WORLD TRADE ORGANIZATION

WORLD BANK GROUP

TRADE AND POVERTY REDUCTION: NEW EVIDENCE OF IMPACTS IN DEVELOPING COUNTRIES

JOINT PUBLICATION BY
THE WORLD BANK GROUP AND THE
WORLD TRADE ORGANIZATION

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This volume is a co-publication of the World Bank and the World Trade Organization.

Attribution—Please cite the work as follows: World Bank Group and World Trade Organization, 2018. *Trade and Poverty Reduction: New Evidence of Impacts in Developing Countries*. World Trade Organization: Geneva.

Acknowledgements—This publication has been coordinated by Marcus Bartley Johns (WBG), Paul Brenton (WBG), Roberta Piermartini (WTO), Mustapha Sadni Jallab (WTO) and Robert Teh (WTO). The coordinators would like to thank Sandra Rossier for her assistance in the preparation of the publication. The production of the publication was managed by Anthony Martin and Edmundo Murray. Design and layout of the publication were undertaken by Corporate Visions, Inc.

ISBN (paper): 978-92-870-4521-8
ISBN (electronic): 978-92-870-4522-5

Cover images: Bigstock and Flickr World Bank

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Foreword

In 2015, the World Bank and the World Trade Organization published a flagship report on the role of trade in the effort to end poverty by 2030. Over the past three years, the two organizations have collaborated in various ways to advance that goal, from supporting implementation of the WTO Trade Facilitation Agreement; to assisting the poor, including women and small-scale traders, to take advantage of trade opportunities; to supporting trade reforms in the world's poorest countries.

The latest report in this collaboration comes during an uncertain time for global trade. There is a trend away from trade openness, and the unstable trade policy environment has developed into one of the key risks facing the global economy. It is essential that we do not lose sight of the significant implications for the poorest and most vulnerable. Trade is a key driver of global growth and poverty reduction. An open global economy has created opportunities for hundreds of millions of people to lift themselves out of extreme poverty.

This new volume brings together contributions from researchers that detail the challenges and opportunities in maximizing the impact of trade openness for the poor. It shows the need to continue to focus on reducing high trade transaction costs faced by poor workers and consumers in developing countries, and it explains how the benefits of trade can vary between rural and urban families, and between women and men. The papers in this collection also demonstrate the value of different research methods to understand links between trade and poverty, while also highlighting areas for further research and for testing new analytical methods.

The collected analysis has important implications for policies and future research. It highlights how trade openness has clear, positive impacts on poverty reduction. For example, trade can benefit the poor by reducing the price of what they consume and increasing the price of what they sell. As producers, the poor can gain by selling their output in overseas markets where they can get a better return. Trade can also benefit the poor because it allows producers of domestic goods to respond to adverse shocks to domestic supply chains by shifting sourcing abroad. Trade can also help particular groups. For example, one of the case studies in this book finds that exporting firms in Africa tend to pay women workers more than non-trading firms.

For some sectors and groups, however, the research shows serious challenges. One example is lower incomes due to import competition. Another is the risk that various "behind the border" barriers – like limited competition in transport and distribution, weak infrastructure, or a lack of information on new opportunities – will negate the benefits of export opportunities or lower-cost imports.

Understanding these issues is essential for designing complementary policy reforms to help maximize the overall positive gains of trade openness for the poor. This requires more policy-relevant research, as well as an effort to address data constraints in areas such as services trade or the impact of non-tariff measures.

With recent World Bank forecasts indicating that the pace of poverty reduction is slowing, there is an urgent need to intensify reforms and increase investments that help the extreme poor. Maximizing the benefits of trade openness for everyone, especially the poorest and most vulnerable, will be critical to driving inclusive, sustainable economic growth and finally ending extreme poverty on the face of the earth.

Jim Yong Kim
President
World Bank Group

Roberto Azevêdo
Director-General
World Trade Organization

Trade and Poverty Reduction: New Evidence of Impacts in Developing Countries: Introduction and Overview

In recent years there has been an intensification of the long-running debate on the effects of trade integration. This debate has focused largely on the impact of trade in advanced economies, which has risked diverting attention away from the impact of trade on people's lives in developing countries, and especially the extreme poor. This volume brings together new research, using a range of different analytical approaches, that examines how the extreme poor have fared following trade liberalization in various developing countries and regions and the challenges that poor people face in benefitting from trade.

Trade has been recognized as an engine for inclusive economic growth and poverty reduction in the 2030 Agenda for Sustainable Development. The 2015 joint WTO-World Bank publication, *The Role of Trade in Ending Poverty* strengthened the evidence that trade has played a critical role in poverty reduction and that the further integration of developing countries into an open global economy will be essential for achieving the goal of ending extreme poverty by 2030.

That publication (hereafter referred to as the "2015 joint report") has contributed to focusing the debate on the challenges that the extreme poor face given their vulnerability, as well as the strategies that are most effective in maximizing the positive impact of trade. One of the main messages of the 2015 joint report was that trade openness or trade growth alone may not be sufficient to end extreme poverty. The extreme poor face specific constraints—due to the fact that they tend to work in rural areas, in the informal sector, live in fragile states and face gender inequality—that can limit their ability to benefit from wider trade-induced economic gains.

The 2015 joint report emphasized that the greatest impact on poverty reduction will come from a coherent and multi-pronged approach that addresses these specific constraints. To this end, the report discussed policy actions that governments can take individually and collectively to maximize the gains from trade for the poor:

(i) *Lowering trade costs for deeper integration of markets*, tackling policy and infrastructure barriers to goods and services trade are critical to growth and poverty reduction;

(ii) *Improving the enabling environment* including policies related to human and physical capital, access to finance, governance and institutions, and macroeconomic stability;

(iii) *Intensifying the poverty impact of integration policies* by bringing a greater focus on tackling remoteness from markets at the sub-national level, and facilitating the activities of poor and small traders;

(iv) *Managing and mitigating risks faced by the poor* that limit them from benefiting from trade opportunities when they arise and build poor people's resilience to the effects of adverse events; and

(v) *Improving data and analysis to inform policy* to better understand the trade-related constraints that the poor in many countries continue to face including through the use of new technologies for data generation and analysis, including big data.

The present volume builds on this, surveying subsequent research and presenting a series of country-level studies to complement the global approach taken in the 2015 joint report. It continues to focus on the linkages between trade and extreme poverty rather than the broader distributional effects of trade and the agenda of shared prosperity. It seeks to build understanding of the challenges surrounding each of the four constraints that were the focus of the joint report, as well as identifying ways to overcome them, thereby maximizing the contribution of trade to poverty reduction. The case studies included in this volume reinforce the need to move forward with the above agenda to maximize the gains from trade for the poor. One of the main objectives of the current volume is to bring a focus to the country and regional level, providing insights and examples of analytical methods that can be drawn upon for work in other countries and regions.[1]

The chapters contained in this volume highlight some new analytical approaches to understanding and addressing the linkages between trade and poverty, while also showing the ongoing challenges facing the research and policy community in this work. Before summarizing each chapter, this section reviews the recent literature on trade and poverty, noting where chapters in this volume contribute to the literature. This overview chapter concludes by discussing the main policy implications of the chapters and priorities for future work.

Overview of the recent literature on trade and poverty, including links with the current volume

The economic literature suggests that trade openness is key to poverty reduction, but must be part of a wider effort. Trade influences the income of the poor through various channels: through its effects on economic growth, relative prices, macroeconomic stability and on government revenues (Winters, 2002 and Winters et al., 2004). The impact of trade on poverty then depends on decisions within the household on how income is allocated. Trade can itself influence how such decisions are made, for example by empowering women within the household. Trade can further affect long-term development outcomes if it leads declines in child malnutrition rates, higher school attendance and performance etc. The effect of trade on the poor depends on the specific mechanism at play, the nature of trade policy change (whether it increases import competition or market access), the specific industry or firm where the poor work and household decision-making. In this book we focus on how the effects of trade depend on informality, geographical location (rural or urban area) and gender.

Trade can benefit the poor by spurring economic growth. Sustained economic growth is the most powerful tool for poverty alleviation. A household's income is derived from sale or utilization of its resource endowments (landholdings, capital, labour or human capital). People are poor because they have few endowments or because the rewards received from those endowments are low. Typically, the poor suffer from both afflictions. Rapid and sustained economic growth allows the poor opportunities to increase their initial endowments (save to accumulate capital, get an education to increase human capital) and to earn better rewards for supplying their resources to others, typically through the market. Another avenue through which trade can spur economic growth is by increasing the pace of innovation by firms. First, trade liberalization increases the size of the market and the incentives to innovate. Second, to the extent that technical knowhow is embodied in products, trade liberalization makes possible knowledge spill-overs through improved access to imports. Third, an increase in the degree of openness of an economy will typically enhance product market competition. The increase in productivity means more output or income can be obtained by society, and therefore also by the poor, from a given amount of resources.

Trade can benefit the poor by reducing the price of what the poor consume and increasing the price of what the poor sell. Trade opening changes relative prices in both product and factor markets. These changes affect the members of the household as both consumers and

[1] The chapters for this report were selected following a call for papers by the WTO and World Bank that provided new empirical work on the trade and poverty nexus. There was an explicit request for papers that addressed issues relating to rural poverty, fragility and conflict, gender and informality. Perhaps reflecting the challenges of data, there were few submissions that addressed trade, poverty and conflict or that had an explicit focus on informality. In selecting papers for inclusion, beyond quality the volume has sought to capture evidence from a range of countries in different regions.

Trade reforms can create new opportunities, but also involve adjustment costs for the poor. Access to international markets may deliver higher average incomes to farmers who specialize in producing export crops, but may bring greater competition that reduces the demand for poor workers in import competing sectors.

sellers of goods and factors of production (e.g., labour). As producers, the poor can gain by selling their output in overseas markets where they can get a better return. As producers, the poor are also consumers of inputs. Trade can allow them to get better access to material and services inputs and technology that improve productivity in the production of the goods and services that the poor produce. As consumers, trade liberalization can be beneficial to the extent that it reduces the price for imported goods. As income earners, prices can affect wages and employment.

