share fem village inc #Married villager	-0.292 (0.244)	
% 6 - 11 years	1.326*** (0.370)	1.325*** (0.372)
Share fem migrant inc # % 6 - 11 years		0.115 (0.716)
##% 12 - 17 years	2.055*** (0.448)	2.073*** (0.452)
Share fem migrant inc ##% 12 - 17 years		0.512 (0.694)
Total expenditures PC (log)	-0.410*** (0.045)	-0.412*** (0.045)
HH size (log)	0.068 (0.226)	0.048 (0.226)
_cons	-2.617*** (0.634)	-2.595*** (0.623)
N	2991	2991

Notes: * p<0.1, ** p<0.05, *** p<0.01, Control variables not presented here, but included as in Table 4.7. Variables 1-6 are centered. Variable and interaction term are also jointly significant in all cases. Results on Fixed effects model are similar. See also notes of Table 4.7.

Source: Own calculations based on households surveys 2007 – 2010.

Table 4.12 Fixed effects model and hurdle model, including self-employment

	Hurdle model:		
	(1) FE:	(2) FE-Logit Participation Decision Binary variable edu exp	(3) Conditional FE: Amount Decision Log share of edu exp
Dependent variable:	<i>Share of edu exp</i>		
Share fem local inc (wage+self)	0.006 (0.006)	0.001 (0.002)	-0.030 (0.077)
Total local inc wage (log)	-0.002*** (0.001)	-0.000 (0.000)	-0.027*** (0.007)
Total local inc self (log)	0.000 (0.002)	0.001 (0.001)	0.012 (0.024)
Share fem migrant inc (wage+self)	-0.037*** (0.010)	-0.003 (0.005)	-0.584*** (0.143)
Total migrant inc wage (log)	0.001** (0.001)	0.000 (0.000)	0.034*** (0.009)
Total migrant inc self (log)	0.000 (0.001)	0.000 (0.000)	0.031** (0.016)
Share fem local inc (wage+self)	-0.001 (0.001)	-	-0.013 (0.014)
# Total local inc wage (log)			
Share fem local inc (wage+self)	-0.002 (0.001)	-	0.006 (0.015)
# Total local inc self (log)			
Share fem migrant inc (wage+self)	0.003 (0.002)	+	0.061** (0.029)
# Total migrant inc wage (log)			
Share fem migrant inc (wage+self)	0.000 (0.002)	-	0.006 (0.023)
# Total migrant inc self (log)			
Total expenditures PC (log)	-0.004 (0.003)	0.002*** (0.003)	-0.445*** (0.042)
HH size (log)	0.028** (0.012)	0.005*** (0.008)	-0.024 (0.189)
Female education	0.003* (0.001)	0.000 (0.000)	0.057*** (0.021)
Male education	0.001 (0.001)	-0.000 (0.001)	0.035* (0.020)
% 6 - 11 years	0.112*** (0.025)	0.025*** (0.042)	1.246*** (0.359)
% 12 - 17 years	0.138*** (0.028)	0.020*** (0.032)	2.267*** (0.391)
% 18 - 23 years	0.102*** (0.030)	0.005 (0.007)	2.073*** (0.442)
% 24 - 45 years, female	0.070* (0.036)	-0.001 (0.007)	2.786*** (0.596)
% 24 - 45 years, male	0.066** (0.032)	0.001 (0.004)	1.661*** (0.511)
% 46 - 65 years, female	0.072* (0.039)	-0.015* (0.029)	3.333*** (0.658)
% 46 - 65 years, male	0.063* (0.038)	-0.000 (0.006)	2.123*** (0.597)
% > 65 years	0.077* (0.039)	-0.012* (0.023)	3.194*** (0.674)
Self-employed	-0.015 (0.014)	-0.004* (0.008)	-0.202 (0.189)
Agriculture	0.015** (0.006)	0.002* (0.004)	0.088 (0.087)
Land owned	-0.001 (0.001)	-0.000 (0.000)	-0.012 (0.013)
N	5265	1366	3416

Notes: * p<0.1, ** p<0.05, *** p<0.01, variables 1-6 are centered. FE-Logit: reported are marginal effects, since marginal effect are difficult to derive for interaction terms in conditional logit models, only sign and significance are reported here. Conditional FE: conditional on non-zero education expenditures. Constant included but not reported. Difference of marginal effects between Share fem village inc (wage+self) and Share fem migrant inc (wage+self) is significant in all three models .

Source: Own calculations based on households surveys 2007 – 2010.

5 POVERTY AND NUTRITION: A CASE STUDY OF RURAL HOUSEHOLDS IN THAILAND AND VIETNAM

An earlier version of this paper was accepted as background paper for the ADB Key Indicators 2014 Special Chapter: Addressing Knowledge and Statistical Gaps in Relation to Poverty Reduction, Inequality, and Inclusive Growth. Manila: Asian Development Bank.

Abstract

In this paper we analyse the link between nutrition and poverty in two Asian countries in which monetary-based poverty reduction has been especially successful. Thailand and Vietnam are two emerging market economies where poverty rates are now below 10 % and are in further decline. It is not clear to what extent this success has translated into similar improvements regarding the nutritional situation of the people and especially that of children. Results of this paper show that undernutrition continues to be a problem in Vietnam, with child underweight rates at 25 %, defined to be of high severity by the WHO (2014). In Thailand, the prevalence of 12 % of children being underweight is within the range of medium severity. Additionally, overweight becomes a new nutrition problem, with 20 % of children being overweight in Thailand and 12 % in Vietnam. Factors that influence nutrition outcomes, measured as z-scores of the weight-for-age indicator for children and as Body-Mass-Index (BMI) for adults, are investigated by using ordinary least squares (OLS) and instrumental variables (IV) regressions by country. The paper analyses whether factors correlated with nutrition change when households move away from the poverty line by differentiating three subsamples based on income groups. Quantile regressions at quantiles corresponding to over- and underweight cut-off values differentiate influencing factors at those nutrition levels. Poverty and income are found to influence nutrition outcomes, but other factors such as mother's height, migration and sanitation condition nutrition as well. Village conditions influence nutrition additionally. Coefficients of respective variables differ by income group. Quantile regressions shows, that while adult's personal characteristics show similar coefficients over the different quantiles, other factors, such as ethnicity, are only important for nutrition at under- or overweight quantiles. All regressions support the results that non-monetary factors play into the reduction of undernutrition; monetary poverty reduction therefore is not a sufficient condition to eliminate malnutrition.

5.1 Introduction

Asian countries have made significant progress in poverty reduction during recent decades. This has largely been due to economic growth and direct measures for poverty reduction. The optimistic view is that poverty in Asia may soon come to an end. But there are at least two reasons to be more careful in this prediction. First, head count ratio as a static poverty measure does not allow for any conclusion about the risk of people falling back into poverty, i.e. their vulnerability to poverty (Klasen & Waibel, 2013). In the past, economic, ecological and political shocks have been responsible for many people falling back to poverty. Examples are the financial, economic and food price crises which have hit Asian countries in 2008. The second reason why it is perhaps much too early to declare victory on the poverty front in Asia is that monetary poverty is just one of the several dimensions of poverty. Education, health and nutrition, for example, are other non-monetary poverty dimensions that need to be taken into account (Carter & Barrett, 2006; Clark & Hulme, 2010; Sen, 2000; Tsui, 2002). Several studies have demonstrated that the correlation between monetary and non-monetary poverty is low (Baulch & Masset, 2003; Günther & Klasen, 2009; McKay & Lawson, 2003).

One important dimension of poverty is nutrition. The global food price crisis reminded the development community that food security remains a global concern. The number of undernourished people in the world passed beyond the 1 billion mark, the majority of them live in Asia. In this paper we analyse the link between nutrition and poverty in two Asian countries where monetary-based poverty reduction was considered to be especially successful: Thailand and Vietnam, two emerging market economies where poverty rates are now below 10 % and are in further decline. It is not so clear to what extent this success has translated to similar improvements in the nutritional situation of the people and especially that of children, as market failures, lacking access to public goods and services, inter- and intra-household inequality as well as long-time health effects of malnutrition impede nutrition. Emerging market economies as Thailand and Vietnam also face a further problem of malnutrition: increasing overweight. With economic development the nutrition in developing countries changes towards diets rich in fats, the so called nutrition transition, leading to overweight and obesity with tremendous health problems (e.g. Popkin, Adair, & Ng, 2012). Women who were malnourished as children have a higher risk for overweight and pass this risk to their children, aggravating the double burden of malnutrition in emerging countries (Baptiste-Roberts et al., 2012).

In this paper we address the following specific questions:

- (1) Does malnutrition, especially among rural children, remain a problem in Thailand and Vietnam in spite of the progress made in poverty reduction?
- (2) What are the factors that condition the nutritional status in the rural population of the two countries?
- (3) What are the factors that influence nutrition outcomes as rural households in the two countries move away from the poverty line?

The analysis in this paper is concentrated on the rural populations in Thailand and Vietnam. We use data from a unique and rich household panel data set of three provinces in Northeast Thailand and three provinces in Vietnam¹⁹, collected under the DFG FOR 756 project on vulnerability to poverty.²⁰ Surveys were conducted in 2007, 2008 and 2010 and contain data on 4400 households in 440 villages. The provinces were purposively selected on basis of a low per capita income, a high importance of agriculture, and the existence of risk factors such as remoteness, low agricultural potential and poor irrigation infrastructure. Having these conditions in common, the provinces nonetheless vary in agro-ecological conditions, infrastructure and development potential (Hardeweg et al., 2013). Within the provinces, a three-stage cluster sampling procedure on sub-district, village and household level was employed, resulting in a household sample representative of the rural areas of the six provinces. The survey instrument was a comprehensive questionnaire covering detailed information on household members and the composition of income and expenditures. It included self-reported anthropometric data of all household members including children below 5 years of age and their mothers. Since datasets containing both, anthropometric data as well as detailed information on income and consumption, are scarce the dataset is especially useful for the analysis of poverty and nutrition.

5.2 Conceptual framework

In this section we establish the conceptual basis of this study. We introduce three aspects necessary for analysing the relationship between nutrition and poverty. First, the most common measures of nutrition in order to identify the nutrition outcome variables are defined and the data quality is assessed. Second, we discuss how to integrate nutrition into economic household

¹⁹ The provinces included are Ubon Ratchathani, Buriram and Nakhon Phanom in Thailand and Ha Tinh, Hua Thien Hue and Dac Lac in Vietnam.

²⁰ www.vulnerability-asia.uni-hannover.de, for the sampling procedure see Hardeweg et al. (2013).

models and explain our choice of econometric models for estimation. Third, we identify the main variables that have been used in models aiming to explain the change in the nutritional status of people in developing countries.

The nutritional status of a population is often measured by using anthropometric indicators, mostly for children below the age of five. For example, in the Millennium Development Goals underweight of children is one of the indicators for hunger. Stunting and wasting of children are indicators for the WHO's Global Targets 2025. Also, the largest share of scientific publications on malnutrition concentrates on children below the age of 5. There are several reasons for this choice of indicators. First, even short periods of undernutrition can cause long lasting or even irreversible damage to children. Child malnutrition can lead to low cognitive outcomes and therefore to lower productivity even during adulthood. Second, children's bodies react faster to changes in food supply and food shortages manifest faster in weight and height. Therefore, the nutritional status of children below the age of 5 is a good proxy for the current nutritional situation of a population. However, only a share of households has children below the age of 5. For a complete picture of the nutritional status of a population, indicators for adults should be included. Even if adults are less vulnerable to short term food shortages, their health and nutrition determine their capacity for physical work, and therefore determine their economic support to the society (WHO Expert Committee, 1995).

The most commonly used anthropometric measures to describe the nutritional status of a population are weight and height.

- a) Weight-for-age (WFA)
- b) Height-for-age (HFA) (stunting)
- c) Weight-for-height (WFH) (wasting)
- d) Body mass index (BMI) for age (for children)
- e) Body mass index (BMI) for adults

For children the indicators are related to age or height, (a – d) while for adults the body mass index (e) is the only measure. WFA is an indicator of underweight, low HFA is an expression of stunting, low WFH is called wasting and the BMI is a measure for underweight, generally used for adults. All five indicators are used as proxies of undernutrition relative to defined threshold values. Although calculated from the same anthropometric data, these indicators measure different aspects of undernutrition and can therefore give different results for the same population. The most commonly used measure is weight-for-age (WHO Working Group, 1986),

since it reveals both, acute and chronic malnutrition (de Onis & Blössner, 2003) and is for example used in the Millennium Development Goals. Stunted growth, which means low height relative to age (HFA), is an indicator for chronic malnutrition and early childhood illnesses. WFH is regarded to be an indicator for acute undernutrition as weight can drop rapidly in cases of acute food shortages while height is unaffected by short time changes in food supply. For adults, BMI is the most widely used indicator, measuring the current nutritional status. For children, reference standards and cut-off points for BMI-for-age have only been developed some years ago and are not yet that widely used (Cole et al., 2007). Furthermore, WFH, WFA and BMI can also be used to detect overweight. Overweight is a second state of malnutrition, as it leads to severe health problems.

Statistically, child under- (and over-)nutrition is measured using growth data in comparison to an international healthy reference population of the same age (or height), using standards developed by the WHO (de Onis et al. 2009). To describe the extent of malnutrition for (a) to (d) z-scores are used which are defined as

$$z - score = \frac{x - \mu}{\sigma} \quad (5.1)$$

where x is the observed value, μ is the mean of the reference population and σ is the standard deviation of the reference population. For indicators (a) to (d) a z-score of -2 is common, i.e. for WFA, if children are more than two standard deviations below the median of their reference group, they are considered underweight. The body mass index (BMI) is calculated as weight in kg divided by the square of height, measured in meters. For children, z-scores for BMI-for-age are used while for adults, a fixed BMI cut-off value of below 18.5 defines underweight. For children, overweight is usually defined as WFA or WFH larger than 2 z-scores from the reference population. For adults, the cut-off point for overweight is at a BMI of 25. For the econometric models of this paper we decide to use WFA as the dependent variable for children, as, and is widely used to reveal both, acute and chronic malnutrition. For adults we use BMI.

Our dataset contains weight, height and age²¹ of children and adults. Values have been reported by the household heads. Since the WHO recommends anthropometric data to be measured, we took several steps to verify the quality of our data. First, we used the cut-off points for data

²¹ Age of children has been reported in years, while WHO usually uses age in months. As a robustness check and to verify our results, we excluded children below 1 year, as in the first year growth is especially rapid. Results did not change, so that all children below 5 are included in our analysis.

exclusion recommended by the WHO Expert Committee (1995). Therefore, observations with z-scores below -6 or above +6 (HFA), below -5 or above +5 (WFH, BMI) or below -6 or above +5 (WFA) respectively were excluded from the analysis, as these extreme values most probably stem from measurement errors. Second, we compared prevalence of underweight, wasting and stunting in our data with WHO data. Results can be found in Table 5.10 in the appendix. In general, our data show a higher prevalence of undernutrition, which can be explained by the rural sample containing poor provinces that our data is based on. As an additional reference we find our results on WFA in line with an estimation of Haddad et al. (2003) who predicted a prevalence of 28 % underweight children for Vietnam in 2015. Third, we assessed data quality using the standard deviation of z-scores, a method proposed by the WHO Expert Committee (1995) and Mei and Grummer-Strawn (2007). As expected, recommended ranges of standard deviations for z-scores are smaller than standard-deviations in our self-reported data (see Table 5.11, appendix). Results on the data quality of the different indicators confirmed our decision of using WFA as a dependent variable in the econometric models. Fourth, to support our results on child malnutrition and to give a broader picture on the nutritional situation of our sample population, we also analyse adult nutrition using BMI values, which are less prone to measurement errors than child growth data, due to slower changes in weight and height, and have smaller standard errors due to a larger sample size of in total 38,000 observations.

After defining the measures for nutrition, we now discuss how to integrate nutrition into economic models. Aside from income, health and nutrition can be considered as components of a household's utility function, given a household's production choices and resource constraints. However, as pointed out by Alderman (2012), the explanatory power of income based indicators is poor and according to Almond and Currie (2011) it is increasingly recognized that the health and nutritional status of children is not only subject to postnatal but to prenatal conditions as well. This suggests that information on a mother's health prior to child birth is important for assessing the nutritional status of children. Modelling nutrition outcomes (N) therefore can be formulated as a function of household income (Y), household (X) and village (Z) characteristics, and child's (C) and mother's (M) characteristics, or adult's characteristics respectively. Following Kabubo-Mariara et al. (2009) we specify a model for the nutritional status of children below the age of five (equation (5.2)):

$$N_{it} = f(Y_{jt}, C_{it}, M_{it}, X_{jt}, Z_{kt}, \varepsilon_{it}) \quad (5.2)$$

For adults of the age 19-59, equation (5.3) is established.

$$Na_{it} = f(Y_{jt}, A_{it}, X_{jt}, Z_{kt}, \varepsilon_{it}) \quad (5.3)$$

Nc_{it} is the nutritional outcome of child i at time t , Na_{it} is the nutritional outcome of adult i . Y is income of household j , C are child, M mother and A adult characteristics of person i , X describe household characteristics and Z is a vector of characteristics of village k , all at time t . In our models, we use z-scores of WFA as dependent variables for children and BMI for adults.

As the dependent variables in our models, we use WFA as nutrition outcome indicator for children (Nc) and BMI as nutrition outcome indicator for adults (Na), both as continuous variables. For comparison of results between Thailand and Vietnam, we estimate all our models separately for each country.²² First, we estimate linear model using pooled data with time fixed effects and cluster robust standard errors. In order to deal with possible endogeneity of the income variable we apply an instrumental variable two-stage least squares (IV 2SLS) approach where necessary. Endogeneity of the income variable can arise, because nutrition might influence labour productivity, and the time allocated for work could influence the time allocated to child care. Additionally, the instrument corrects for a possible measurement error in the income variable. The Durbin-Wu-Hausman test confirmed endogeneity of the income measure for most regression. Only for the Vietnam model on child nutrition, we cannot reject exogeneity of the income variable, and use ordinary least squares (OLS) instead of IV 2SLS. Following Alderman et al. (2006) and Haddad et al. (2003), we use (log) asset value as an instrument, which influences income, but is exogenous to nutrition outcomes. The instrument is significant at the 5 %-level in the first-stage regression and proves to be a strong instrument based on the Stock-Yogo criterion (Cameron & Trivedi, 2010).

To identify whether factors that condition the nutritional status of rural children in the two emerging market economies change as households move away from the poverty line, we apply an OLS model to three subsamples, truncated by income. As cutting points we choose the 2 \$ poverty line and the 4 \$ poverty line, which serves as middle-income threshold (ADB, 2010).

At lower levels of nutrition outcomes an increase in nutrition values implies a positive health effect. For high nutritional levels close to or above the threshold for overweight an increase in weight-for-age z-scores results in negative health effects. The influence of income (and other

²² Models pooling both countries are additionally presented in the appendix.

factors) might depend on the level of nutrition. We therefore apply quantile regression to our nutrition model. Quantile regression allows the estimation of the relationships between nutrition and regressors at different points of the conditional distribution of nutrition values. Additionally, it offers the advantage of being more robust regarding outliers than mean estimation, and, as a semiparametric approach, it avoids assumptions about the parametric distribution of errors (Cameron & Trivedi, 2010). For our nutrition model, coefficients are estimated at those quantiles that correspond to the thresholds of over- and undernutrition, which is a WFA of $-2/ +2$ z-scores for children and a BMI of 18.5/ 25 for adults. The corresponding quantile for each regression is indicated in the regression tables.

The choice of explanatory variables follows the general framework developed by UNICEF (Menon, 2012). The framework distinguishes between immediate, underlying and basic causes of undernutrition, whereby immediate causes are lack of food and nutrition intake and poor health status. Underlying factors are food access, child care practices, water, sanitation and health services. Institutions, economic structure and environment influence nutrition as basic causes. In the following, we describe the choice of variables in detail.

Most studies on child undernutrition use Demographic and Health Survey (DHS) data (e.g. Agee, 2010; Kabubo-Mariara et al., 2009; Kandala et al., 2009), which are rich in terms of health information on child and mother, but do not always provide income or consumption data. In our panel data set we do have direct measures available; therefore we include (log) per capita income as Y . Higher income and reduction in poverty have been found to have positive effects on nutrition and health (e.g. Anand & Ravallion, 1993; Strauss & Thomas, 1998) but this relationship can vary across countries and within households (Haddad et al., 2003). This variation can be attributed to inequality and the different extents to which public goods are directed towards nutrition (Anand & Ravallion, 1993). Also, for overnutrition we expect a positive influence of income, as in developing and emerging countries westernized diets are more often adopted in richer households, leading to a higher prevalence of undernutrition (Popkin et al., 2012).

In the models on child nutrition, we add age, gender and a dummy variable reflecting whether the child was sick in the reference period as child characteristics (C). Since the risk of malnutrition has been shown to differ with the ages of children (Alderman et al., 2006; Menon, 2012), we include age dummies. A slower growth of girls/boys might occur if intra household allocation of resources discriminates for gender (Belitz et al., 2010). The nutritional status of a child will suffer in times of illness, but with good health care, effects will be less strong (Menon, 2012). For mother

characteristics (M), height is generally believed to predetermine the child's nutritional status, which underlines intergenerational transmission of undernutrition through genes and economic status (Belitz et al., 2010). Mother's education (Smith et al. 2003) is used as a proxy for child care practices. Migration of the mother might additionally reduce time for childcare. In the models on the nutritional status of adults, we include similar variables on adult characteristics (A): gender, education, age and dummies on sickness and migration. For household characteristics (X) we include household size and dependency ratio which may influence the resource situation of the household and the degree of childcare (Belitz et al., 2010). Migration of other household members measured in months absent per year is included as a proxy for the amount of remittances sent to the rural household. To measure the influence of sanitation facilities in the household we include a dummy on having running water and whether or not the household has a private water toilet. For village characteristics infrastructure is included, proxied by percentage of households with sanitation (Haddad et al., 2003). We control for the relative wealth of the village by including average income of the village. In Vietnam we also include a dummy for ethnic minorities and control for different agro-ecological zones, i.e. whether the household is located in a mountainous region in Vietnam. For Thailand we add province dummies for the same reason.

5.3 Descriptive analysis

In this section we describe the background of our data which were collected among 4400 households in Thailand and Vietnam in 2007, 2008 and 2010. The provinces covered by our panel survey can be characterized as being vulnerable to poverty due to poor infrastructure and a strong reliance on natural resources for livelihoods.

5.3.1 Income, consumption and poverty

Figure 5.1 shows the distribution of per capita income (per month) for 2007 and 2010 in Thailand and Vietnam, differentiated by province. The 1.25 \$, the 2 \$, and the 4 \$ income per capita and day poverty lines are added in red. While the 1.25 \$ line marks the extremely poor, the 4 \$ line is a threshold which can be regarded as characterizing the middle class (ADB, 2010). The data show that while extreme poverty (i.e. below the 1.25 \$ line) is low, a large number of the rural population in both countries live just above the 1.25 \$ but below the 2 \$ poverty line. In 2010, around 10 % of Thai households and 20% of Vietnamese households were below the poverty line of 1.25 \$. Increasing the threshold to 2 \$ per day doubled the numbers of the poor in Thailand, and increased it to more than a third in Vietnam. In 2010, the poverty rate was higher for both,

1.25 \$ and 2 \$ poverty lines. The largest share of households in both countries and years lived below the middle class threshold of 4 \$. Variation between provinces is small but has increased in 2010, after the food price and economic crisis suggesting that provinces have employed different coping mechanisms. It is also interesting to note that poverty in 2010 has declined more strongly in Thailand than in Vietnam, which suggests that Thailand recovered better from the crisis and that employed social protection measures for the poor may have been effective.

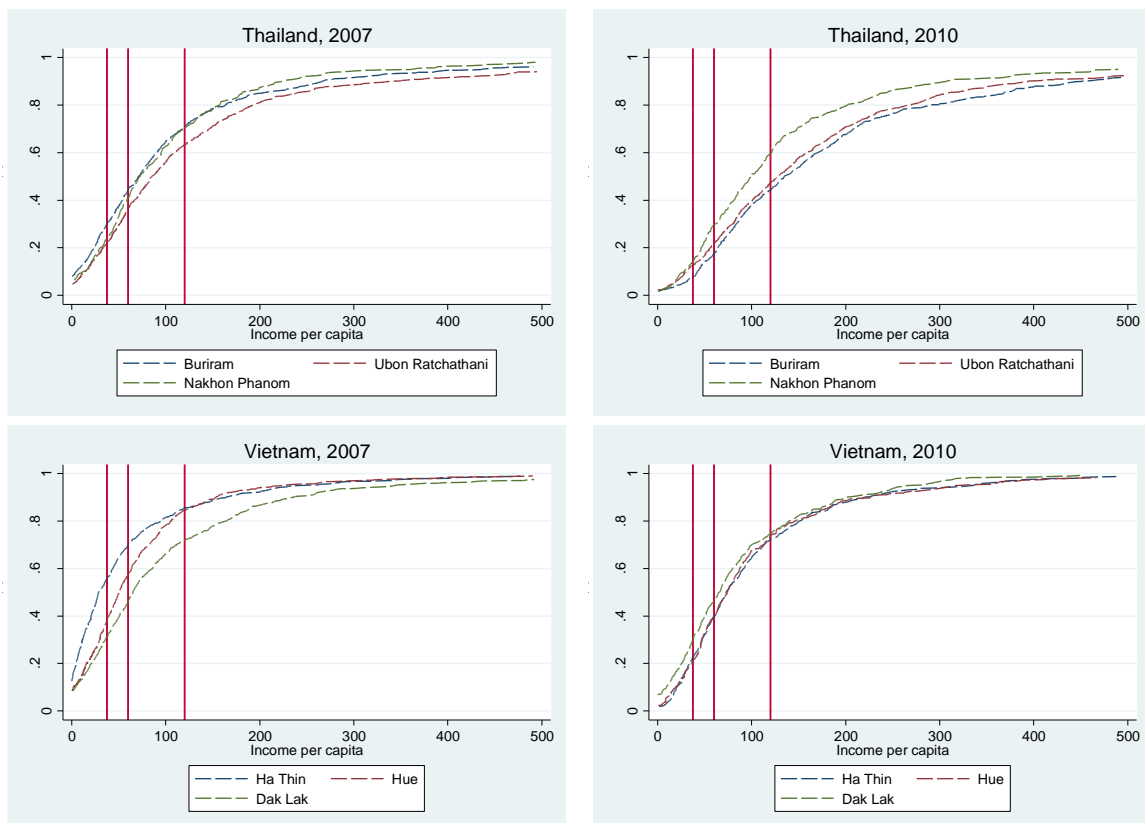


Figure 5.1 Distribution of income per capita in Thailand and Vietnam, 2007 and 2010

Note: Poverty lines at 1.25 \$, 2 \$ and 4 \$ per day. Income per capita and month. Accounted for survey design.