As an example of how poor producers can benefit from trade, there is evidence that the US-Viet Nam FTA has helped poverty reduction in Viet Nam. Families living in provinces that benefitted from the largest cuts in the costs of exporting to the US also saw the largest decline in poverty (McCaig, 2011). Benefits have also been extended to people working in the informal sector, as export opportunities have promoted the reallocation of workers from micro-enterprises to the formal sector (McCaig and Pavcnik, 2014).

The challenge for policy, however, is to implement trade reforms in a way that the increases the likelihood that the benefits will reach the extreme poor. The benefits of trade reforms may not reach the poor, if they are not connected to markets. This can be the case for the rural poor, who tend to be low skilled and less mobile than those living in urban areas. A study of Indian liberalization in the 1990s (Topalova, 2007 and 2010) showed that although poverty in India declined, it declined less for households living in rural districts more exposed to import competition.

The country studies in this volume also highlight the differentiated impact of trade reform in rural compared to urban areas. For instance, in Ghana, households in rural areas that are net producers of agricultural products experience greater losses in welfare than households in urban areas. The study on India (Mendoza, Nayyar and Piermartini) shows that the products of rural households face an average tariff in overseas markets that is 10.9 percentage points higher than that faced by the products of urban households. This underlines the need to do more to address the sources of agricultural trade costs, including weak internal connectivity as well as market access barriers, in order to maximize the positive impact of trade opening for the rural poor. In their study on the potential pass-through of price changes due to reforms at Dar es Salaam port in Tanzania, Depetris-Chauvin et al. highlight the extent to which domestic transport costs and lack of

competition among intermediaries limit the gains of trade from being passed on to the poor in rural areas. The study by Kunaka, drawing on research in Uganda, highlights the importance of information barriers for agricultural producers seeking to participate in trade.

Trade reforms can create new opportunities, but also involve adjustment costs for the poor. Access to international markets may deliver higher average incomes to farmers who specialize in producing export crops, but may bring greater competition that reduces the demand for poor workers in import competing sectors. Adjusting to these changes can be costly. Poor workers may require some retraining or may need to move to another location to access newly generated jobs. Also specialization into the production of one or few crops, for example, while increasing income of the poor when prices are high, it may reduce their income when prices are low. These costs are particularly difficult for the poor to bear given their lack of resources and limited access to finance. This is compounded by the lack of effective social safety nets in many poor countries that can support poor people during periods of transition. Therefore, what should be short-term adjustment costs from trade can turn out to have long-term negative outcomes for the poor. The current volume contributes to understanding the potential for increased vulnerability of households in trade-exposed sectors because of trade liberalization, even when trade contributes to an overall increase in incomes and reduction in poverty (Magrini and Montalbano).

Existing evidence points to the importance of putting in place appropriate policies to smooth the costs of adjustments for the next generation, as well as in the short-term. For example, by increasing the demand for skills and when adequate information on this is provided, trade can contribute to improved educational outcomes. Jensen (2012) shows that recruitment campaigns in rural villages in India that provided information about job opportunities in information technology (IT) in urban areas were associated with increased schooling of young girls. However, primary school attendance, especially for girls, declined in Indian regions more exposed to international competition (Edmonds, Pavcnik and Topalova, 2009 and 2010).

Trade benefits the poor, if it is associated with greater diversification and greater macroeconomic stability. Macroeconomic volatility is usually bad for the poor because it can reduce economic growth and adversely affect the distribution of income and generate inequalities. The poor have little access to finance to be able to tackle a period of tightened liquidity, therefore they are the most affected by macroeconomic volatility. If domestic shocks are the major source of volatility, trade can help reduce volatility through export diversification (Caselli et al., 2012). For example, when a country has multiple trading partners, a domestic recession or a recession in any one of the trading partners translates into a smaller demand shock for its producers than when trade is more concentrated. Trade allows domestic goods producers to respond to shocks to the domestic supply chain by shifting sourcing abroad. Geographical export diversification may also help reduce the impact of country-specific external shocks (Jansen, Lennon and Piermartini, 2015). In fact, a recent study by the IMF (2014) finds a robust negative correlation between export diversification and output volatility in low-income countries.

However, greater trade openness also implies greater exposure to external shocks—especially in outward-oriented industries. Countries with closer trade links tend to have more tightly correlated business cycles (Frankel and Rosen, 2008) suggesting that trade acts as a transmission mechanism to propagate a country specific shock to others. By leading to greater specialization in output, trade reduces diversification in production and may make a country more susceptible to idiosyncratic shocks. Kose and Riezman (2001) find that because a significant fraction of African countries' exports are concentrated in a narrow range of primary commodities, terms of trade shocks account for 45% of the volatility in aggregate output. Moreover, adverse trade shocks can cause prolonged recessions since they induce a significant decrease in aggregate investment. Koren and Tenreyro (2007) also suggest that greater volatility in developing countries arises from their initial specialization in the most volatile production sectors. Economic development involves diversifying away from these volatile sectors.

Opening up to trade may put the poor at risk, if it reduces government revenue. The poor benefit from the provision of public goods and may be helped by government transfer programmes. What happens to customs revenues after trade reform can therefore matter greatly to the poor since the share of trade taxes in government revenues is typically high in poor countries.

However, connecting to global markets does not necessarily lead to lower government revenues from trade. At first glance, trade liberalization will reduce tariff revenues and this will certainly occur if all trade taxes are reduced to zero. However, fostering trade may involve measures that do not affect tariff revenues. This is the case for reforms that reduce red tape at the border. Also, liberalization typically stops short of complete tariff elimination. The "Laffer curve" analysis suggests that there is a tariff rate that maximizes customs revenues; if the initial tariff rate is above this rate, tariff liberalization can actually increase customs collection. Furthermore, to the extent that quantitative restrictions are replaced by tariffs, new sources of tariff revenues will be generated by trade reform. In many countries non-discriminatory consumption taxes, such as a value-added tax, are also levied at the border. Hence, while tariff revenues will fall, revenues from consumption taxes applied to imported goods will rise and mitigate the overall revenue loss. Finally, lower customs revenues will be partially or wholly made up for by greater collection of domestic taxes (holding tax rates constant), as economic activity and growth is stimulated by trade opening.

Finally, trade opening can affect the way decisions are made within the household, which can have an important impact on poverty. This is particularly the case if trade empowers women within the household by creating jobs for women that would not otherwise be available. For example, cross-border trade in Africa provides income for hundreds of thousands of poor women. The emergence of the apparel sector in Bangladesh has created substantial jobs for women and has contributed to changing social attitudes towards women and girls. The empowerment of women within the household is typically associated with better nutritional and educational outcomes for children, which in turn leads to higher productivity in the long-term. Hence, the nexus between trade and gender is a critical area for attention.

The current volume includes a number of studies that deepen our understanding of how the impact of trade reform may not necessarily be the same for women as it is for men. This is important since in many poor countries women and female-headed households typically have a higher propensity to be poor than men and male-headed households.

The chapter on Ghana (Orkoh) finds female-headed households are likely to benefit more from the implementation of the ECOWAS Common External Tariff, especially in urban and coastal areas, as they are more likely to be net consumers of products where prices are expected to decline. The chapter on trading firms in Africa (Duda-Nyczak and Viegelahn) finds that exporting firms tend to pay more to women workers than non-trading firms. Combining qualitative and quantitative data on small-scale, cross-border traders in Lao PDR and Cambodia, Seror, Clarke and Record document that women face both visible and invisible constraints to participating in cross-border trade, although they might not be as great as those faced by women traders in Africa. Their study underlines the importance of adequate border infrastructure, streamlined border procedures, and access to finance. The chapter on India (Mendoza, Nayyar and Piermartini) calculates that women consistently face higher tariffs in overseas markets than men. On average, women's tariffs are 6 percentage points higher than those that men face, based on the type of work in which they are employed. These studies reinforce the need to assess the gender implications of trade reforms and to identify and address if there are particular challenges that women face to benefit from the opportunities or deal with the risks that trade brings.

In sum, the discussion above has stressed that there are several channels through which international trade affects poverty. Evidence shows that not all the poor are affected equally. The effects will depend on where they live (rural versus urban areas), their individual characteristics (skill, gender), the type of trade policy change (increased import competition or export opportunities) and where they work (industry, firm, formal/informal sector). Since the effects are context specific, case study analysis of the type we present in this book is very important to better understand the variety of channels through which trade can affect poverty.

Description of the chapters in the current volume

In one of a number of papers on African countries, Martínez, Baghdadi and Kruse examine the relationship between the reduction of most-favored nation (MFN) tariffs, the conclusion of several free trade agreements, and implementation of streamlined trade procedures from the 1990s to 2005 in Tunisia and the decline in poverty. The authors estimate that the fall in the prices of consumer goods from further tariff reduction would improve the welfare of low-income households by about 1% of expenditure, but would not improve welfare for richer households (with similar distributional results across regions). This limited gain reflects a conservative calculation of the likely pass through of changes in tariffs to domestic prices; the higher pass through rate used in similar studies would result in significantly larger welfare improvements. Lower consumer goods prices are estimated to benefit rural households more than urban households, improve average welfare in female-headed and male-headed households by about the same amount, and improve welfare for self-employed, poor workers only slightly more than for more formal workers. Household welfare also improves because lower tariffs tend to increase wages. However, wage data are available only at the industry rather than individual level, and this estimation is not reliable.