Source: Own calculations based on household survey 2007 & 2010.

In Figure 5.2 the effect of food prices on the distribution of food consumption shares is shown for both countries by aggregating the data of the respective three provinces. It can be seen that in 2010, at a time when food prices were high due to the aforementioned economic crisis, the distributions for both countries shifted to the right. This indicates that the majority of rural households had to allocate a much higher share of their consumption expenditures towards food consumption. The effect was stronger in Vietnam, where the mode shifted to about 80 % while it increased to above 60 % in Thailand. Relating these observations to the data on poverty and

consumption shows that, in spite of a decline in poverty, adjustments in food consumption became necessary and therefore consequences for the nutritional status of the population are likely.

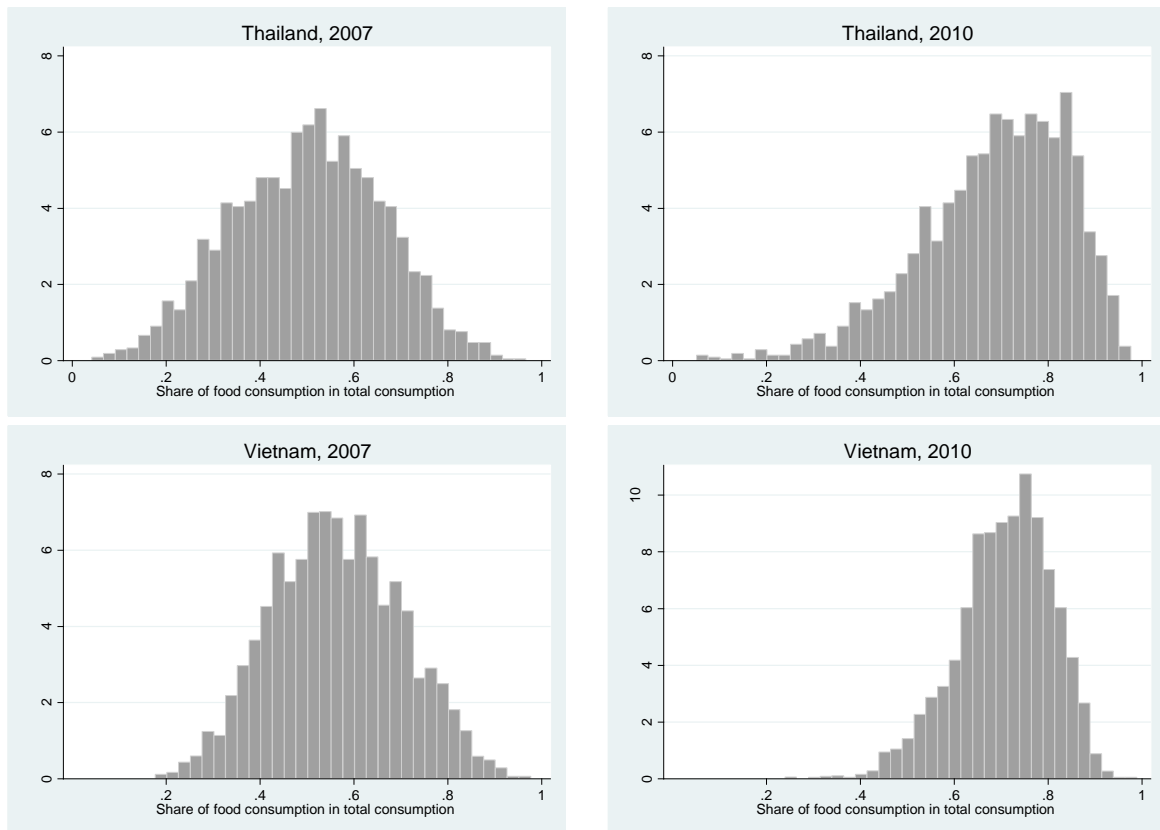


Figure 5.2 Share of food in total consumption in Thailand and Vietnam, 2007 and 2010

Note: Accounted for survey design.

Source: Own calculations based on household surveys 2007 & 2010.

5.3.2 Nutrition and income

In the next step we assess nutritional outcomes of the households in our sample. In Figure 5.3 the distribution of BMI for the adult rural population in both countries is presented and Figure 5.4 shows WFA z-scores for children using the 2010 data set. For adults, the average BMI in Thailand is higher than in Vietnam where the share of persons below the 18.5 threshold is considerably higher. The results suggest that undernutrition is still a problem. Interestingly, the proportion of underweight adults in both countries is higher than the share of poor people in 2010. In addition, in Thailand the so called double-burden phenomenon can be observed whereby the share of obesity is almost at par with the occurrence of undernutrition.

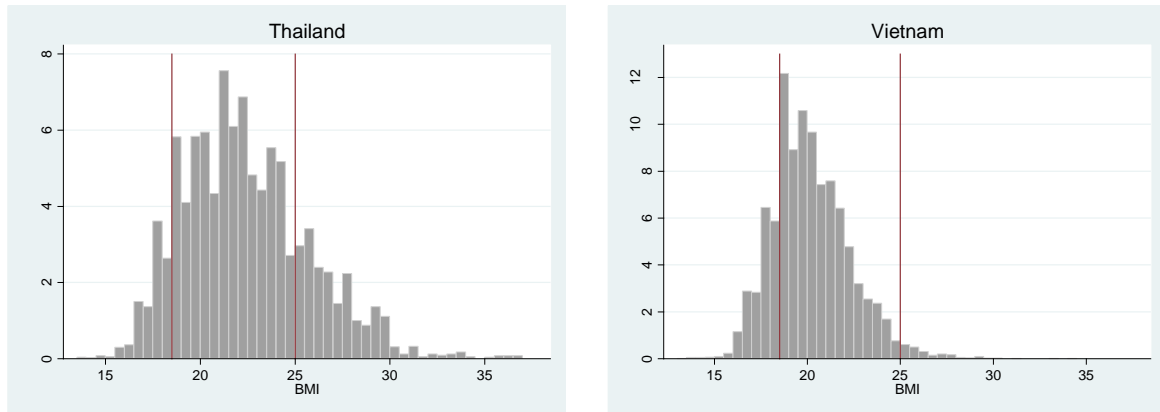


Figure 5.3 Distribution of the BMI over adult household members in Thailand and Vietnam, 2010

Note: Accounted for survey design. Adults age 19-59.

Source: Own calculations based on household survey 2010.

Figure 5.4 shows the distribution of the weight-for-age z-scores for children below 5 years of age in 2010. Also here, the double-burden can be observed, with values below the underweight threshold and above the overweight threshold. The distribution is slightly shifted to the left in Vietnam, resulting in a lower mean z-score, a higher percentage of underweight and lower percentage of overweight children in comparison to Thailand.

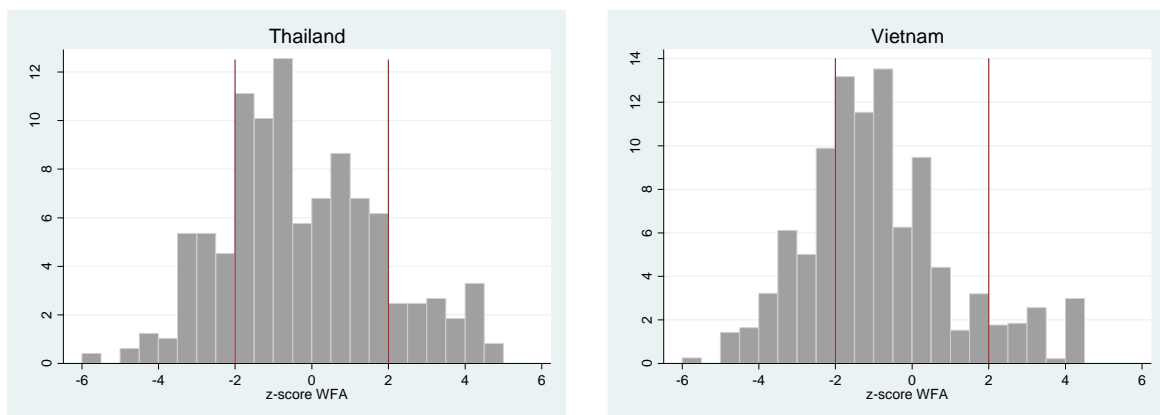


Figure 5.4 Distribution of the WFA z-scores over children below 5 years of age in Thailand and Vietnam, 2010

Note: Accounted for survey design.

Source: Own calculations based on household survey 2010.

A complete overview of nutrition indicators, pooled over three years, is presented in Table 5.1. We calculated the mean differences in nutrition outcomes for the pooled data set of three years on average and across different intervals of per capita income for Thailand and Vietnam separately. In total, 12% of children in Thailand and 25% of children in Vietnam are underweight

based on the WFA indicator. This corresponds with a level of medium severity for Thailand and high severity for Vietnam based on the definition of the WHO. Values for stunting are much higher than those for underweight and wasting, which is consistent with usual patterns (WHO, 2014). As expected, undernutrition rates are still higher in Vietnam. For the comparison across income groups, we start with a per capita income of below 2 \$ and take 8 \$ or more per day as the upper range. For nutrition indicators we take the respective shares based on WFA, BMI, HFA and WFH for children and BMI for adults.

Table 5.1 Mean differences in nutrition outcomes by income group in Thailand and Vietnam

Income (PPP\$ per capita and day)	Total	0 - <2	2 - <4	4 - <6	6 - <8	>=8
THAILAND						
Share of children underweight (WFA)	0.12	0.13	0.15	0.10	0.08	0.09
Share of children stunted (HFA)	0.43	0.43	0.45	0.44	0.40	0.34
Share of children wasted (WFH)	0.12	0.12	0.14	0.11	0.14	0.11
Share of children underweight (BMI)	0.14	0.14	0.14	0.12	0.15	0.13
Share of children overweight (WFA)	0.20	0.20	0.19	0.19	0.25	0.22
Share of adults underweight (BMI)	0.12	0.13	0.13	0.13	0.11	0.11
Share of adults overweight (BMI)	0.18	0.18	0.18	0.17	0.19	0.20
VIETNAM						
Share of children underweight (WFA)	0.25	0.29	0.19	0.15	0.16	0.15
Share of children stunted (HFA)	0.52	0.51	0.48	0.48	0.49	0.53
Share of children wasted (WFH)	0.15	0.16	0.13	0.16	0.15	0.09
Share of children underweight (BMI)	0.15	0.16	0.13	0.13	0.12	0.10
Share of children overweight (WFA)	0.12	0.12	0.12	0.13	0.15	0.17
Share of adults underweight (BMI)	0.26	0.30	0.25	0.23	0.23	0.19
Share of adults overweight (BMI)	0.02	0.01	0.01	0.02	0.03	0.02

Note: Data pooled 2007, 2008, 2010. Accounted for survey design. Children younger 5, adults age 19-60.

Source: Own calculations based on household surveys 2007-2010.

Table 5.1 shows that in both countries with increasing income the share of undernourished persons falls for most indicators. The relationship seems to be stronger in Vietnam than in Thailand. In Vietnam, the share of underweight children based on WFA in the middle and upper income categories is only half of the share in the lowest income group. In Thailand the share falls only about 4 %. The most dramatic decrease appears to take place between 2 \$ and 4 \$ per day. While causality cannot be assumed with this type of comparisons as other factors may be confounding the decline, the result is consistent with earlier predictions of the influence of income on nutrition (e.g. Haddad et al., 2003).

Table 5.1 confirms our finding that overnutrition is a problem for rural households in Thailand Vietnam. Adult overweight is mainly a problem in Thailand, while only few adults are overweight in Vietnam. In Vietnam, child overweight is more common than adult overweight, 12 % of children are overnourished. In Thailand, one fifth of children in the sample are overweight. Overweight

seems to be correlated to income, as the prevalence increases with income. The prevalence in low income groups nevertheless suggests that a diet rich of fats is also available for the poorer households.

The relationship between income and nutrition outcomes is further demonstrated in Figure 5.5 (see appendix), which shows a scatterplot of the data set relating monthly per capita income and adult BMI. For Thailand it can be shown that, while the likelihood of a person to fall out of the norm tends to decrease with higher income, the dispersion is high and increased in 2010, after the crisis. In Vietnam this pattern is clearer and also more consistent between the two years. It can be established that there is a considerable share of undernutrition beyond the poverty line in both countries; the nutrition problem does not end when a household has surpassed the poverty line. In Figure 5.6 (appendix) a similar exercise is performed for WFA of children. Generally, the dispersion is higher than for adult BMI. While the share of underweight children is higher in Vietnam, there is a fair amount of overweight existent among children in both countries, which suggests misguided developments in nutrition. What can be said for adults also seems to be true for children: the end of poverty is not the end of malnutrition, and with increased income problems of overweight emerge.