Orkoh assesses the welfare effects of changes in the domestic prices of commodities as a result of Ghana's adoption of the common external tariff of the Economic Community of West African States (ECOWAS), with special attention to gender differences. These price changes would improve the welfare of poor and female-headed households as consumers, but reduce the welfare of both poor and rich households as producers, with male-headed households being the most affected. The net effect is around zero for poor male-headed households and negative for the rich, but positive for female-headed households in the low- and middle-income categories. While the results also depend on the geographic location of the household, among other factors, the reform is thus expected to have pro-poor and pro-female effects. The study recommends that the government introduces compensatory policies, such as income transfers that would target male-headed households that are producers

Evidence shows that not all the poor are affected by international trade equally. The effects will depend on where they live (rural versus urban areas), their individual characteristics (skill, gender), the type of trade policy change (increased import competition or export opportunities) and where they work (industry, firm, formal/informal sector).

and streamline the ongoing Livelihood Empowerment Against Poverty Programme to help poor, male-headed households. It could also aim to improve infrastructure in the regions that will experience a net welfare loss, in order to make them more competitive.

Duda-Nyczak and Viegelahn study wages in exporting and importing firms of the manufacturing sector in Africa, using firm-level data for 47 countries and matched employer-employee-level data for 16 countries. The average firm-level and employee-level wage paid by exporters is higher than that paid by non-exporting firms. It is gains from economies of scale that explain the positive wage premium of exporters, rather than differences in skill utilization, differences in workforce characteristics, or technology transfers. In contrast, there is no evidence that importers pay higher wages than non-importers, at least when comparing firms of the same age. The wage premium of importing at the employee-level is estimated to be negative. Finally, there is no significant differences between female and male workers' wages in trading firms, but some evidences of a gender wage gap between trading and non-trading firms.

Depetris-Chauvin et al. assess the likely welfare and poverty impact of a project to modernize the port of Dar es Salaam, Tanzania. They assume that the improvements would lead to a 5% reduction in border prices for bulk imports and a 5% increase in the price of exports. The model allows that reductions in border prices are not always fully passed through to the domestic economy because of the lack of competition among importers and exporters in some sectors. Besides market structure, the likely impact of the project is reduced by poor infrastructure and logistics in Tanzania. Transport costs increase substantially moving away from the port, contributing to a high degree of geographical market segmentation in Tanzania. To a large extent, the short-term positive welfare impacts of improving the port alone are modest for all groups of households considered. In particular, the effect is very small for poor households, as the incidence of international trade in the consumption basket and as a source of income for the poor is very low. In the long run, a better functioning port could reduce rural poverty if other policies and infrastructure improvements (particularly for inland transport) are put in place to alleviate the many constraints affecting small holders' access to food and cash crop export markets.

Market participation by small scale farmers in Uganda, particularly those in remote regions, is severely limited by inadequate transport that raises transport costs and impairs quality, and by lack of information on market conditions. The paper by Kunaka explores how infrastructure investments, cooperation between farmers and the use of information technology can help farmers access more efficient transport, reduce their dependence on intermediaries and increase their incomes. Simulations using an agent based modelling (ABM) technique indicate that strategic placement of markets, improving access to warehouse facilities, encouraging farmers associations, improving the institutional framework for contract farming, and facilitating compliance with good agricultural practices (GAP) standards could reduce transport costs, raise prices received by smallholders, and increase their participation in the market.

A number of studies examine the relationship between trade opening and poverty reduction in Asia. Consistent with other studies, Magrini and Montalbano find that

the level of poverty and the risk of future poverty fell sharply in Viet Nam following the *Doi Moi* reforms, which included trade liberalization reforms. However, households engaged in sectors that were more exposed to trade experienced increased risk, and thus a significant probability of falling into poverty in the near future. The greater the exposure to trade of a household's activities, the more important was risk in determining variations in household consumption. After *Doi Moi*, households involved in farming were, on average, five times more likely than households involved in non-farm activities to fall into poverty. Similarly, rural households faced greater risk of falling into poverty than did urban households. These findings underline the importance of helping farmers exposed to international competition to reduce their vulnerability to poverty, despite higher average incomes as a result of trade liberalization. Measures could include safeguards against excessive price volatility and assistance with managing risk through increasing savings (e.g., by increasing the availability of micro-financial instruments), improving access to credit, and increasing the availability of insurance (e.g., through community-based risk-sharing or institutional products targeted to farmers most involved in tradable cropping).

Seror, Record and Clarke focus on small-scale cross border trade (SSCBT) and gender in Lao PDR and Cambodia. They show that such trade can provide significant earning opportunities for women, yet women appear to be underrepresented in such activities in Cambodia and Lao PDR. Physical sexual harassment does not appear to be a significant problem. Nevertheless, women face greater constraints in participating in SCCBT than do men. Inadequate border infrastructure imposes delays in trading, while women face greater time constraints due to more household responsibilities. Access to financing for women traders is more limited due to greater difficulties in obtaining loans from relatives. Women have less bargaining power vis-a-vis border officials, which increases the cost of nontransparent and arbitrary customs procedures and results in a higher tax burden. Women pay higher taxes and are more likely to be controlled by quarantine services, but this is not due to a greater likelihood of illegal behavior.

One reason that poor people may not capture the full benefit from participation in international markets is that the goods they produce tend to be subject to relatively high trade barriers.

Several policy improvements would expand opportunities for women to profit from SCCBT. Increasing transparency, simplifying procedures and limiting border officials' discretion would reduce the time burden women face and the disadvantages from their smaller bargaining power. Improving infrastructure would also reduce the time required at the border. Increasing provision of childcare services would reduce household responsibilities. Easing fees and restrictions on motorized transport would reduce the importance of physical strength in moving goods across some border posts. Providing training in gender sensitivity and formulating a Charter for Cross-Border Traders and Brokers stating the rights and duties of all parties involved in cross-border trade would improve women's experience at the border.

One reason that poor people may not capture the full benefit from participation in international markets is that the goods they produce tend to be subject to relatively high trade barriers. The paper by Mendoza, Nayyar and Piermartini analyses the average overseas tariffs faced by different groups of Indian workers, by matching Indian household survey data collected from July 2011 to June 2012 with information on the industrial classification of products. Tariffs faced by exporters in international markets are higher, and non-tariff measures (NTMs) more numerous, on goods produced by poor workers than on goods produced by rich workers. Tariffs also are higher on

goods produced in rural and more remote areas than on those from urban centers, on goods produced by informal enterprises than by formal ones, and on goods produced by women than by men. And the global reduction in tariffs from 1996 to 2012 failed to ameliorate these differences. Access to international markets is more difficult for the poor. How did we get there? Essentially, efforts to protect poor workers across countries (tariff protection in China and the United States is higher on goods produced by poor workers than on goods produced by rich workers) face a coordination problem. If poor workers produce the same kinds of goods, then each country's attempts to protect its own poor workers by imposing higher tariffs and more NTMs on such goods will reduce the access of all poor workers to international markets, and thus limit the reduction in poverty from trade liberalization.

Conclusions on policy priorities and issues for deeper analysis

The studies presented in this book show that reducing barriers for the goods that the poor consume, facilitating access to external markets for the goods that the poor produce, and connecting the poor to global markets by overcoming international and domestic trade-related costs are all central to maximizing the potential benefits of trade for poverty reduction. Trade can work through a variety of channels to alleviate poverty including: creating jobs and increasing job opportunities; making goods consumed by poor households cheaper; lowering the pecuniary and non-pecuniary barriers to trade that fall most heavily on poorer producers; and facilitating the access to information and technology that can transform production processes or make them more efficient. However, this report underlines the importance of trade policy being accompanied by appropriate and sound macroeconomic and sectoral policies to ensure that gains generated from trade are shared as widely as possible, and that trade does not exacerbate inequalities or contribute to increased vulnerability. Building on the joint report and subsequent studies, the papers included in this volume make substantial contributions to increasing our understanding of how trade can help drive poverty reduction and steps that governments can take to maximize the positive impacts from trade and mitigate adverse outcomes for the poor. Nevertheless, there is still much to be done to enhance the benefits for the poor of increasing integration of markets across borders.

Key policy issues

Beyond the broad areas of complementary policies identified in the joint report, several specific policy challenges emerge from the papers in this volume as requiring more attention as part of trade policy reform strategies in developing countries and in support under the Aid for Trade agenda:

- **A focus on reducing the high trade transaction costs faced by poor workers and consumers in developing countries, to realize potential gains.** Several sources and impacts of these high transaction costs are noted in contributions to this volume, including tariff and non-tariff barriers (Mendoza, Nayyar and Piermartini) transport and logistics costs (Kunaka and Depetris-Chauvin), costs associated with accessing information (Seror, Record and Clarke; Kunaka). The potential benefits of reducing these costs are demonstrated in several papers (for example, Orkoh; Martínez, Baghdadi and Kruse).

- **Ensuring competition and efficiency in provision of services along domestic distribution networks**, which can be essential to ensure that the potential benefits from trade are realized by poor people. Lack of access to road and rail infrastructure limits the returns to poor exporters and the benefits from declining prices of imported final and intermediate products, especially for the rural poor (Kunaka). Lack of competition in the transportation and distribution sector and poor logistics services mean that the impact of trade reforms can be very small for poor households (Depetris-Chauvin).

- **More attention to mitigating the risks that poor producers and workers face from increased import competition.** Exposure to import competition can increase the vulnerability of people who are below the poverty line or have recently exited poverty (Magrini and Montalbano). There is therefore a role for policies that help address these risks, and make the investments

needed so that trade-driven poverty reduction results in a sustained transition from poverty to higher income levels. These include: (i) *Improving access to finance*. For the poor to invest to benefit from new opportunities to export typically requires access to finance. Access to finance is essential for the poor to weather temporary periods of dislocation caused by trade. However, in poor countries this is often constrained, especially for women; and (ii) *Expanding the social safety net and insurance*. The poor in developing countries often lack access to formal insurance and a social safety net. Typically, they rely on family networks for these services, which may impede mobility across regions and occupations if there are costs involved in changing jobs.

Priority issues for research and analysis

One of the benefits of this volume, and of the wider set of submissions received in response to the call for papers issued by the WTO and the World Bank, is that they shed further light on the value of different research methods employed to understand trade-poverty linkages, while also highlighting areas for further research and testing new analytical methods.

In terms of the research methods used, there is no dominant approach and different methods are required according to the issues being assessed and the availability of data. The volume includes a number of papers which use information from household surveys to trace through the impact of changes in relative prices due to trade reforms on welfare. The papers vary in the way in which they model the impact of trade reform including detailed partial equilibrium approaches and the use of a computable general equilibrium (CGE) model to explore wider inter-sectoral implications. Other papers use econometric techniques applied to detailed firm level and employee data to examine the impact of exporting and importing on wages. Other papers use more novel research approaches obtaining data from detailed surveys of small-scale traders at the border and from agent based modelling to assess detailed issues related to the impacts of trade that are not possible in more aggregate sector and economy-wide modelling approaches.

A key issue that a number of papers explore is the degree of pass-through from changes in border prices to the changes in relative prices actually faced by poor people. Typically, it is assumed that there is perfect pass-through but there is increasing evidence that this does not hold in reality, especially in regard to the key characteristics of the poor discussed above and in the joint report: location in rural areas, informality and fragility. The papers here show that assumptions about pass-through are critical in determining estimates of the extent to which poor people are affected by trade.

The contributions to this volume include both *ex ante* and *ex post* analyses of trade reforms. These in turn cover a variety of examples, including tariff liberalization, reduction of non-tariff barriers, trade facilitation, and regional trade integration. The majority of papers assess the impact on poverty of potential or previous episodes of trade liberalization by modelling the change in prices of particular sectors and linking these with the results of household surveys.

It is clear that the papers in this volume make a significant contribution to building an understanding of the value of existing research methods available to study trade and poverty linkages, and ways in which these are being modified and improved. At the same time, the papers also highlight the gaps in research and analytical methods for understanding trade and poverty linkages. The following priorities are suggested for future work.

Data limitations remain a critical constraint to deeper research and analysis, especially with regard to fragile and conflict states, informality and gender. There is a need for a more systematic effort to capture the lessons learned through the use of new methods to gather relevant data (e.g., through data scraping, mobile phone surveys) and through use of a wider range of data sources (e.g., nutritional data; geospatial imagery).

Understanding the potential impact of the reduction of non-tariff barriers, especially for food and agro-processed products. There is very little analysis of how barriers such as quantitative restrictions, differences in regulations across countries, poor trade facilitation, and a lack of competition among key value chain players impact

on poverty and different groups of the poor. There is also limited knowledge of specific policy approaches that can facilitate their removal. For example, more attention needs to be given to reducing the costs of compliance with standards and regulations for poor producers. Of particular importance are measures related to trade in agricultural products and compliance with Sanitary and Phytosanitary (SPS) regulations. It remains extremely difficult and costly for poor producers of agricultural products to access markets in richer countries. There is also enormous potential for trade between developing countries in food products, which is stymied by restrictive regulations and onerous inspection procedures, especially for traded products. There is considerable potential for the use of new ICT technologies for rapid testing and certification of traded commodities grown by smallholder farmers, to reduce the costs of compliance and of trading across borders.

Facilitating trade in services. Services exports provide new routes to deliver jobs for the poor, and in particular for women, who are employed intensively in services sectors such as tourism, health and education, as well as improving access to critical services that can drive development through increased imports.[2] Sectors such as tourism can be an important source of jobs and incomes for the poor in rural areas and can be a key sector for fragile states as they emerge from conflict. Access to information, logistics, education and health services can increase productivity and allow small producers to access larger export markets. Yet there is very little analysis of the constraints to services trade that impact most heavily on the poor and scant guidance for governments on how to address these. As with non-tariff measures, this is compounded by a lack of data on services trade flows —although innovative, technology-enabled methods to gather this data are helping address this, as discussed below.

Exploiting the potential for technology to provide solutions that help ensure a positive impact of trade for the extreme poor. Access to the Internet and other forms of digital technology holds significant promise for connecting the poor to new or better trade opportunities, by lowering many of the costs associated with trade (e.g., information costs). For example, in rural areas of China the rapid growth of e-commerce for agriculture has led to significantly higher demand for value-added niche agricultural goods, like organic produce.[3] Access to information for farmers in countries like India is addressing information asymmetries, a key source of trade-related costs for the poor, and the Internet is being used to lower logistics costs in East Africa in ways that reduce transaction costs for producers. There is also the potential for new forms of Internet-enabled trade to help firms and entrepreneurs overcome the constraints imposed by informality and small size. This is particularly applicable for e-commerce in goods, where there are many examples of platforms that help connect individual artisans, re-sellers of goods, and farmers to markets. Across these various applications of technology that could reduce trade costs facing the extreme poor, there is a need to more systematically capture the lessons learned through pilot initiatives, and apply them at greater scale where feasible.

The relationship between informality and trade. A number of papers in this volume touch on the issue of trade and informality but detailed analysis of the links between trade and informality remain absent. None of the papers submitted to the call for this volume had an explicit focus on informality. In part this reflects the lack of easily available data and that new approaches are required. For example, participants of the informal economy are often very reticent to provide information to what may appear as an official survey. Given very large numbers of the extreme poor who derive their income from the informal sector, it is essential to grow the body of country evidence on the constraints posed by informality for participation in trade and how trade can provide opportunities for informal enterprises to grow and ultimately transition to the formal sector and so obtain better access to finance, information and skills. Understanding and addressing the risks associated with operating in the formal relative to the informal sector is a key issue. In many cases, operating in the informal sector is a rational response to the risks and costs of

[2] See, for example, see Dihel and Goswami (2016).

[3] http://www.chinadaily.com.cn/business/2016-12/20/content_27719089.htm and http://www.scmp.com/news/china/article/1662752/chinas-new-farmers-are-using-e-commerce-transform-agriculture

being formally registered. It may also be that the scale of operation that is feasible in small domestic economies limits operation to the informal sector, a constraint that can be broken by access to larger overseas markets.

Understanding and enhancing second round impacts of trade reforms. This involves taking analysis beyond the typical focus on short-term impacts on consumption and production through changes in prices brought about by trade reform, to looking at strategies and responses that maximize the positive impact over time. For example, the typical approach in assessing the impact of global shocks that lead to higher food prices on poor households has been to identify whether the household is a net consumer or producer of food products. Given the finding that most poor households are net consumers of food, analyses using this approach typically conclude that higher food prices are likely to increase poverty in the short run (see, for example, Ivanic and Martin (2008, 2014)). However, in the medium households adjust to higher food prices in ways that can lead to lower poverty. This could be through investments, for example in fertilisers and higher yielding seeds, that increase productivity and output. There could also be shifts within the household to activities that generate higher wage income for the household as demand for unskilled labour in rural areas increases. Finally, the impact of changing household income on poverty will depend on intra-household distributional decisions which are not captured in the net food position of the household. The latter could include policies that further support the empowerment of women, which can have long-term development outcomes in terms of lower child malnutrition, and higher school participation and attainment rates.

Conclusion

Trade has made a critical contribution to poverty reduction to date, and further integration of developing countries into international markets will be essential for ending poverty and leaving no one behind. However, as the 2015 joint WTO-World Bank report emphasized, the gains from trade integration alone may not be sufficient to end poverty by 2030. Complementary efforts are required to tackle the constraints that people living in poverty face if they are to maximize the gains of trade. The papers presented in this volume explore these constraints in more detail at the country level in several regions, making a significant contribution to the literature. They showcase various research methods for exploring trade and poverty linkages, while also making clear the areas in which research and analytical gaps exist, for future work to fill. In this way, it is hoped that this volume contributes not only to the growing body of work on trade and poverty in developing countries, but also contributes to further efforts among researchers and policymakers to address the many gaps that remain in this field.

Trade has made a critical contribution to poverty reduction to date, and further integration of developing countries into international markets will be essential for ending poverty and leaving no one behind.

References

Caselli, F., M. Koren, M. Lisicky and S. Tenreyro (2015). "Diversification Through Trade". CEPR Discussion Paper10775.

Dihel, N. and A. Goswami (2016). *The Unexplored Potential of Trade in Services in Africa*, World Bank, Washington DC.

Edmonds, E., N. Pavcnik and P. Topalova (2009). "Child Labor and Schooling in a Globalizing Economy: Some Evidence from Urban India." *Journal of European Economic Association*, Papers and Proceedings 7 (2–3), 498–507.

Edmonds, E., N. Pavcnik and P. Topalova (2010). "Trade Adjustment and Human Capital Investment: Evidence from Indian Tariff Reforms." *American Economic Journal: Applied Economics* 2 (4), 42–75.

Frankel, J. A. and H. Rosen (2008). "The Endogeneity of the Optimum Currency Area Criteria," *The Economic Journal* 108, 1009-1025.

IMF (2014). "Sustaining Long-Run Growth and Macroeconomic Stability in Low-Income Countries – The Role of Structural Transformation and Diversification – Background Notes," Washington, DC: IMF.

Ivanic, M. and W. Martin (2008). "Implications of Higher Global Food Prices for Poverty in Low-Income Countries." *Agricultural Economics* 39, 405–16.

Ivanic, M. and W. Martin (2014). "Short- and Long-Run Impacts of Food Price Changes on Poverty." World Bank Policy Research Working Paper No. 7011.

Kose, M.A. and R. Riezman (2001). "Trade Shocks and Macroeconomic Fluctuations in Africa," *Journal of Development Economics* 65 (1), 55-80

Jansen, M., C. Lennon and R. Piermartini (2016). " Income volatility: whom you trade with matters," *Review of World Economics* 152, 127–146.

Jensen, Robert. (2012). "Do Labor Market Opportunities Affect Young Women's Work and Family Decisions? Experimental Evidence from India," *The Quarterly Journal of Economics* 127(2), pp. 753–792.

Koren, M. and S. Tenreyro (2007). "Volatility and Development," *Quarterly Journal of Economics* 122 (1): 243-287.

McCaig, B. (2011). "Exporting out of poverty: Provincial poverty in Vietnam and U.S. market access." *Journal of International Economics*, 85(1), pp. 102–113.

McCaig, B. and N. Pavcnik (2014). "Export Markets and Labor Reallocation in a Low-Income Country." NBER Working Paper No. 20455.