In the next step of the descriptive analysis of our data we establish four groups based on the criteria poverty and nutrition. Group (1) are children living in households below the 2 \$ poverty line and who are underweight based on the WFA indicator. Group (2) represents children from poor households who are not underweight. Group (3) and (4) are children from non-poor households with and without underweight respectively.

Table 5.2 shows that children's characteristics on individual, households and village levels differ among the four groups. In Thailand, poor households tend to have less small scale businesses and tend to rely more on own agriculture and wage labour. Poor households with underweight children have less money available for consumption than poor households with normal weighted children. Poor households also tend to live in villages with less favourable infrastructure conditions, as they live in villages which have less sanitary infrastructure, suggesting the existence of environments of the poor.

Although different in the poverty status, poor and non-poor households with underweight children have some characteristics in common. Underweight children, when compared to their counterpart group in both poverty categories, tend to have mothers who are less educated and are of shorter height. Their family members spent less months working as migrant workers.

Hence, the descriptive analysis confirms the findings from the literature that nutrition outcomes are also driven by factors which are beyond monetary wealth. These include, for example households characteristics and inherited conditions.

Table 5.2 Comparison of children by poverty and nutritional status, Thailand

Group	(1) Poor & Underweight	(2) Poor & No underweight	(3) Non poor & Underweight	(4) Non poor & No underweight
Income				
Income per capita & month (PPP\$)	22.53	22.91	165.63	185.63
Share agricultural income*	0.41	0.53	0.21	0.22
Share natural resource income*	0.09	0.27	0.04	0.03
Food consumption p.c. & month (PPP\$)	41.88	49.09	72.90	68.83
Share food in total consumption	0.60	0.62	0.63	0.60
Business income (dummy)	0.19	0.20	0.33	0.34
Child				
Child was sick (dummy)	0.05	0.05	0.01	0.04
Child is a girl (dummy)	0.44	0.46	0.42	0.45
Mother				
Mother height (cm)	153.89	156.07	156.76	157.82
Mother education (years)	7.02	7.30	8.60	9.31
Mother is a migrant (dummy)	0.15	0.23	0.17	0.18
Household				
Household size	5.28	5.32	5.11	5.27
Dependency ratio	2.19	2.06	2.03	1.89
Migrant months of HH members	1.03	2.70	0.96	2.06
Share agricultural worker in HH	0.59	0.62	0.52	0.49
Share wage employed in HH	0.05	0.05	0.10	0.10
Share business worker in HH	0.36	0.33	0.38	0.41
Private Toilet (dummy)	0.91	0.95	0.97	0.97
Tap water (dummy)	0.27	0.26	0.22	0.31
Value assets per capita (PPP\$)	717.04	1364.01	1648.90	2014.91
Value livestock per capita (PPP\$)	195.47	179.28	201.43	241.39
Landsize per capita (ha)	0.67	0.57	0.73	0.76
Village				
% HHs with sanitation	74.66	75.54	79.59	78.04
Distance to town (minutes)	57.99	55.67	55.39	56.33
Village income p.c & month (mean, PPP\$)	130.85	148.10	219.81	180.41
N (children)	97	586	132	831

Notes: Pooled data 2007 -2010. Poverty line: 2 \$. Underweight: < -2 z-scores WFA. * negative crop/natural resource incomes excluded.

Source: Own calculations based on household surveys 2007- 2010.

The respective comparison for Vietnam shows similar results. For a household's poverty status occupational orientation, sources of income and migration play important roles. In addition, land size per capita and education differ considerably between poor and non-poor households. Poor

households are more often part of an ethnic minority and face worse sanitary conditions. They live in poorer villages with less sanitary infrastructure.

In Vietnam underweight children in poor and non-poor households are more often sick. In both poverty groups underweight children have mothers with lower education and are more often part of an ethnic minority. Mother's height shows less variation throughout all four groups than in Thailand. Also in Vietnam we can observe environments which seem to favour underweight: poor and non-poor children live in poor villages that are more remote and more often in the mountains in comparison to non-underweight children of the same poverty group. In Vietnam for poor households the ratio is about 1:2, meaning that at least one out of three children in poor households is undernourished, while for non-poor households it is one out of five. For Thailand the respective ratios are about 1:6 and 1:7, which once more underlines the expectation that nutrition problems continue to exist beyond the poverty line.

Table 5.3 Comparison of children by poverty and nutritional status, Vietnam

	(1)	(2)	(3)	(4)
	Poor & Underweight	Poor & No underweight	Non poor & Underweight	Non poor & No underweight
Income				
Income per capita & month (PPP\$)	24.55	25.93	147.67	162.50
Share agricultural income*	0.51	0.65	0.36	0.33
Share natural resource income*	0.07	0.07	0.02	0.03
Food consumption p.c. & month (PPP\$)	33.01	34.93	47.5	52.92
Share food in total consumption	0.70	0.69	0.68	0.66
Business income (dummy)	0.14	0.20	0.36	0.41
Child				
Child was sick (dummy)	0.09	0.04	0.04	0.02
Child is a girl (dummy)	0.56	0.49	0.49	0.50
Mother				
Mother height (cm)	154.46	154.53	154.82	155.06
Mother education (years)	5.43	6.14	6.80	8.17
Mother is a migrant (dummy)	0.00	0.01	0.02	0.01
Household				
Household size	5.50	5.56	5.15	5.03
Dependency ratio	2.27	2.26	1.97	2.03
Migrant months of HH members	0.04	0.08	0.15	0.143
Ethnic minority (dummy)	0.39	0.30	0.29	0.17
Share agricultural worker in HH	0.82	0.78	0.66	0.54
Share wage employed in HH	0.04	0.05	0.16	0.18
Share business worker in HH	0.15	0.17	0.19	0.28
Private Toilet (dummy)	0.09	0.12	0.23	0.31
Tap water (dummy)	0.05	0.07	0.10	0.15
Value assets per capita (PPP\$)	379.06	382.59	791.10	1049.20
Value livestock per capita (PPP\$)	160.50	140.28	332.96	223.60
Landsize per capita (ha)	0.13	0.14	0.22	0.17
Village				
% HHs with sanitation	10.11	11.85	22.75	17.74
Distance to town (minutes)	50.12	49.71	52.70	46.34
Village income p.c & month (mean, PPP\$)	87.88	98.62	126.93	136.00
Mountainous area (dummy)	0.32	0.28	0.41	0.34
N (children)	297	658	144	632

Notes: Pooled data 2007 – 2010. Poverty line: 2 \$. Underweight: < -2 z-scores WFA. * negative crop/natural resource incomes excluded. Accounted for survey design.

Source: Own calculations based on household surveys 2007-2010.

5.3.3 Summary of descriptive results

In summary, our descriptive analysis of 4400 rural households corresponding to over 38000 individuals, including adults and children, allows us to give some initial answers to our research questions.

The first observation is that, while poverty reduction has been successful in both countries, this success is subject to the choice of the poverty line. Clearly, extreme poverty is now negligible in

both countries when using the 1.25 \$ line, but when increasing the poverty line to 2 \$ per day headcount ratios increase remarkably. This suggests that vulnerability to poverty continues to be a problem.

The second point is that nutrition problems persist in both countries in spite of their success in poverty reduction. The problem is bigger in Vietnam than in Thailand. A considerable share of the rural adult population is underweight, based on a minimum BMI of 18.5. In Thailand, this share is about 12 % and in Vietnam 26 % of the adult rural population. In Thailand, 43 % of children are stunted, 12 % are underweight. In Vietnam, the problem is even larger, with 52 % of children being stunted and 25 % underweight. The latter value corresponds well with Haddad et al. (2003) who predicted, with their cross country nutrition model, underweight (WFA) for pre-school children in Vietnam to be at around 28 % in 2015. Following the assessment of the WHO, these values are of medium to high severity (WHO, 2014). The results also confirm the concern of a double burden of malnutrition, especially in Thailand, where we find 18 % of adults and 20 % of children to be overweight. In Vietnam, overweight might become a problem in the future, as currently only 2 % of adults, but 12 % of children are overweight.

Third, as suggested in the literature, income seems to be a poor predictor for success in reducing undernutrition. Moving up the income scale, starting with 2 \$ income per capita and going beyond 10 \$, shows that undernutrition of children declines with higher income only slightly in Thailand. It does so more rapidly in Vietnam, starting at a higher level, but with a declining rate above 5 \$ per day. This underlines the role of non-income factors which governments wanting to improve the nutritional status of their population have to take into account. A similar result can be shown for overnutrition. While overweight increases with income, overweight is existent also in poorer households.

This result lends some support to the hypothesis that reducing or eliminating monetary poverty does not automatically reduce other forms of poverty to the same extent. Although there are some differences between the poor and non-poor when comparing nutrition indicators, nutrition problems do exist beyond the poverty line. The factors responsible for income poverty are not necessarily the same as those for nutrition poverty, which will be closer examined in the next section.

5.4 Econometric analysis

To test the hypotheses derived from the literature and to further explore the findings of our descriptive analysis, the econometric models as outlined in Section 5.2 have been applied. The dependent variable of the two models for children is the WFA z-score. For adults, the dependent variable is BMI. For each of the groups, children and adults, we first estimate linear models by country for the full sample and by three different income groups. To identify non-linear effects, we estimate quantile regressions at the cut-off points for undernutrition and overnutrition.

5.4.1 Nutrition models for children

Thailand

Table 5.4 shows the results of the linear models for children from Thailand. In column 1 the IV regressions is shown, in columns 2-4 OLS regressions for three different income groups are presented to identify non-linear relations in different income groups. Income is positively correlated with nutrition outcomes in the IV model. We leave out the income variable in the models on subsamples, as the differentiation of subsamples by income group determines the main variation in the variables and therefore makes the income variable even more sensitive to measurement errors.

To identify further influencing factors, characteristics of the child, the mother, the household and village were included in the model. In the model on the full sample over all income groups, child characteristics do not significantly influence nutrition. We find a negative correlation of child sickness only in the highest income group. In this group discrimination in favour of girls can be observed. This result is not in line with the usual expectation of gender discrimination against girls, but has been found also by other authors (e.g. Belitz et al., 2010; Svedberg, 1990). In the middle income group, sickness and nutrition outcomes are positively correlated. We do find a significant correlation with mothers' heights in the model for the poorest group, but not in the IV model. Migration of the mother is positively correlated with nutrition for the poorest income group. Reduced child care due to migration of the mother seems to be compensated by increased resources due to remittances, or increased knowledge on nutrition gained in the city.

Household characteristics do not show significant effects, except for a negative correlation of household size in the highest income group. Regarding village characteristics, good access to sanitation in the village has a positive effect in the full models as well as for the poorest group. Especially for the poor, therefore, sanitation seems to be important for nutrition outcomes. In the

richest group, remoteness of the village is negatively correlated with nutrition. The time dummy for 2010 is negatively correlated with nutrition values in all models except for the richest group. This fits well with the explanation of high food prices being reflected by this time dummy, as poorer households have more difficulties coping.

Table 5.4 Nutrition models for children, Thailand

Dependent variable: z-score WFA	ALL (IV)	0-2\$	2-4\$	>4\$
Income				
Income per capita (log)	2.799* (1.592)			
Child				
Child was sick	0.182 (0.252)	0.127 (0.360)	1.214** (0.476)	-0.747*** (0.284)
Child is a girl	0.202 (0.147)	0.033 (0.205)	0.143 (0.268)	0.533** (0.212)
Mother				
Mother height	0.014 (0.010)	0.023* (0.013)	-0.002 (0.017)	0.017 (0.017)
Mother education	-0.000 (0.032)	0.022 (0.036)	0.047 (0.040)	0.041 (0.029)
Mother is a migrant	0.363 (0.223)	0.461* (0.272)	-0.232 (0.392)	0.498 (0.461)
Household				
Household size	0.027 (0.040)	0.040 (0.041)	0.076 (0.072)	-0.114** (0.056)
Dependency ratio	-0.036 (0.098)	-0.037 (0.137)	-0.132 (0.149)	-0.034 (0.161)
Migration of HH members	0.012 (0.011)	0.001 (0.014)	0.036 (0.024)	-0.003 (0.021)
Private Toilet	0.192 (0.252)	0.093 (0.387)	0.262 (0.315)	-0.098 (0.493)
Tap water	-0.041 (0.141)	0.031 (0.228)	-0.439* (0.254)	0.226 (0.209)
Village				
% HHs with sanitation	0.004** (0.002)	0.007** (0.003)	0.003 (0.003)	0.003 (0.003)
Distance to town	-0.003 (0.002)	0.000 (0.004)	-0.002 (0.004)	-0.007* (0.004)
Village income mean (log)	-0.568 (0.460)	-0.092 (0.736)	-0.771 (0.701)	0.014 (0.519)
Ubon	0.227 (0.171)	-0.064 (0.274)	0.581* (0.312)	0.408* (0.246)
Nakhon Phanom	0.162 (0.211)	0.100 (0.333)	0.515 (0.377)	0.240 (0.313)
2008	-0.092 (0.131)	-0.200 (0.212)	0.016 (0.282)	-0.068 (0.241)
2010	-0.691*** (0.195)	-0.908*** (0.293)	-0.722** (0.302)	-0.162 (0.252)
_cons	-14.223 (9.106)	-1.530 (4.989)	6.827 (5.333)	0.377 (4.397)
N	1376	567	363	446
R ²	0.16	0.18	0.25	0.27

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered on individual level. Age is controlled for and significant. IV: log asset value.