Topalova, P. (2007). "Trade Liberalization, Poverty and Inequality: Evidence from Indian Districts," in Harrison, A. (ed). *Globalization and Poverty*, University of Chicago Press.

Topalova, P. (2010). "Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India." *American Economic Journal: Applied Economics* 2(4), 1–41.

Winters, L.A., N. McCulloch and A. McKay (2004). "Trade Liberalization and poverty: the evidence so far." *Journal of Economic Literature* 42(1): 72-115.

The international border–Petrapole, West Bengal, India–is a bilateral trade gateway between India and Bangladesh.

Is Tunisian Trade Policy Pro-poor?[1]

Inma Martínez-Zarzoso, University of Goettingen and University Jaume I
Leila Baghdadi, WTO Chair Holder, Tunis Business School, University of Tunis
Hendrik Wiard Kruse, University of Goettingen

1. Introduction

Trade liberalization policies affect the domestic economy through their impact on prices of goods and services. Consequently, these policies also can affect average productivity and lead to industrial restructuring. The main goal of this research is to estimate the distributional effects of trade policy at the micro level using household survey data, and to determine whether trade liberalization affected different groups of poor people differently. To our knowledge this question has not yet been addressed for Tunisia.

Trade policy in Tunisia has been evolving over time through a progressive reduction of tariff protection that has narrowed the gap between most favored nation (MFN) tariffs and preferential tariffs and increased the number of free trade agreements (FTAs) signed with its main trading partners. Most FTAs involve a gradual elimination of tariffs, at least for non-agricultural products (WTO, 2005). The maximum tariff rate in 1995 was 43% for non-agricultural products and 150% for agricultural products. Tariff reductions to bring the MFN rate close to the tariff applied to preferential imports have reduced the average rate from 45% in 2006 to 14% in 2016; and the maximum rate of 150% was reduced to 36% in 2009. By 2016, Tunisia had concluded trade agreements with about 60 countries.

Several other key policy changes in Tunisia's liberalization also took place in the 1990s and the 2000s. In particular, the reform of external trade, established by the law of 1994, launched a first program (2000–2004) that resulted in an integrated system of electronic management of external trade procedures, which reduced the time needed to complete foreign trade operations. The second program, launched in 2005, put in place a custom risk management system and more transparent standards and technical regulations. However, from 2005 to 2015 there were no other significant modernization steps, and trade policy remained almost unchanged, with only one FTA signed (with Iran in 2008—WTO, 2016). Since 2015, all technical import control documents can be transmitted electronically, but the processing of the numerous tax incentives still relies on paper documents.

While the reduction in tariff rates and the simplification of the tariff regime (there are only three tariff rates: zero, 20% and 36%) have reduced distortions, trade remains subject to extensive controls. State-owned enterprises and a number of boards (Trade Board, Cereals Board and Oil Board) exercise considerable control over international trade. Imports are still subject to many controls and permits, although the development plan launched in 2016 is supposed to review the role played by these entities in the development process.

[1] We gratefully acknowledge financial and intellectual support from the World Trade Organization Chair at Tunis Business School, University of Tunis, Tunisia and the Economic Research Forum (ERF). I. Martínez-Zarzoso is also grateful for the financial support received from Project ECO2017-83255-C3-3-P (AEI, FEDER, EU). The authors thank participants at the 22nd Annual Conference of the ERF, Caroline Freund and Chahir Zaki for their constructive comments.

According to the World Bank (2016) the overall level of poverty in Tunisia has fallen since the mid-1980s, due to increasing economic growth and several program interventions. However, inequality and social inclusion remain an issue.

Trade policy in Tunisia has been evolving over time through a progressive reduction of tariff protection that has narrowed the gap between most favored nation (MFN) tariffs and preferential tariffs.

The structure of the economy experienced some significant changes in the 1990s and 2000s. Tunisia remains an open economy, with trade in goods and services equaling 90% of GDP in 2015. However, a loss of competitiveness of Tunisian firms since 2005 has been reflected in a rise in the import share of GDP from 45 to 50% and a fall in the export share from 45 to 39%. Exports of machinery and transport equipment have increased sharply, while the share of agricultural products and of clothing in total exports has dropped (the latter fell from 30 to 16% of total exports in the second half of the 2000s). Participation in trade is dominated by enterprises in the coastal regions and in urban areas, with the main exported products being olive oil, seafood, "harissa" and dates. Tunisia's main trading partner remains the European Union (EU-28), which in 2014 received almost 75% of Tunisian exports and sourced 53% of its imports. However, the EU shares have fallen with imports from China increasing from 3% of Tunisian imports in 2005 to 7% in 2014.

According to the World Bank (2016) the overall level of poverty in Tunisia has fallen since the mid-1980s (in particular, extreme and moderate poverty fell in urban and rural areas from 2000 to 2012), due to increasing economic growth and several program interventions, including social assistance programs (e.g., social investment funds, energy subsidies, rural development programs, microcredit programs, etc). However, inequality and social inclusion remain an issue. Given the importance of international trade for the Tunisian economy, it is of great interest to determine whether the decline in poverty is related to the fall in protectionism.

The main question to be answered is how trade reforms affect domestic prices and to what extent these changes translate in turn into changes in household welfare. There are a number of channels through which households are affected by trade reform. Declines in tariffs will reduce goods prices, and households that are net consumers of these goods will benefit, while net producers will be hurt. In addition, changes in prices can also affect employment and wages. Households, as income earners, may benefit as higher prices in competitive exporting sectors attract more producers into a given industry and increase employment and subsequently also wages. Conversely, declining prices for imports will put pressure on employment and wages in import competing sectors.

The main result is that household welfare improves due to the reduction in tariffs. This effect is greater among low-income groups, since the decline in consumer goods prices benefited poor more than rich households. Labor income effects are sizable, but statistically significant

Tunisia remains an open economy, with trade in goods and services equaling 90% of GDP in 2015.

only for the skilled. The rest of the paper is organized as follows. Section 2 reviews the related literature and presents some stylized facts. Section 3 outlines the methodology and describes the data sources, variables and the model specification. Section 4 presents and discusses the results, and Section 5 concludes.

2. Review of the literature

Most empirical evidence at the macro level indicates that trade openness has a positive impact on economic development in general (Doyle and Martínez-Zarzoso, 2011). However, the benefits are usually unevenly distributed across households. Recent literature shows that the impact of tariff liberalization on households, both as consumers and factory owners, is positive overall. However, the distribution of gains differs significantly across income levels and geographic regions within countries.

Porto (2006) develops a method to estimate the distributional effects of trade policies using household survey data and applies it to the case of Argentina. He finds that the average poor and middle-income family benefited from the Mercosur agreement. More specifically, Porto (2006) assumes a unitary pass-through rate from tariffs to prices, and uses intra-Mercosur and common external tariffs and import shares to compute the price changes. Next, he obtains the consumption effects by multiplying budget shares by the computed price changes, and uses locally weighted regressions (Fan, 1992) to analyze the relationship between those changes along the distribution of per capita household expenditure. He finds that the resulting welfare impact increases with income per capita expenditure, indicating a greater gain for higher-income than low-income households.

However, when taking into account the positive labor income effect on household welfare, estimated using a wage equation and calculating wage-price elasticities, a net pro-poor effect of the reduction in tariffs due to Mercosur is observed. The intuition behind this result is that the reduction in tariffs on traded goods raised the relative price of goods intensive in unskilled labor (increase in the price of food and beverages and decline in price of household equipment), which reduced the wages of more-skilled workers relative to those of less-skilled workers. The estimated effects are small, around 6% of initial expenditure. The main policy conclusion is that poverty in Argentina would have been higher without the Mercosur agreement.

Several recent studies, including Nicita (2009), Ural Marchand (2012), Borraz et al. (2013) and Nicita et al. (2014), have applied a similar methodology, relaxing some of the strong assumptions made in Porto (2006).

The main novelty of Nicita (2009) and Ural Marchand (2012) was to estimate the extent to which the impact of trade reforms on prices differed in rural versus urban areas. Indeed, market imperfections partially isolate households from the effects of tariff changes, and this isolation is more severe in rural areas.

Nicita (2009) allow for less than full pass-through from changes in border prices of traded goods domestic prices by using an econometric model proposed by Goldberg and Knetter (1997). It is estimated that in Mexico only 33% of the tariff reduction for agricultural products and 27% for manufactures were reflected in domestic prices. Contrary to Porto (2006), richer households gained more from trade liberalization in Mexico than poor households.

Ural Marchand (2012) estimates similar pass-through equations and finds that Indian households experienced gains at all per capita expenditure levels as a result of trade liberalization, while the average effect was generally greater for poor households, and varied significantly across the per capita expenditure spectrum. The main novelty of Nicita (2009) and Ural Marchand (2012) was to estimate the extent to which the impact of trade reforms

on prices differed in rural versus urban areas. Indeed, market imperfections partially isolate households from the effects of tariff changes, and this isolation is more severe in rural areas. Ural Marchand (2012) estimates that the pass-through of tariff reductions to domestic prices was only around 40% in rural areas, compared to around 66% in urban areas.

Borraz et al. (2013) also find that trade liberalization had a pro-poor effect in Brazil, as poverty fell and inequality remained unchanged. This result is mainly explained by the decrease in consumer prices after Brazil entered Mercosur, as the net impact on household welfare due to changes in wages was almost zero.

Finally, Nicita et al. (2014) examines the impact of the structure of trade protection on income distribution at the household level in six Sub-Saharan African (SSA) countries. They find that trade policies in SSA tend to redistribute income from rich to poor households. The main novelty of this research is that they present a method to indirectly estimate wages, which are not available in many countries.

We extend this literature to the case of Tunisia and take on board the novelties incorporated by recent studies. For instance, we take the estimated pass-through from a companion paper (Baghdadi et al., 2016) and estimate wage equations and welfare effects along the lines proposed above. We also estimate different average welfare effects by region, between rural and urban households, and by gender. We do not expect to find substantial differences among regions, since Tunisia is a small country.

This study is the first investigation of the effects of trade policy on income distribution in Tunisia. Minot et al. (2010) are to our knowledge the only authors who estimate the poverty effects of trade policy in Tunisia for given scenarios, using a computable general equilibrium model (CGE) calibrated with household data for 1995. Their main results indicate that poverty will decline slightly, from 8.1% to 7.6%, if all tariffs on imports from all countries are eliminated. In contrast, we aim to estimate the effect of trade policy on the entire distribution of income and taking into account tariffs.

3. Model specification, data and variables

We apply the methodology proposed in Porto (2006) to recently available household-level data for Tunisia in order to assess the effect of trade on income distribution. The model is used to simulate the effects of trade policy changes on household wellbeing along the entire distribution of expenditure per capita by extending the techniques used in Deaton (1989). The latter provides a non-parametric, empirical methodology to explore the impact of small changes in prices following trade reform on household welfare.

The model focuses on the effect of changes in domestic prices and wages that could be attributed to changes in trade policy. A change in a tariff translates into a change in the border price of traded goods which is passed through to domestic prices (retail and factor prices) to a variable extent. The magnitude of the pass-through is determined by country-specific or region-specific factors, which in turn influence the extent to which trade policies can affect domestic prices. These factors are, among others, domestic policies, institutions, geography, market competitiveness and infrastructures. In Baghdadi et al. (2016) we show that market concentration and market power are also crucial factors affecting pass-through for different sectors in Tunisia.

Based on our estimate of the pass-through, we calculate the inverse of so-called "compensating variation," which measures how much money households would have to be given in order to be compensated for hypothetical changes in prices and can be interpreted as a measure of the change in welfare. Wages are analysed using Mincerian equations, which link wages to skills, age (where typically an inverse U-shaped relationship is found), regions and gender. We augment this framework to include trade policy variables interacted with the level of skill. The econometric methodology adopted in this chapter is presented in detail in Appendix A.

3.1 Data and variables

The estimation of the impact of trade policy changes on welfare requires the use of various sources of data and a number of steps to consolidate and merge the data at the same level of disaggregation. Moreover, concordances between the different classifications have to be manually constructed to match the various datasets.[2] The main sources for the data are national surveys, and trade and protection statistics from national and international sources (INS, COMTRADE and WITS).

Expenditure shares along the distribution of income are obtained from the national survey on household consumption and expenditures compiled periodically by the National Institute of Statistics and harmonized by the Economic Research Forum (ERF), which kindly provided us with the data. The 2005 survey, used in this paper, is the eighth of its kind. The survey was launched in early May 2005 and lasted until the end of April 2006, to take into account seasonal changes in household consumption. This survey aims to identify the current standard of living of families through an accurate estimation of expenditure and food consumption, and to compare these findings with those of previous years. The survey collects information on aspects related to the expenditures and living conditions of families, such as their access to education and health services.

The 2005 survey includes a representative sample of 13,400 households, distributed among 1,116 counties (villages, campaigns and cities) of Tunisia. The survey consists of three axes: (i) household expenditures, (ii) nutrition, and (iii) social and collective services. The household expenditure axis includes the whole sample, whereas the nutrition axis only includes half the number of households present in the first axis (6,700 households). The final axis includes one-third of the household spending axis (4,450 households).

From this survey we derive information on broad expenditure shares, educational attainment, literacy, marital status, household size, educational status of head and spouse, and industry of occupation for head and spouse, and other individual characteristics such as age, household head's sex and geographic indicators (urban or rural). Information on years of schooling is not included, but the information on educational attainment reports whether respondents have completed primary or lower

[2] These industry conversions are available from the authors on request.

secondary, secondary, post-secondary or equivalent, university, or post-graduate education. We use different definitions of skilled versus unskilled labor. In fact, there is a trade-off in choosing the minimum standard for skilled labor. Although the vast majority of respondents report no education at all (or no graduation), having a meaningful indicator requires that the bar should not be set too low. As a benchmark, we define a person as skilled if he or she had secondary or higher education. Summary statistics and expenditure shares are reported in Tables B.1 and B.2 in the Appendix.

Unfortunately, individual wages are not recorded in these surveys. Instead, industry-specific wage indices were obtained from the INS. They were linked to the household data using the industry of occupation of household members. Industry is reported following the 2-digit ISIC classification (Rev. 3 for 2005 and Rev. 4 for 2010). That leaves us with 61 industries for 2005 and 67 industries in 2010. Using industry-level data precludes studying inequality within industries, which is a major drawback of the dataset. Tariffs are from the WITS database. Another limitation of the dataset is that there is no information on whether households depend on the sale of agricultural or other goods for their income. For this reason, we can only study the labor income channel, and not the producer income channel when investigating how trade policy could affect households' income.

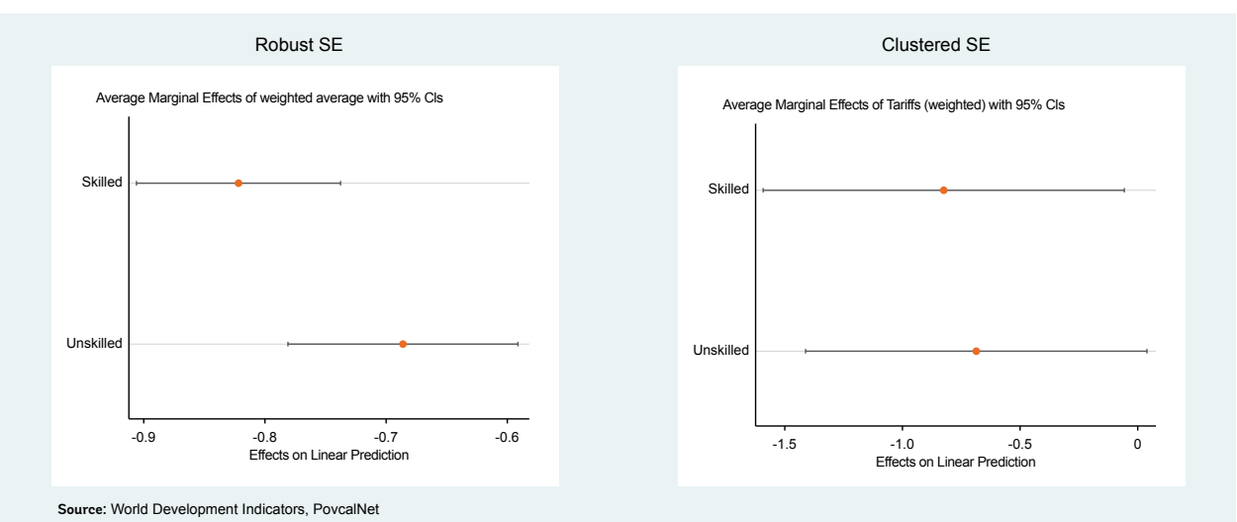
4. Main results

4.1. Wage estimations

The results obtained from estimating Mincerian equations (model 3 in Appendix A) are shown in Table C.1 in the Appendix. Our findings show that wages increase with education (the skill dummy represents literacy) and are higher for male than for female workers. Concerning the effect of trade policy, Figure 1 plots point estimates and confidence intervals for changes in tariffs differentiated by skill level. It displays a negative correlation between tariffs and wages, indicating that a reduction in tariffs will tend to increase wages. Apparently, higher educated households are affected more by changes in tariffs. The plot on the right-hand side of Figure 1 uses more conservative industry-clustered standard errors for the calculation of confidence intervals. The effect of trade policy is still significant at the 5% level for skilled workers and at the 10% level for unskilled workers. At the same time, the difference between the two effects is no longer significant.

These results, however, should be treated with caution. As mentioned above, the variation reflects merely 61 sectors for 2005 and 67 sectors for 2010 for which data were available. Monte Carlo simulations are used as a robustness check. They support our previous results as shown in Figure C.1 in the Appendix.

Figure 1: Effect of trade policy on wages. Confidence intervals

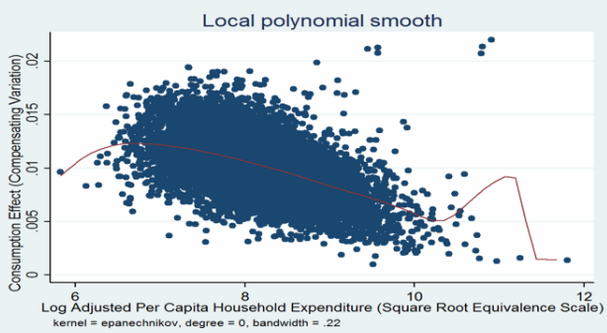


Source: World Development Indicators, PovcalNet

4.2 Welfare effects

Figures 2–4 show the consumption, earnings and total welfare effects along the income distribution of households, in the scenario of full elimination of tariffs. The main assumptions used to construct the figures are: skill level is defined in terms of literacy; the tariff pass-through is 0.10 (from Baghdadi et al., 2016); the elimination of tariffs leads to a 1.025% increase in wages, and the interaction coefficient between weighted tariffs and skill groups is -0.335 (both from the results in Table C.1). Finally, the squared root of the equivalence scale is used to calculate household size. Results using household expenditure per head and the OECD modified equivalence scale are very similar, as shown below.

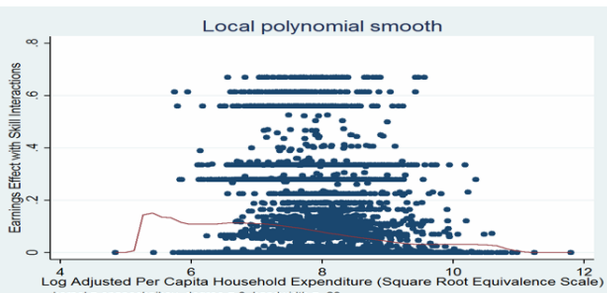
Figure 2: Consumption effects



Note: Authors' elaboration using wage elasticities in Table C.1 and incomplete pass-through.