Source: Own calculations based on household surveys 2007-2010.

Vietnam

Table 5.5 presents results of the nutrition models for children using the data from Vietnam. Since we could not reject exogeneity of the income variable, the full model is estimated as OLS. As expected, log income positively influences the nutrition outcome in the full model.²³

Child health is significantly correlated with nutrition, i.e. if a child was sick in the previous period its nutrition outcome is negatively affected. This correlation is significant in the full model, as well as for the poor group, and could suggest a worse health infrastructure in Vietnam than in Thailand. In the full model, being a girl increases nutrition outcomes. Regarding mother characteristics, we do not find significant effects of mother's height or education. For migration we find different results depending on the income group. As in Thailand, a migrant status of the mother is significantly and positively correlated with nutrition only for the poor income group, where remittances might increase the household's resources. For the middle income group, migration of the mother is negatively correlated with nutrition outcomes, suggesting reduced time for child care of the mother.

Migration of other household members is positively correlated for the middle and high income groups. This might be due to remittances increasing resources of the households. Against expectations from the descriptive results, a negative effect of belonging to an ethnic minority cannot be observed for any of the models. Infrastructure proves to be an important factor for nutrition as good sanitary conditions of a household significantly increase nutritional outcome: having access to a private toilet is positively correlated with nutrition outcomes in the OLS model, as well as for the poor and high income groups.

Regarding village characteristics, village income seems to play the largest role: average village income is positively correlated with nutrition for the poorest income group. These children might gain from social networks within the village to support their nutrition. In the analysis by income group, nutrition values are significantly worse in 2010 than in 2007 (and 2008) for the middle income group. A possible explanation is the increase in food prices.

Age of children is not reported here, but shows, as expected from the literature, significantly worse nutrition values for older children in both countries. Comparing goodness of fit of the models for Thailand and Vietnam, results on R^2 are better for Vietnam, with results of around 0.45

²³ A comparison of the size of coefficients in Thailand and Vietnam is difficult for the models on child undernutrition, as coefficients from IV regressions on nutrition are generally larger than for OLS regressions.

in comparison to around 0.20 in Thailand. In Thailand there seem to be further influencing factors which we are not able to identify. Results show, that differentiating different income groups reveals further influencing factors for these groups.

Table 5.5 Nutrition models for children, Vietnam

<i>Dependent variable: z-score WFA</i>	ALL (OLS)	0-2 \$	2-4 \$	>4 \$
Income				
Income per capita (log)	0.486** (0.211)			
Child				
Child was sick	-0.720*** (0.267)	-0.790*** (0.291)	-0.708 (0.514)	0.509 (0.475)
Child is a girl	0.152* (0.087)	0.100 (0.115)	0.226 (0.175)	0.212 (0.196)
Mother				
Mother height	0.003 (0.007)	-0.002 (0.007)	0.000 (0.017)	0.018 (0.015)
Mother education	0.009 (0.016)	-0.007 (0.023)	0.039 (0.028)	-0.008 (0.030)
Mother is a migrant	-0.681 (0.838)	1.303* (0.758)	-3.867*** (0.330)	-0.989 (0.824)
Household				
Household size	0.048 (0.041)	0.044 (0.046)	0.000 (0.048)	0.076 (0.080)
Dependency ratio	0.062 (0.062)	0.017 (0.074)	0.236* (0.125)	0.098 (0.128)
Migration of HH members	0.068** (0.032)	-0.004 (0.022)	0.329*** (0.046)	0.077*** (0.022)
Ethnic Minority	-0.166 (0.168)	-0.249 (0.198)	-0.050 (0.233)	-0.135 (0.321)
Private Toilet	0.275** (0.119)	0.468** (0.215)	-0.225 (0.225)	0.470** (0.211)
Tap water	0.071 (0.120)	-0.166 (0.173)	0.230 (0.236)	0.295 (0.209)
Village				
Share HHs with sanitation	-0.000 (0.002)	0.001 (0.003)	0.003 (0.003)	-0.005 (0.004)
Distance to town	-0.000 (0.001)	-0.001 (0.001)	0.001 (0.000)	-0.000 (0.001)
Village income mean (log)	0.476 (0.459)	1.008* (0.603)	-0.519 (0.800)	0.155 (0.707)
Mountainous area	-0.067 (0.142)	0.033 (0.216)	-0.145 (0.187)	-0.250 (0.205)
2008	-0.088 (0.103)	-0.264* (0.146)	-0.166 (0.203)	0.347* (0.181)
2010	-0.164 (0.138)	-0.191 (0.193)	-0.552** (0.266)	0.247 (0.201)
_cons	-3.953 (3.354)	-3.179 (3.912)	5.855 (5.996)	-1.614 (4.502)
N	1705	944	395	366
R ²	0.46	0.46	0.55	0.46

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered on individual level. Child age is controlled for and significant. Accounted for survey design.

Source: Own calculations based on household surveys 2007-2010.

Quantile regression

Malnutrition can not only take the form of undernutrition, but especially emerging countries undergoing a nutrition transition of changing diets face a double burden of under- and over nutrition. Figure 5.4 shows that this problem already persists in the rural areas of Thailand, although it is a minor problem in comparison to undernutrition. It is likely to become a larger problem in Vietnam in the future. To make sure we do not confound influencing factors for under- and overnutrition, we run quantile regressions (Table 5.6) at the cut-off points of under- and overnutrition, -2 z-scores and +2 z-scores of WFA. For Thailand these are the 0.12 and 0.80 percentile, for Vietnam the 0.27 and 0.88 percentile. These results already show that undernutrition is a larger problem in Vietnam and overnutrition tends to be a larger problem in Thailand, but a double burden exists in both countries. In total, coefficients at the under- and overnutrition cut-off levels differ significantly based on the t-statistic, showing that there are different factors influencing nutrition, depending on whether children are threatened by under- or overnutrition.

In Thailand, income shows no significant effect on nutrition at over- and underweight levels. In Vietnam, income is positively correlated with nutrition for high and low nutrition levels. The coefficient is larger at high nutrition values, suggesting a stronger correlation of income and nutrition at the border to overweight. Child sickness is only an influencing factor in Vietnam and for low nutrition values, which suggests a worse access to health care in Vietnam than in Thailand. Prenatal conditions, proxied by the height of the mother, correlate in Thailand with higher nutrition outcomes at both thresholds of under- and overnutrition.

Several household characteristics influence nutrition outcomes, results differ between countries. In Thailand, migration of household members is positively correlated with nutrition outcomes at both levels. Additional resources due to received remittances seem to positively influence nutrition and decrease the risk of undernutrition, but at the same time increase the risk of overnutrition. Being part of an ethnic minority is negatively correlated with nutrition outcomes at low levels in Vietnam, identifying ethnic minority children as a group especially threatened by undernutrition. The importance of sanitation conditions for nutrition can be seen in the results for Vietnam, as having a private toilet is positively correlated with nutrition at high and low levels. Living in a richer village seems to increase nutrition outcomes of children threatened by undernutrition in Vietnam, which might be due to social networks in the village. The time effect of lower nutrition values in 2010, which might be due to higher food prices, can be found at high and low nutrition values in Thailand, as well as low nutrition values in Vietnam.

The model shows, that in each country context, there are, first, influencing variables, that have a similar influence on nutrition outcome, no matter whether those outcomes are at the boarder to under- or overweight. These include migration in Thailand, and sanitation in Vietnam. Second, some variables differ in their influence on nutrition outcomes, depending on whether children are threatened by under- or overweight. These include income and ethnic minority in Vietnam.

Table 5.6 Quantile regressions on child nutrition, Thailand and Vietnam

<i>Dependent variable: z-score WFA</i>	TH	TH	VN	VN
	at z-score -2 0.12 perc.	at z-score +2 0.80 perc.	at z-score -2 0.27 perc.	at z-score +2 0.88 perc.
Income				
Income per capita (log)	0.399 (0.489)	0.457 (0.392)	0.460* (0.262)	0.788** (0.355)
Child				
Child was sick	0.279 (0.253)	-0.304 (0.445)	-0.531** (0.209)	-0.137 (0.328)
Child is a girl	0.140 (0.183)	0.118 (0.179)	0.175** (0.087)	-0.024 (0.112)
Mother				
Mother height	0.028** (0.011)	0.023** (0.011)	0.002 (0.008)	0.014 (0.009)
Mother education	0.018 (0.023)	0.033 (0.031)	0.014 (0.014)	-0.014 (0.016)
Mother is a migrant	-0.006 (0.304)	0.250 (0.242)	-2.315 (1.707)	1.605 (2.409)
Household				
Household size	0.009 (0.055)	-0.018 (0.048)	-0.017 (0.029)	0.078* (0.044)
Dependency ratio	-0.048 (0.128)	-0.178 (0.119)	-0.023 (0.071)	-0.012 (0.067)
Migration of HH members	0.028** (0.013)	0.030* (0.017)	0.126 (0.144)	-0.044 (0.213)
Ethnic Minority			-0.321** (0.137)	-0.114 (0.155)
Private Toilet	-0.113 (0.325)	0.446 (0.409)	0.278** (0.123)	0.280* (0.170)
Tap water	0.073 (0.165)	-0.193 (0.181)	-0.056 (0.120)	-0.183 (0.151)
Village				
% HHs with sanitation	0.003 (0.003)	0.006** (0.003)	-0.001 (0.003)	0.002 (0.003)
Distance to town	-0.002 (0.003)	-0.003 (0.003)	-0.001 (0.001)	-0.001 (0.001)
Village income mean (log)	-0.309 (0.704)	-0.306 (0.486)	0.886** (0.365)	0.171 (0.432)
Ubon	0.082 (0.170)	0.360* (0.219)		
Nakhon Phanom	0.226 (0.274)	0.127 (0.281)		
Mountainous area			-0.050 (0.117)	-0.160 (0.128)
2008	-0.153 (0.166)	-0.144 (0.215)	-0.166* (0.098)	-0.039 (0.120)
2010	-0.730*** (0.211)	-0.542** (0.234)	-0.292* (0.157)	-0.161 (0.153)
_cons	-6.169 (4.864)	-0.281 (4.645)	-7.264*** (2.710)	-3.305 (3.308)
N	1376		1705	
Difference t-statistic		**		***

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are bootstrapped with 400 replications. Time fixed effects. Age of children is controlled for and significant. z-score -2 is cut-off point for underweight, z-score +2 is cut-off point for overweight.

Source: Own calculations based on household surveys 2007-2010.

5.4.2 Nutrition models for adults

In the next step, we perform the same analysis as for children in Chapter 5.4.1 on adult nutrition. The dependent variable is BMI. The advantage of this subsample is the larger sample size.

Thailand

For adults in Thailand (Table 5.7) we find income to have a significant influence on nutrition in the full model. The size of the coefficients cannot be compared with the models on child nutrition, because of differently scales dependent variables.

Adult characteristics have a surprisingly similar influence over all income group regressions. We do not find a significant correlation with sickness, which might be explained by the better health care system in Thailand. Females are better nourished than males. Being female increases nutrition outcomes for all groups, except for the richest income group. Nutrition increases with age in all regressions; education is negatively correlated with nutritional outcomes, which is difficult to explain. Migration also is negatively correlated with nutrition, which might point towards poor urban living conditions of these migrants.

Migration of other household members also decreases nutrition outcomes, in the full models, as well as for the richest income group. Tap water is a positive influencing factor for the richest income group. While it is a positive influencing factor for child nutrition, village sanitation conditions are, in contrast to the results for children in Thailand, negatively correlated with nutrition of adults in the full model and for the middle income regression. Results suggest that better nourished adults also live in villages with higher average incomes, except for the middle income group. Living in Ubon, the most developed province, is positively correlated with nutrition for both full models, and the richest income group.

Table 5.7 Nutrition models for adults, Thailand

<i>Dependent variable: BMI</i>	ALL (IV)	0-2\$	2-4\$	>4\$
Income				
Income per capita (log)	11.923*** (1.844)			
Adult				
Adult was sick	0.129 (0.106)	-0.069 (0.152)	0.089 (0.174)	0.186 (0.153)
Adult is female	0.225*** (0.072)	0.316*** (0.103)	0.403*** (0.104)	0.071 (0.095)
Age	0.057*** (0.004)	0.056*** (0.005)	0.053*** (0.006)	0.079*** (0.005)
Education	-0.112*** (0.014)	-0.059*** (0.017)	-0.092*** (0.017)	-0.054*** (0.014)
Adult is a migrant	-0.339*** (0.079)	-0.491*** (0.117)	-0.332** (0.130)	-0.429*** (0.115)
Household				
Household size	0.070*** (0.021)	0.041* (0.023)	0.041 (0.029)	-0.042 (0.027)
Dependency ratio	0.275*** (0.052)	0.087 (0.067)	0.152* (0.083)	0.311*** (0.079)
Migration of HH members	-0.006** (0.003)	-0.004 (0.004)	-0.007 (0.004)	-0.007* (0.004)
Private Toilet	0.140 (0.152)	0.181 (0.236)	0.288 (0.243)	0.248 (0.239)
Tap water	0.050 (0.065)	0.149 (0.100)	0.018 (0.112)	0.251*** (0.090)
Village				
% HHs with sanitation	-0.002*** (0.001)	-0.001 (0.001)	-0.004*** (0.001)	0.000 (0.001)
Distance to town	-0.002 (0.001)	-0.002 (0.002)	0.000 (0.002)	-0.001 (0.002)
Village income mean (log)	0.369** (0.188)	0.568* (0.324)	0.539 (0.337)	0.503** (0.229)
Ubon	0.216** (0.086)	0.184 (0.132)	0.127 (0.128)	0.250** (0.112)
Nakhon Phanom	0.165 (0.110)	0.103 (0.163)	-0.135 (0.161)	0.075 (0.150)
2008	0.059 (0.037)	0.182** (0.075)	-0.090 (0.101)	0.215*** (0.079)
2010	-0.142*** (0.049)	0.015 (0.100)	-0.070 (0.107)	0.019 (0.077)
_cons	-79.475*** (14.760)	16.129*** (2.126)	16.771*** (2.190)	15.729*** (1.516)
N	19318	6240	5069	8009
R ²	0.05	0.07	0.09	0.12

Notes: * p<0.1, ** p<0.05, *** p<0.01. Sample: adults 18-59. Standard errors are clustered on individual level. IV: log asset value. Only adults age 19-59 included.