Figure 2 shows the total consumption effect due to the change in the prices of the traded goods. The solid curve shows the estimated inverse compensating variation (explained in Section 3 above), which is downward sloping, indicating a pro-poor effect of liberalization. The average consumption effect is positive and significantly different from zero. The gains extend to 1% of initial household expenditure for low-income households and are close to zero for rich households, with the exception of a few outliers that also obtain higher gains.

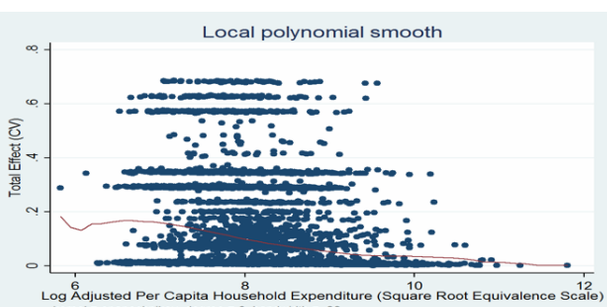
Figure 3: Earnings effects



Note: Authors' elaboration using wage elasticities in Table C.1 and incomplete pass-through.

Figure 3 shows that the earnings effect is sizable, in contrast to Borraz et al. (2013) for Brazil. It seems that poor households, again, benefit more. Results for the wage effect should in our case be treated with caution. As can be seen above there is very little variation, and it is due to intersectoral rather than inter-household variation, and should be thus mainly explained by composition effects.

Figure 4: Total welfare effect



Note: Authors' elaboration using wage elasticities in Table C.1 and incomplete pass-through.

Figure 4 shows the total welfare effect for all households, which has been computed by aggregating the consumption and earnings effects. The increase in the welfare of low-income households amounts to about 2.5% of initial household expenditure, while welfare increases for richer households are less.

The analysis of differences across population groups (urban versus rural, gender, regions, and employment types) is based on the consumption effect, as the estimation of the wage effect has shown to be quite noisy and lacking important interpersonal variation. Poor people in rural areas would benefit slightly more than their counterparts in urban areas from trade policy changes in Tunisia (Figure 5), probably due to the higher share of food products in their expenditure. There is little systematic difference in the impact of trade policy by gender (Figure 6), and the distributional effects across regions seem to be rather similar (Figure B.1 in the Appendix). Finally, the increase in welfare for self-employed, poor workers (in Tunisia, a useful proxy for informality) is only slightly higher than for other types of workers (Figure B.2).

Figure 5: Consumption effect for urban and rural areas

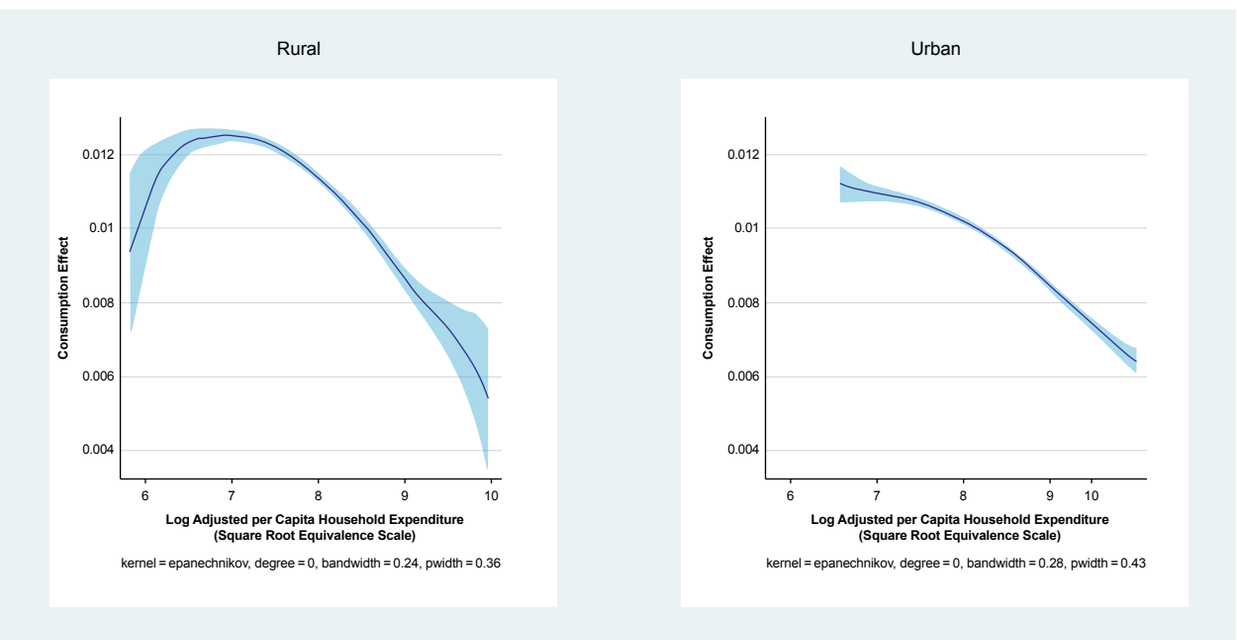
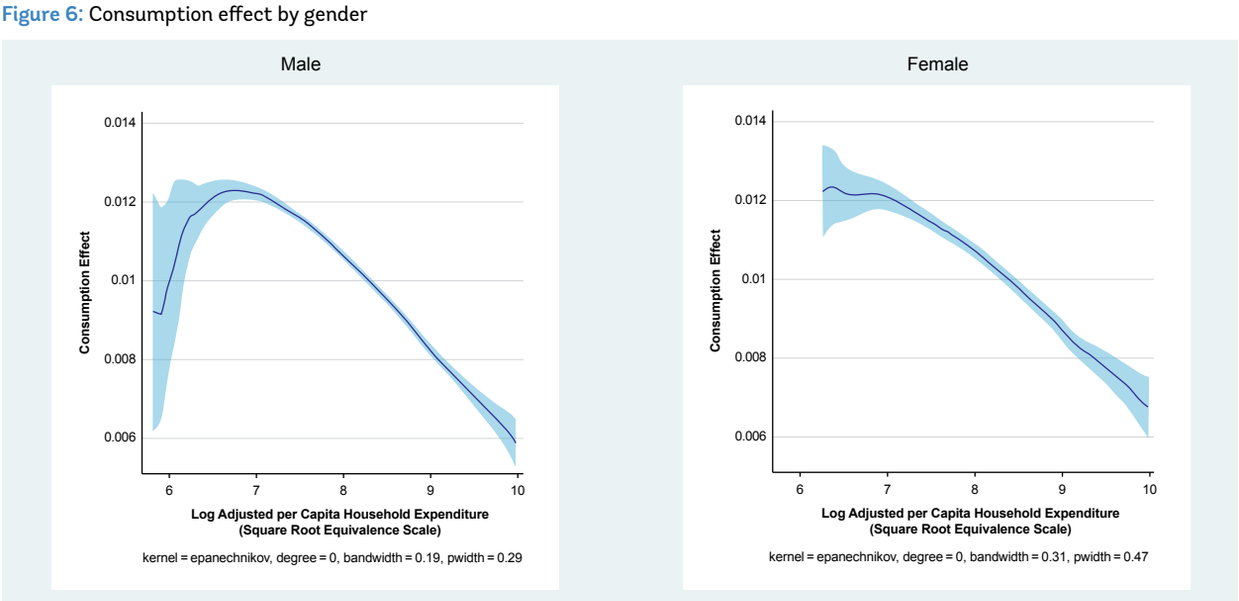


Figure 6: Consumption effect by gender



4.3 Robustness

The greater positive impact of trade reform for the poor in Tunisia remains if we change some of the underlying assumptions. A pass-through assumption of 0.5 (in line with the results in Baghdadi et al. (2016) also results in the poor benefiting more from tariff reductions than the rich. Figure 7 provides the consumption effect and Figure 8 the total effect (the earnings effect does not change due to this alternative assumption). Similarly, using unadjusted per capita household expenditure to measure income also generates a pro-poor impact of tariff reduction (the fitted curve in Figure 9 is almost the same as in Figure 4, except that it looks smoother and less influenced by outliers).

Figure 7: Consumption effect with alternative pass-through

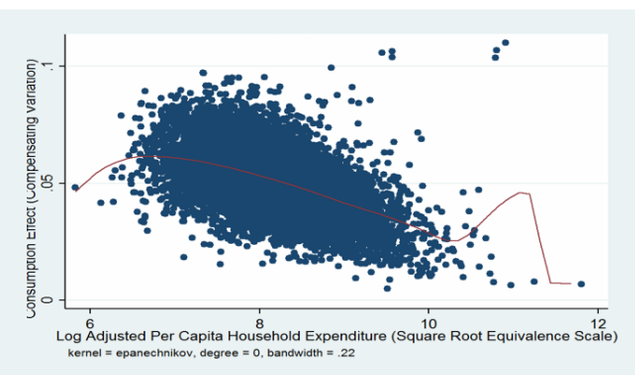


Figure 8: Total welfare effect with alternative tariff pass-through

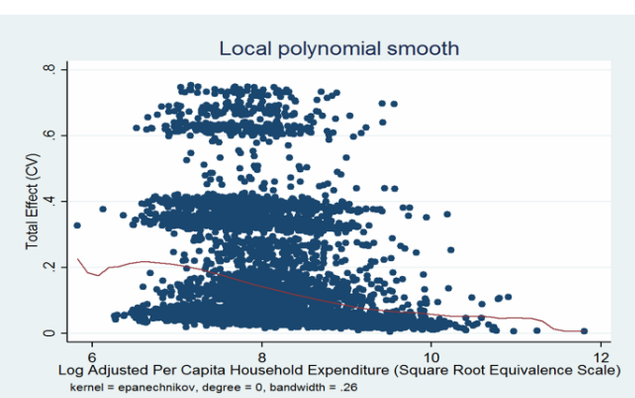
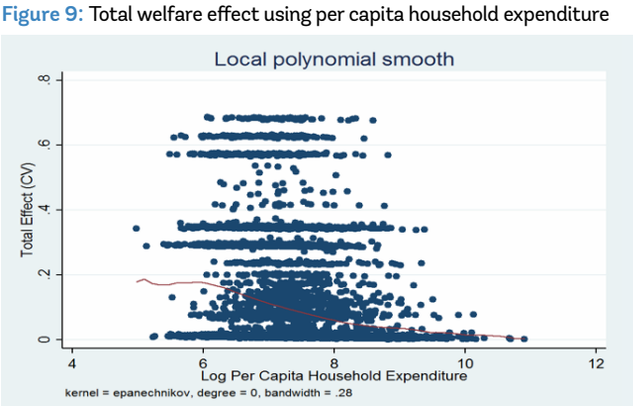