Source: Own calculations based on household surveys 2007-2010.

Vietnam

In the adult models on Vietnam (Table 5.8) income positively influences nutrition outcomes. The coefficients are larger in Vietnam than in Thailand. Some of the adult characteristics have, similar to the Thailand model, very constant influencing factors throughout all regressions, varying only little in the size. Being sick reduces nutrition outcomes significantly, which suggests problematic access to health care. Being female negatively influences the nutrition outcomes throughout all income groups, while nutrition outcomes increase with age, except for the poorest income group. Education has a positive correlation with nutrition only for the richest income group. Migrants do not significantly differ from non-migrants in regard to nutrition.

While migration of other household members was positively correlated with child nutrition in Vietnam for the richer income groups, it is negatively correlated with adult nutrition for the middle income group. Being part of an ethnic minority gives also contradicting results for adults in comparison to children: for adults, belonging to an ethnic minority positively influences nutrition; coefficients are similar throughout all income groups. A possible explanation might be that adults who were underweight as children, from a medical perspective, have a higher probability of becoming overweight, which might bias results here (Baptiste-Roberts et al., 2012). Similar results as in comparison to child nutrition are found for the sanitary conditions of the household: Having access to a private toilet increases nutrition for all income groups. Having access to tap water increases nutrition for the poorer and middle income groups.

Regarding village characteristics, we find adults from remote villages to have lower nutrition outcomes in the full model as well as for the richest income group. Village income and nutrition outcomes are positively correlated for the poorest and the richest income group. Why this coefficient turns negative in the full model is not clear. Supporting the results on ethnic minorities, living in a mountainous area increases nutrition outcomes for the poorest group, which generally would be against our expectations. The time dummies show a decrease in nutrition outcomes at least for the poorest income group for the years 2008 and 2010 in comparison to 2007, despite increasing mean incomes over this time.

Table 5.8 Nutrition models for adults, Vietnam

<i>Dependent variable: BMI</i>	ALL (IV)	0-2\$	2-4\$	>4\$
Income				
Income per capita (log)	19.594*** (2.592)			
Adult				
Adult was sick	-0.388*** (0.069)	-0.426*** (0.072)	-0.435*** (0.092)	-0.503*** (0.111)
Adult is female	-0.735*** (0.043)	-0.697*** (0.061)	-0.678*** (0.064)	-0.738*** (0.073)
Age	0.009*** (0.003)	-0.002 (0.003)	0.013*** (0.003)	0.027*** (0.004)
Education	-0.015 (0.009)	0.005 (0.009)	0.016 (0.010)	0.023* (0.013)
Adult is a migrant	0.146 (0.093)	-0.058 (0.117)	-0.030 (0.133)	0.211 (0.139)
Household				
Household size	0.061*** (0.020)	-0.029* (0.017)	-0.020 (0.020)	-0.017 (0.020)
Dependency ratio	0.133*** (0.046)	-0.033 (0.045)	0.112** (0.054)	0.213*** (0.062)
Migration of HH members	-0.009* (0.004)	-0.004 (0.004)	-0.016*** (0.004)	-0.005 (0.004)
Ethnic Minority	0.707*** (0.128)	0.683*** (0.099)	0.699*** (0.113)	0.773*** (0.148)
Private Toilet	0.032 (0.085)	0.375*** (0.084)	0.203** (0.082)	0.381*** (0.071)
Tap water	-0.031 (0.095)	0.192* (0.106)	0.281*** (0.106)	-0.281*** (0.094)
Village				
% HHs with sanitation	-0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Distance to town	-0.005*** (0.001)	-0.000 (0.001)	-0.002 (0.001)	-0.004*** (0.002)
Village income mean (log)	-0.932*** (0.329)	0.531** (0.217)	-0.187 (0.211)	0.442* (0.230)
Mountainous area	-0.099 (0.080)	0.133* (0.081)	0.142* (0.085)	-0.015 (0.091)
2008	-0.137*** (0.048)	-0.086* (0.044)	-0.149** (0.065)	0.049 (0.061)
2010	-0.018 (0.067)	-0.163** (0.064)	-0.012 (0.083)	0.081 (0.087)
_cons	-133.721*** (19.734)	16.710*** (1.400)	20.685*** (1.376)	16.268*** (1.467)
N	17513	7406	4597	5510
	.	0.07	0.07	0.07

Notes: * p<0.1, ** p<0.05, *** p<0.01. Sample: adults 18-59. Standard errors are clustered on individual level. IV: log asset value. Accounted for survey design.

Source: Own calculations based on household surveys 2007-2010.

Quantile regression

To disentangle influencing factors for over- and undernutrition, we repeat the quantile regression analysis for adults (Table 5.9). For both countries, there are significant differences between the regressions at the under- and overnutrition cut-off points based on the t-statistics. In Thailand income is a significant influencing factor for adult nutrition at both thresholds; the coefficient is larger at the threshold to overweight. This means that income increases nutrition outcomes stronger for those adults at the boarder to overweight, than for those close to underweight. In Vietnam income is a significant influencing factor only at low nutrition outcomes.

In both countries, sickness is negatively correlated with nutrition at the undernutrition cut-off point, at the overnutrition cut-off point it is positively correlated to nutrition in Thailand. Similar results can be found for gender discrimination: Vietnam, being female is in both cases negatively correlated with nutrition, in Thailand it is additionally positively correlated at high nutritional outcomes. Age is in all four specifications positively correlated with nutrition. Education is negatively correlated with nutrition in Thailand, and, as expected, positively correlated with nutrition at low values in Vietnam, as education can influence knowledge on nutrition. Migration is negatively correlated with nutrition at both quantiles in Thailand, suggesting poorer living conditions for migrants, and has no significant effect in Vietnam.

Sanitation again proves to be an important factor: Having a private toilet is positively correlated with nutrition in Vietnam at both quantiles, and in Thailand at the lower quantile. Access to tap water is positively correlated in Thailand at both quantiles. In Vietnam, living in a remote village negatively influences nutrition at low values; a high average village income has a positive influence on nutrition outcomes in both specifications for Thailand and Vietnam, the influence is larger for the upper quantiles.

Table 5.9 Quantile regressions on adult nutrition, Thailand and Vietnam

<i>Dependent variable: BMI</i>	TH	TH	VN	VN
	at BMI 18.5 0.12 perc.	at BMI 25 0.82 perc.	at BMI 18.5 0.26 perc.	at BMI 25 0.98 perc.
Income				
Income per capita (log)	0.967** (0.445)	2.000*** (0.582)	1.215** (0.515)	0.559 (1.438)
Adult				
Adult was sick	-0.330*** (0.118)	0.274** (0.122)	-0.627*** (0.050)	0.034 (0.230)
Adult is female	-0.433*** (0.059)	0.797*** (0.083)	-0.741*** (0.035)	-0.728*** (0.137)
Age	0.042*** (0.003)	0.091*** (0.004)	0.004** (0.002)	0.035*** (0.007)
Education	-0.031*** (0.009)	-0.095*** (0.011)	0.020*** (0.006)	0.011 (0.021)
Adult is a migrant	-0.152** (0.069)	-0.591*** (0.111)	0.060 (0.084)	-0.065 (0.334)
Household				
Household size	0.024* (0.013)	0.006 (0.022)	-0.033*** (0.010)	-0.064* (0.037)
Dependency ratio	0.087** (0.041)	0.211*** (0.050)	0.046 (0.031)	0.036 (0.110)
Migration of HH members	-0.001 (0.002)	-0.004 (0.003)	-0.005** (0.003)	-0.004 (0.011)
Ethnic Minority			0.610*** (0.055)	0.751*** (0.222)
Private Toilet	0.384** (0.181)	0.270 (0.198)	0.218*** (0.048)	0.929*** (0.230)
Tap water	0.133* (0.069)	0.239*** (0.089)	-0.039 (0.058)	0.305 (0.303)
Village				
% HHs with sanitation	-0.000 (0.001)	-0.002 (0.001)	0.001 (0.001)	-0.000 (0.003)
Distance to town	0.001 (0.001)	-0.002 (0.002)	-0.002*** (0.001)	-0.003 (0.003)
Village income mean (log)	0.495*** (0.186)	0.602** (0.272)	0.423*** (0.160)	1.049* (0.546)
Ubon	0.065 (0.078)	0.159 (0.115)		
Buriram	-0.027 (0.085)	-0.095 (0.125)		
Mountainous area			0.081* (0.047)	0.498*** (0.184)
2008	0.157** (0.073)	0.189* (0.101)	-0.001 (0.045)	-0.131 (0.187)
2010	0.017 (0.073)	0.067 (0.093)	-0.007 (0.052)	-0.181 (0.229)
_cons	5.883 (3.764)	1.189 (4.994)	6.154 (3.997)	12.302 (12.011)
N	19318		17513	
Difference t-statistic	***		***	

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are bootstrapped with 400 replications. BMI 18.5 is cut point for underweight, 25 is cut point for overweight. Only adults 19-59 are included.

Source: Own calculations based on household surveys 2007-2010.

In summary, we find different variables to be correlated with nutrition outcomes, depending on which income group the person belongs to. This supports our assumption of non-linearity in factors influencing nutrition outcomes depending on income and nutritional status. In general, income has an influence, but only for parts of the population. Child and mother characteristics show a correlation, while household characteristics, except for ethnic minority, are less important. However, quite consistently sanitation has been found to be important.

Results for children and adults differ slightly, but main results regarding income and sanitation, are found for both population groups. Quantile regression offers a more detailed view on factors influencing nutrition at different ends of the distribution of nutrition outcomes, the cut-off points for under- and overnutrition. While for some factors, such as income or migration, results between both quantiles differ, other factors have a similar influence on nutrition outcomes at high and low values. For improving the regressions on child nutrition, a larger sample size would be useful.

5.5 Summary and conclusions

This paper investigated the relationship between poverty and nutrition of rural households in the context of two emerging Asian market economies, Thailand and Vietnam. We addressed three research questions. First, we examined to what extent the problem of undernutrition continues to exist in spite of the enormous progress which these two countries have made in poverty reduction. In addition, we examined whether a nutrition problem also exists regarding overweight. Second, we tried to identify the characteristics of children and adults with nutritional problems and differentiated between under- and overnutrition. Third, we assessed the relationship between monetary wealth and nutrition by analysing the factors that influence the nutritional status of children in rural households as these households move out of poverty. We found answers using descriptive statistics as well as econometric models on adult and child undernutrition.

The answer to the first question on whether undernutrition is still a problem in Thailand and Vietnam is a clear yes! As expected, there are differences between the two countries. The rate of undernutrition based on WFA z-scores from our 2010 data set is clearly lower in Thailand with just about 12 % of children below the WHO defined threshold and 25 % in Vietnam. The latter figure is quite close to the one predicted by Haddad et al. (2003) for 2015. Numbers for adults, based on BMI, are similar, with 12 % of adults in Thailand and 26 % in Vietnam being underweight.

Overnutrition has to be regarded as an increasing problem as income rises. The problem is larger in Thailand, with 20 % of children being overweight based on WFA, while only 12 % of children in Vietnam fall into this category. Regarding adults, we find 18 % to be overweight in Thailand (based on BMI), but only 2 % in Vietnam. With overweight rates being higher for children, both countries will increasingly be confronted with a double burden of nutritional problems in the near future.

Regarding the factors correlated with nutrition, we can say that, as expected, socioeconomic conditions matter. The effect of income on nutrition outcomes is positive. In Vietnam, health is a decisive factor for nutrition outcomes. Also in Vietnam, children from families with migrants generally have better nutrition outcomes. In Thailand, children from villages with better sanitation infrastructure are better nourished. In both countries, sanitation is an important influencing factor. Furthermore, the food price crisis of 2008 seems to have had a negative effect on nutrition outcomes in 2010. However, it is not merely the wealth status that matters. Consistent with results shown in earlier papers, rising income and wealth does not automatically make the nutrition problem disappear. What seem to exist are distinct environments of undernourishment, and poor sanitation is a major factor.

Overall, the comparison across income groups suggests that influencing factors for nutrition outcomes differ depending on the income group. Non-monetary factors are important for reducing undernutrition of children and therefore monetary poverty reduction is unlikely to be a sufficient condition for solving the nutrition problem of rural populations in emerging market economies.

This finding is supported when differentiating for factors influencing under- and overnutrition. Here, we find that income in Vietnam is a stronger driver for nutrition at high levels of nutrition outcomes, i.e. at the margin to overweight, while being part of an ethnic minority is a major factor for poor nutrition outcomes at the margin to underweight. In Thailand, mainly the same factors influence nutrition values at high and low levels of nutrition. These are migration of other household members and the height of the mother.

For adults income has a positive influence on nutrition, which is larger in Vietnam than in Thailand. Interestingly, other non-monetary factors correlated with nutrition are not always in line with those correlated with child nutrition. For example, migration of other household members decreases nutrition values of adults in both countries; females have lower nutrition outcomes in Vietnam and higher outcomes in Thailand. Sanitation is as important for adults as it is

for children. Differentiating under- and overnutrition, we find a stronger influence of income on adult nutrition in Thailand for high nutrition outcomes, and in Vietnam significant influence only for low nutrition outcomes. In Thailand having a private toilet influences nutrition outcomes at the margin to underweight, in Vietnam the influence is stronger at the margin to overweight. Access to tap water improves nutrition at both quantiles in Thailand. Living in a wealthy village improves nutrition outcomes in both countries at both quantiles, the effect however is larger at the margin to overweight.

In general, our results give some evidence to the notion that reducing or eliminating monetary poverty does not directly translate into reduction of non-monetary poverty. Investments in non-monetary factors such as sanitation and in remote and disadvantaged areas are recommended for reducing undernutrition. At the same time, education measures regarding healthy diets should be given more attention to better guide the nutrition transition and to counteract overweight.

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Appendix

Table 5.10 Prevalence of undernutrition in comparison to WHO data

	Thailand		Vietnam	
	WHO data	DFG data	WHO data	DFG data
z_score WFA < -2	0.08	0.12	0.15	0.25
z_score HFA < -2	0.17	0.43	0.29	0.52
z_score WFH < -2	0.04	0.12	0.05	0.15
z_score BMI < -2	0.05	0.14	0.04	0.14

Note: WHO Thailand: Survey 2005/06, Northeast. WHO Vietnam: Survey 2010/11, rural areas. DFG data adjusted for survey design.

Source: DFG Household Survey 2007 – 2010. WHO (2014).

Table 5.11 Mean and standard deviation of z-scores in comparison to WHO reference values

	95 percentile SD reference WHO	Thailand			Vietnam		
		Mean	SD	Diff to reference	Mean	SD	Diff to reference
z_score WFA	1.46	-0.04	2.01	0.55	-0.93	1.82	0.36
z_score WFH	1.50	0.39	2.41	0.91	0.25	2.33	0.83
z_score HFA	1.95	-0.90	2.88	0.93	-1.71	2.75	0.80
z_score BMI	1.55	0.23	2.51	0.96	0.35	2.43	0.88

Note: SD: standard deviation.

Source: WHO data based on Mei and Grummer-Strawn (2007), DFG Household Survey 2007- 2010.

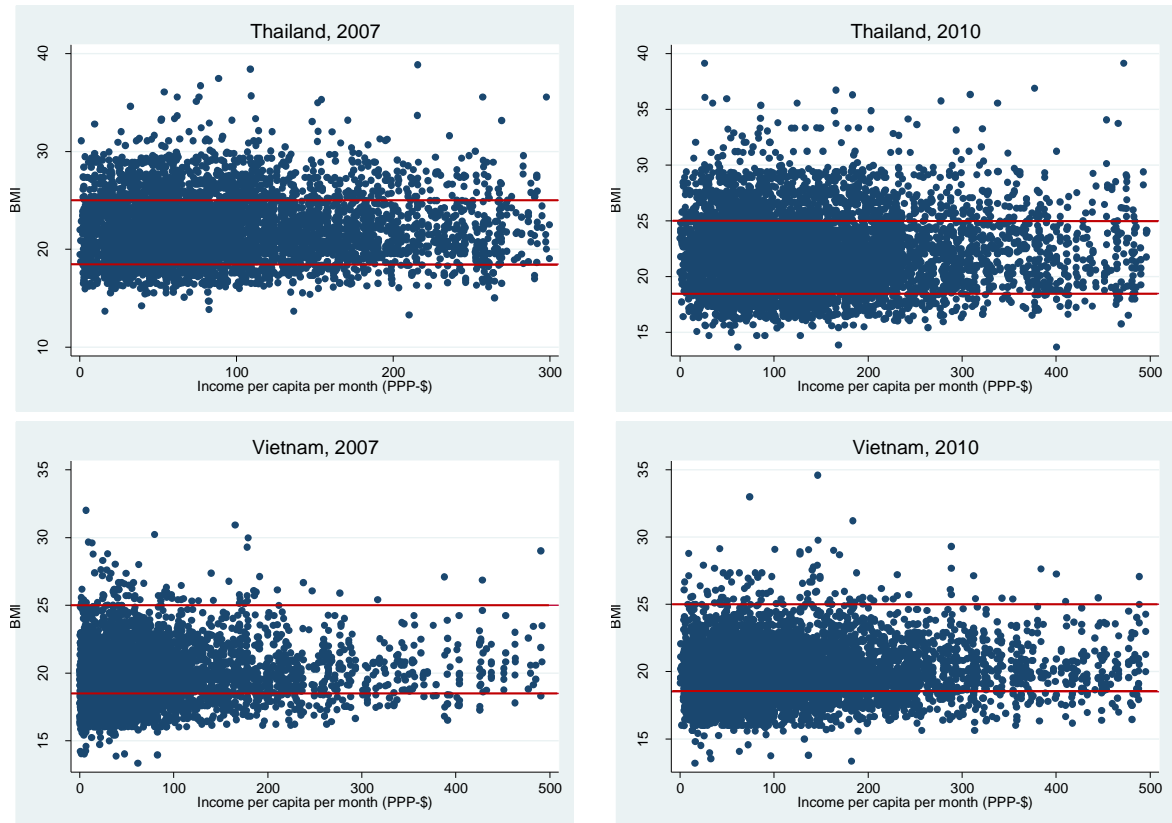


Figure 5.5 Correlation of per capita income and adult BMI, Thailand and Vietnam, 2007 and 2010
Note: Red lines mark cut-off values for under- and overnutrition (BMI 18.5 and 25).

Source: Household survey 2007 & 2010.

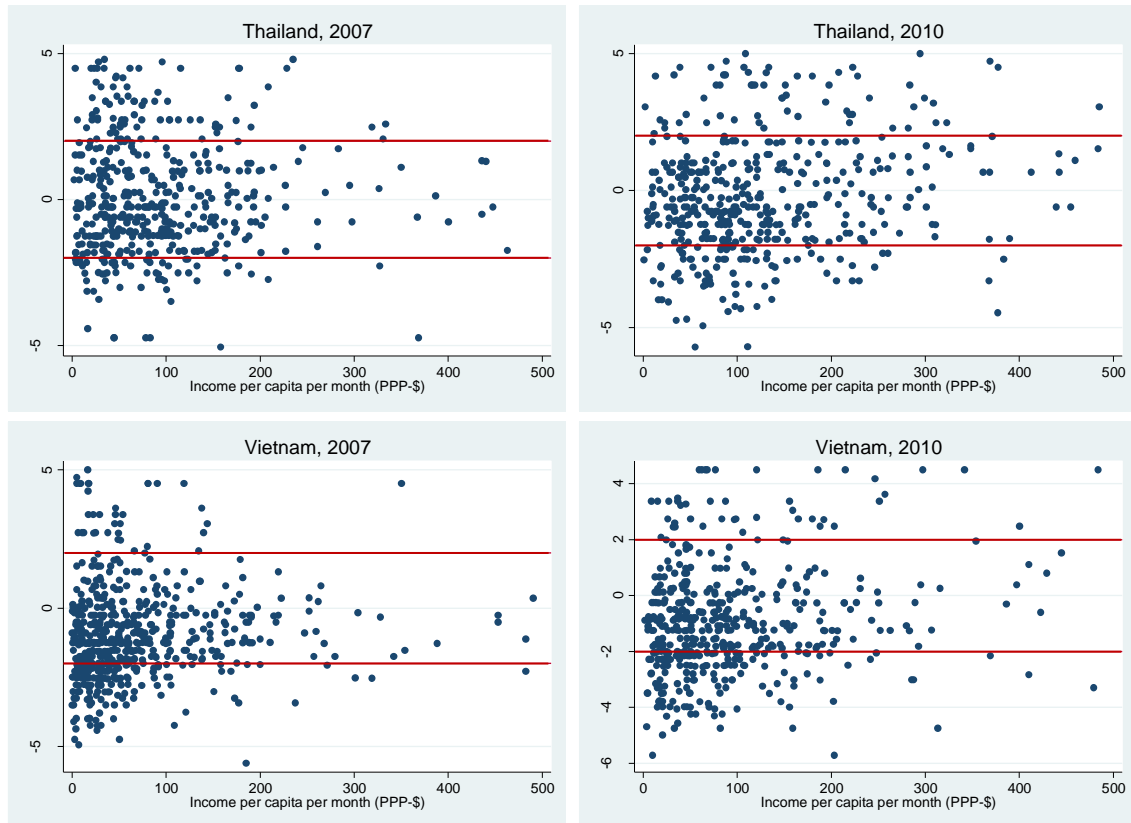


Figure 5.6 Correlation of income and child WFA z-scores, Thailand and Vietnam, 2007 and 2010

Source: Household survey 2007 & 2010 .

Table 5.12 Nutrition models for children, Thailand and Vietnam

Variables	ALL (OLS)	ALL (IV)	0-2\$	2-4\$	>4\$
Income					
income PC	0.546** (0.218)	2.629** (1.156)			
child					
sick	-0.156 (0.187)	-0.092 (0.200)	-0.262 (0.249)	0.540 (0.366)	-0.569* (0.300)
childGirl	0.149* (0.082)	0.171** (0.084)	0.066 (0.108)	0.118 (0.164)	0.403*** (0.149)
mother					
m_height	0.012* (0.006)	0.009 (0.006)	0.010 (0.007)	0.005 (0.011)	0.019 (0.012)
meduyears	0.025* (0.015)	-0.001 (0.021)	0.012 (0.021)	0.045* (0.027)	0.017 (0.023)
m_migrant	0.270 (0.207)	0.335 (0.214)	0.533* (0.301)	-0.210 (0.344)	0.356 (0.432)
household					
HHsize	0.021 (0.028)	0.049 (0.034)	0.040 (0.033)	0.053 (0.056)	-0.033 (0.047)
dep.ratio	0.007 (0.066)	0.033 (0.067)	0.003 (0.078)	0.011 (0.108)	0.026 (0.123)
migmonth_oth	0.013 (0.011)	0.014 (0.012)	-0.001 (0.017)	0.037 (0.023)	0.009 (0.019)
Ethnic Minority	-0.098 (0.171)	-0.158 (0.172)	-0.127 (0.175)	-0.165 (0.272)	0.223 (0.333)
PrivToilet	0.278** (0.111)	0.168 (0.124)	0.284 (0.200)	0.092 (0.202)	0.386** (0.187)
Tapwater	0.056 (0.089)	0.042 (0.093)	0.010 (0.141)	-0.206 (0.189)	0.353** (0.163)
village					
VPsanitation	0.003** (0.001)	0.003** (0.001)	0.006*** (0.002)	0.002 (0.002)	0.000 (0.002)
DISTtown	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.002)	0.000 (0.001)	-0.003* (0.001)
VILLinc	-0.270 (0.324)	-0.584* (0.353)	0.157 (0.676)	-0.887** (0.446)	-0.086 (0.453)
2008	0.010 (0.077)	-0.006 (0.084)	-0.131 (0.126)	0.116 (0.167)	0.145 (0.181)
2010	-0.366*** (0.103)	-0.452*** (0.118)	-0.542*** (0.160)	-0.428** (0.182)	-0.030 (0.188)
Thailand	0.259* (0.143)	0.311** (0.145)	0.124 (0.235)	0.279 (0.227)	0.514** (0.227)
_cons	-1.478 (2.346)	-12.184* (6.257)	-0.522 (4.399)	7.061** (3.551)	-0.132 (3.361)
N	3081	3081	1511	758	812
R ²	0.31	0.28	0.31	0.32	0.32

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered on individual level. Child age is controlled for and significant. IV: log Asset value. Accounted for survey design.

Source: Household Survey 2007 – 2010.

Table 5.13 Nutrition models for adults, Thailand and Vietnam

	ALL (OLS)	ALL (IV)	0-2\$	2-4\$	>4\$
Income					
income PC	1.818*** (0.393)	14.678*** (1.729)			
child					
sick	-0.218*** (0.073)	-0.139* (0.071)	-0.314*** (0.073)	-0.249*** (0.096)	-0.199** (0.099)
female	-0.112** (0.044)	-0.129*** (0.045)	-0.234*** (0.058)	-0.133** (0.064)	-0.262*** (0.065)
age	0.045*** (0.002)	0.038*** (0.002)	0.024*** (0.003)	0.034*** (0.003)	0.056*** (0.003)
eduyears	-0.046*** (0.008)	-0.090*** (0.010)	-0.026*** (0.009)	-0.040*** (0.010)	-0.038*** (0.010)
Migrant (D)	-0.464*** (0.071)	-0.357*** (0.068)	-0.576*** (0.094)	-0.396*** (0.103)	-0.418*** (0.097)
household					
HHsize	-0.003 (0.016)	0.064*** (0.019)	0.001 (0.015)	0.008 (0.019)	-0.039** (0.019)
dep.ratio	0.094** (0.038)	0.202*** (0.042)	-0.008 (0.040)	0.122** (0.052)	0.236*** (0.055)
migmonth_oth	-0.005* (0.003)	-0.005 (0.003)	-0.002 (0.003)	-0.007** (0.003)	-0.007** (0.003)
EthnicMin	0.525*** (0.114)	0.367*** (0.121)	0.676*** (0.084)	0.584*** (0.104)	0.642*** (0.142)
PrivToilet	0.351*** (0.068)	0.167** (0.073)	0.339*** (0.086)	0.254*** (0.083)	0.329*** (0.072)
Tapwater	0.146** (0.070)	0.049 (0.074)	0.140* (0.074)	0.106 (0.080)	0.143** (0.069)
village					
VPsanitation	-0.001 (0.001)	-0.002** (0.001)	-0.001 (0.001)	-0.003*** (0.001)	0.000 (0.001)
DISTtown	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)
VILLinc (log)	0.575*** (0.190)	0.039 (0.186)	0.560*** (0.205)	0.283 (0.214)	0.479*** (0.173)
T	2.013*** (0.102)	2.067*** (0.098)	2.258*** (0.113)	2.190*** (0.106)	1.754*** (0.090)
2008	0.085*** (0.026)	0.003 (0.034)	0.047 (0.042)	-0.105* (0.061)	0.137*** (0.053)
2010	0.034 (0.035)	-0.084** (0.042)	-0.038 (0.055)	0.013 (0.068)	0.021 (0.056)
_cons	0.035 (3.630)	-100.868*** (13.701)	15.467*** (1.320)	17.009*** (1.381)	15.276*** (1.099)
N	36831	36831	13646	9666	13519
R ²	0.17	0.10	0.19	0.18	0.17

Notes: * p<0.1, ** p<0.05, *** p<0.01. Sample: adults 18-59. Standard errors are clustered on individual level. Migrantmonth normalized (+1). IV: log Asset value. Accounted for survey design.

Source: Household Survey 2007 – 2010.

6 SUMMARY AND SYNTHESIS

6.1 Key findings

The thesis consists of four essays on vulnerability to poverty and rural development in Thailand and Vietnam. The empirical analysis of the thesis is based on a panel data set of 4400 rural households from Vietnam, and three provinces from Northeast Thailand, which are characterised by a high vulnerability to poverty. The survey was conducted in 2007, 2008 and 2010 and comprises detailed information on household members including migrants, composition of income and consumption as well as agricultural activities. The first essay additionally draws on a migrant tracking survey of 643 migrants from the same household sample, conducted in Bangkok.

The **first essay** investigates the effects of rural–urban migration on economic development in Thailand. The essay offers some new findings on migration. First, the study shows the importance of poverty as a push factor to migration in Northeast Thailand, as it is the poorer households that send migrants. Nevertheless, migrants are generally more educated albeit at an overall low education level in the rural areas. Migration seems to be a successful strategy for rural households, as it increases household income. Second, there is evidence of a need for better social protection for urban migrants. As most migrants do not have written employment contracts, legal protection is low. Also, since only a small proportion of the migrants have insurance contracts, health service is still an issue, as it is not always clear to what extent they are covered by the government schemes given that they are often registered in their home village. Results show that those migrants have a better chance of finding high quality employment who are from relatively richer households and who have a relatively high education. Third, differentiating between households with successful and less successful migrants, results show that migration has a larger effect on income for those households with migrants in high quality employment. The study therefore shows that migration offers the benefit of income growth for rural households, but is less effective in reducing inequality and relative poverty in rural areas. The message emerging from this paper is that poor rural households tend to produce poor migrants, which could be one of the reasons for the continuous existence of a wide rural–urban divide in welfare. The crucial importance of education for migrants to achieve higher better employment calls for more investment in education quality in rural areas.

The **second essay** analyses investments of farm households as a future-directed strategy in three provinces of Northeast Thailand. We analyse the determinants of different types of investments in agriculture as well as small scale enterprises and the intensity of investments in agriculture. Results show that only 30 % of rural households undertake investments and most investments made are small. Only households with larger land sizes tend to invest and wealthier households are more likely to invest larger amounts. Female headed households, those with older household heads as well as households in remote areas invest less. Access to finance increases the probability of investing in small scale enterprises, but does not influence agricultural investments. Households with larger investments in agriculture tend to not invest in non-farm activities. The pattern of few rural investments made by wealthy households has implications for the distribution of wealth in rural areas in the future. While there is already a large rural-urban income gap in Thailand, a growing gap within rural areas is likely to emerge.

The **third essay** looks at the influence of the share of female income, as a proxy for bargaining power, on education expenditures in a country with high migration rates. It compares the influence of the share of female local income (i.e. income earned by nucleus household members in the village) on the share of education expenditures with the influence of the share of female migrant income. Results show that the share of female local income significantly increases the share of expenditures on education, while the share of female migrant income has a negative significant effect on education expenditures. Both effects are especially large for households with low off-farm (local and migrant) income. This result shows that migration weakens the positive influences of female income shares on education expenditures.

In the **fourth essay** the link between nutrition and poverty in Thailand and Vietnam is analysed. Results of this paper show that undernutrition continues to be a problem in Vietnam, with child underweight rates at 25 %, defined to be of high severity by the WHO (2014). In Thailand, the prevalence of 12 % of children being underweight is within the range of medium severity. Additionally, overweight becomes a new nutrition problem, with 20 % of children being overweight in Thailand and 12 % in Vietnam. Poverty and income are found to influence nutrition outcomes, but other factors such as mother's height, migration and sanitation condition nutrition as well. Village conditions influence nutrition additionally. Coefficients of respective variables differ by income group. Quantile regressions shows that, while adult's personal characteristics show similar coefficients over the two different quantiles, other factors, such as ethnicity, are only important for nutrition at under- or overweight quantiles. All regressions support the results that

non-monetary factors play into the reduction of undernutrition; monetary poverty reduction therefore is not a sufficient condition to eliminate malnutrition.

6.2 Policy implications

The dissertation delivers results that are of high relevance for policy makers in Thailand and Vietnam, in the Southeast Asian region and in emerging market economies in general.

First, all essays point at the problem of inequalities, which exist between rural and urban areas, but also within already disadvantaged areas. The poor, equipped with little land and education, seem to be excluded from the benefits of economic growth. Entry barriers hinder them from benefiting from high-return migration and off-farm employment, and they do not have the means to invest and benefit from self-employment or agricultural opportunities. Policy makers have to direct their attention at those left behind in a society of growing income, and provide them with opportunities.

To reduce vulnerability of rural households, gaps in social safety nets have to be closed, for example regarding the large informal workforce including non-registered migrants. Only if households can rely on safety nets will they be able to employ risky, but high returning income strategies and to improve their standard of living. With reduced vulnerability, they will be able to specialize their income sources, to invest in education and in high-returning activities. This would also benefit agricultural change, as it would give part-time farmers the possibility to give up unproductive farming and full-time farmers the possibility to grow.

Second, investments in education in Thailand are not only necessary regarding nutrition. In general, increasing the quality of and access to education will be major challenges in the near future. Results show that increasing female migration, in particular in households with low incomes, leads to reduced spending on education. Our results therefore suggest that governments may consider investing more into local employment opportunities to women to strengthen education investments. Supporting private investments in agriculture and small scale businesses may therefore not only accelerate agricultural change and the rural non-farm economy, but also offer local employment for women. Further, results on migration and education expenditures may be relevant for the design of cash transfer programs directed at women. Resulting recommendations are not only relevant for policymakers in Thailand, but might be transferred to other countries. Based on our results, public cash transfer programs which

transfer money to women should take into account migration, since transfers to women might - similar as wage income - have weaker effects on human capital investments if the recipient is a migrant. To strengthen this recommendation, further research would be necessary in order to verify results that we found for migrant wage income also for transfer income directed at female recipients.

Third, malnutrition is a problem not only in developing, but also in emerging countries. The problem will not be solved by income growth alone, as undernutrition exists above as well as below the poverty line. Policy interventions therefore cannot rely on the reduction of monetary poverty only, they have to encourage investments into physical infrastructure, sanitation and health, in particular in remote areas. Any proclamation of victory over poverty will be meaningless as long as there is undernourishment.

In addition to undernutrition, emerging market economies have to face the problems arising from a nutrition transition with changing diets. Overweight and obesity will bring large costs to the health system, and will likewise reduce productivity. Here, education of adults and children regarding nutrition will be necessary to confine the prevalence of overweight.

6.3 Future research

This thesis raises a number of topics that deserve more attention in future research. The second paper analyses the investment behaviour of rural households in Northeast Thailand. While the paper quantifies private investment, and characterizes investors, two main questions remain untouched due to data requirements. First, future research should evaluate appropriate policy measures to increase agricultural and rural non-farm investments that are able to facilitate growth of poorer households. Second, to support the result of rather the larger farmers gaining from investment in agriculture and small scale business, an estimation of long-term income and poverty effects of these investments would be beneficial. This would require a longer panel data set. Having information on a longer time span available would enable research to estimate income growth for rural households resulting for agricultural and small scale business investments. Since investments do not pay off immediately, more waves would be necessary to identify those investment types that improve the welfare of households, and estimate and compare their effects on poverty and inequality. While questions on agricultural growth and poverty reduction up to now have been mainly answered based on a macro perspective (compare Christiaensen et al., 2011), microeconomic evidence, particularly from an emerging market

context, is rare. Results on these questions based on microeconomic data would enable policy makers to direct their support towards the participation of poorer farmers in those high-yielding investment strategies.

Several recent papers analyse the effect of different instruments on increasing agricultural investment and growth in different regional settings (e.g. Poulton, Dorward, & Kydd, 2010; Poulton & Macartney, 2012; Webb & Block, 2012; Yu, Liu, & You, 2012). For the region of Northeast Thailand it might be of special interest to investigate whether infrastructure investments and increased regional trade opportunities speed up agrarian change and lead to investments from private part- or fulltime farmers, a topic which has not yet been analysed in this regional context. This topic is especially relevant for Northeast Thailand, as agrarian change might be influenced by the increasing regional trade of outer, disadvantaged, provinces in Thailand with neighbouring countries such as Laos and Cambodia. The ASEAN Community, which will start operations at the end of 2015, is expected to intensify this effect (UNDP, 2014). By increasing trade possibilities and due to high food prices, not only the agricultural sector, but also the agro-industry will gain, grow, and possibly create peri-urban and rural employment possibilities. Increased trade therefore has the potential to strengthen the economy in the outer provinces and decrease inequality – if economic growth trickles down also to rural and remote areas. Research needs to identify conditions for remote farmers to gain from economic growth in peri-urban areas and from regional trade, in order to make poor rural households benefit. Analysis of agrarian changes is best possible with long-term data. The paper on investments included information on four years, 2007 to 2010. To see longer term trends in agrarian change and especially to analyse the effects of recent infrastructure projects in the region, as well as the effects of the ASEAN Economic Unit, a long-term panel data set would be necessary.

Changing family arrangements, including migration of mothers and other household members, influence the well-being of children, a result that has been found as well in the essay on female migration and education as in the essay on nutrition. Linking these two essays, future research should analyse whether migration of the mother influences the nutrition of children and other household members, as nutrition is a major component of human capital. The effects of migration on anthropometric outcomes of child nutrition have only recently been taken up by the literature. The few existing studies (Antón, 2010; Azzarri & Zezza, 2011; de Brauw, 2011; Hildebrandt, McKenzie, Esquivel, & Schargrodsky, 2005; Kroeger & Anderson, 2014) come to the result that migration positively influences nutrition. Still, they leave many questions unanswered. First, most studies concentrate on remittances from international migration. Rural-urban migration, resulting

in lower remittances and often unstable and short-term employment, has not yet been analysed. Second, existing studies are based on data from Latin America and Central Asia; apparently there are no results yet on Southeast Asia. Third, no paper has yet investigated the effect of migration from a gender perspective or analysed the effect of female migration on child nutrition. Analysis would require anthropometric data for children, preferably measured, as well as information about the mother, and would gain from the availability of data on food composition.

Based on our results from the third paper, we recommend (conditional or unconditional) cash transfer programmes directed at women to take into account migration streams. While our essay concentrated on income earned by women, it would be necessary to directly apply the research question to the context of public transfers directed at women, in order to strengthen our policy recommendation. Unconditional and also conditional cash transfers have been increasingly applied in the developing world to redistribute income to the poor. To make the cash transfers more efficient, they have either been tied to conditions, such as school attendance (e.g. PROGRESA in Mexico) or directed to women (e.g. BDH in Ecuador), as these are assumed to spend the income for the benefits of the children. The general effect of these programs is well studied, also because data availability is good, with randomized sample designs being available (Schady & Rosero, 2008). The question whether migration has an influence on the effect of cash transfers directed at women has apparently not yet been analysed. This task would require data from a country where a transfer programme directed at women is in place, migration rates of females are high, and preferably data from a randomized control trial are available.

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