Figure 9: Total welfare effect using per capita household expenditure



In comparison to other studies, the impact of trade reform on welfare using the estimated 10% pass-through for Tunisia of around 1% of initial household expenditure, is similar to the gains found in Borraz et al. (2013) for Brazil, but lower than the welfare effects found in Ural Marchand (2012) for India and Porto (2006) for Argentina. However, when using a pass-through of 50%, the benefits are very similar—around 6% of initial expenditure—to those estimated in Porto (2006).[3]

The main policy conclusion is that trade liberalization in Tunisia would in fact reduce poverty if it is made through a reduction of tariff barriers. This result is in line with the *ex-ante* analysis conducted by Minot et al. (2010) (see above). Similar to our findings, they also show that poverty will decline more in rural than in urban areas.

5. Conclusions

This paper examines how Tunisian households would be affected by further tariff liberalization. The distributive impacts from the perspective of both consumers and workers are considered, as well as the price transmission mechanism. In particular, the effects of trade liberalization or, more generally, trade policy reform on household wellbeing and poverty, are identified and compared for the analyzed sectors. The overall effect is decomposed into a consumption and income effect on wages, and separate results are shown for different groups of households. We distinguish between rural and urban households and also show the effects by region, by gender and by type of employment.

The reduction in the prices of traded goods is found to improve welfare for all households along the distribution of income. The increase in welfare due to lower prices on consumption goods is larger for poor than for rich households. The welfare increase due to wage effects is also positive, and greater for poor than for rich workers. However, wage effects are less accurately estimated than the consumption gains, because the lack of individual wage data means we rely on average sectoral wages. When added to the consumption effect, we find that the welfare of the poor increases by about 2.5% when assuming that the tariff pass-through is low (about 10%). This is a conservative estimate, given that the pass-through could be around 50 to 60%.

A limitation of this study is that the effect of the changes in the prices of traded goods on the prices of non-traded goods has been excluded from the analysis. Nevertheless, these effects are probably small for Tunisia, where non-traded services are highly regulated and could only weakly respond to general equilibrium effects. We leave this issue for further research. Also, the data required to analyse the income effect on households that sell specific goods—for instance agricultural—are not available. Another issue is that this framework only takes static effects into account. Trade policy could also change the production structure of the economy, and this in turn could have an effect on welfare.

Summarizing, the findings suggest that trade liberalization in Tunisia could have a net positive welfare effect on households and that the benefit is higher for poorer households. However, the magnitude of these effects is estimated to be small in economic terms.

Summarizing, the findings suggest that trade liberalization in Tunisia could have a net positive welfare effect on households and that the benefit is higher for poorer households. However, the magnitude of these effects is estimated to be small in economic terms.

[3] Porto (2006) assumed complete pass-through.

References

Baghdadi, L., H. Kruse and I. Martinez-Zarzoso, (2016). "Trade policy without trade facilitation: Lessons from tariff pass-through in Tunisia." In: Teh, R., M. Smeets, M. Sandi Jallab and F. Chaudri (eds.), *Trade cost and inclusive growth. Case studies presented by WTO chair-holders*. World Trade Organization.

Borraz, F., D. Ferrés and M. Rossi (2013). "Assessment of the Distributive Impact of National Trade Reforms in Brazil," *Journal of Economic Inequality* 11, 215-235.

Deaton, A. (1989). "Rice prices and income distribution in Thailand: a non-parametric analysis." *Economic Journal* 99, 1–37.

Doyle, E. and I. Martinez-Zarzoso (2011). "Productivity and Trade and Institutional Quality: A Panel Analysis." *Southern Economic Journal* 77 (3), 726-752.

Fan, J. (1992). "Design-adaptive nonparametric regression." *Journal of the American Statistical Association* 87 (420), 998–1004.

Feenstra, R. and G.H. Hanson (2003). "Global Production Sharing and Rising Inequality: A Survey on Trade and Wages", in: E. Kwan Choi and J. Harrigan (eds.), *Handbook of International Trade*, Oxford: Blackwell.

Goldberg, P. and M. Knetter (1997). "Good prices and exchange rates: what have we learned?", *Journal of Economic Literature* 35, 1243–1272.

Heckman, J.J., L.J. Lochner and P.E. Todd (2003). "Fifty Years of Mincer Earnings Regressions," NBER Working Paper 9732.

Mincer, J. (1958). "Investment in Human Capital and Personal Income Distribution,"*Journal of Political Economy* 66(4), 281-302.

Minot, N., M.A. Chemingui, M.Thomas, R. Dewina and D. Orden (2010). "Trade Liberalization and Poverty in the Middle East and North Africa," IFPRI Research Monograph, Washington D.C.

Nicita, A. (2009). "The price effect of tariff liberalization: Measuring the impact on household welfare," *Journal of Development Economics* 89: 19-27.

Nicita, A., M. Olarreaga and G. Porto (2014). "Pro-poor trade policy in Sub-Saharan Africa," *Journal of International Economics* 92(2), 252-265.

Porto, G. G. (2006). "Using survey data to assess the distributional effects of trade policy," *Journal of International Economics* 70(1): 140-160.

Ural Marchand, B. P. (2012). "Tariff Pass-Through and the Effect of Trade Liberalization on Household Welfare." *Journal of Development Economics* 99 (2), 265-281.

World Bank Group and World Trade Organization (2015). *The Role of Trade in Ending Poverty*. World Trade Organization: Geneva.

World Bank (2016). *Tunisia Poverty Assessment 2015*. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/24410 License: CC BY 3.0 IGO.

World Trade Organization (2005). *Trade Policy Review: Tunisia*. WTO Secretariat, Geneva.

Appendix

Appendix A: Methods

A.1 Analytical Framework

We apply the methodology proposed in Porto (2006) to simulate the effects of trade policy changes on household wellbeing along the entire distribution of expenditure per capita across households.

The framework that Porto (2006) employs is based on the concept of compensating variations and on an expenditure income identity. By assumption for each household, expenditure equals factor earnings plus transfers:

$$e^h(\mathbf{p_T}, \mathbf{p_N}, \bar{u}^h) = w^h + \varphi^h \qquad (1)$$

where the expenditure function of household *h* on the left-hand side at a given level of utility $\bar{u}$ depends on the vector of prices for traded goods $\mathbf{p_T}$ and non-traded goods $\mathbf{p_N}$. On the right-hand side, w denotes wages and φ is set to zero at the benchmark scenario with protection.

Changes in tariffs affect consumption via domestic prices, and income via wages. If prices and wages change while the composition of the consumption basket and the level of utility stay the same, φ has to change in order for the identity to hold. $\Delta\varphi$ can be interpreted as the compensating variation, or a measure of the change in welfare as a consequence of trade policy. It is defined as the amount of money a household would have to be given (or forfeit) in order to be able to afford the exact same basket of goods they consumed before the price change.

A.1.1 Consumption Effect

The consumption effect measures how much more expensive the given bundle of consumed goods gets because of the induced price change, and can be calculated as follows:

$$\frac{\Delta\varphi_{hpt}}{e_t} = \sum_k \left(s_{hkt}\zeta_{kt}\frac{\Delta\tau_{kt}}{\tau_{kt}} \right) \qquad (2)$$

s_{hkt} is the share of good *k* in expenditure of household *h* at *t*. ζ_{kt} is the elasticity of prices *k* with respect to tariffs, and τ_{kt} is the tariff rate. ζ_{kt} is typically obtained from a tariff pass-through equation (see Bagdhadi et al 2016b) in which an elasticity of price with respect to the tariff *factor* is calculated. More specifically, let $\xi \equiv \frac{d\ln P_{kt}}{d\ln(1+\tau_{kt})}$ be the estimate obtained from the pass-through regression.[4]

Thus, $\zeta_{kt} \equiv \frac{d\ln P_{kt}}{d\ln \tau_{kt}} = \xi\frac{\tau_{kt}}{1+\tau_{kt}}$. Note, that $\zeta_{kt} = 0$ for all non-traded goods. This holds as long as cross-price elasticities are not considered.

A.1.2 Mincerian wage equations and the income effect

The effect of tariffs on the relative wages of skilled vis-à-vis unskilled labor is analyzed using the Mincerian Earnings Equations due to Mincer (1958). Following Ural Marchand (2012), the Mincerian

[4] P_{kt} can be interpreted as elements of the stacked vector **P=** $\binom{P_T}{P_N}$

Equation is augmented with industry specific tariffs and an interaction term between tariffs and the skill level:

$$\ln w_{ijt} = \lambda_0 + \lambda_1 \tau_{jt} + \lambda_2 (\tau_{jt} * SKILL_{it}) + \lambda_3 SKILL_{it} + \beta_1 AGE_{it} + \beta_2 AGE_{it}{}^2 + , + \varepsilon_{ijt} \quad (3)$$

where w_{ijt} are wages,τ_{jt} is the tariff rate, $AGE_{it}$is age of individual *I* and $\mathbf{I}_{it}$is a vector with individual characteristics. i denotes individuals, j sector and t time. $SKILL_{it}$ denotes the skill level of worker i.

Unfortunately, wages are not available at the household level, and, hence, vary only across sectors and time. In order to check robustness of our point estimates, we run 1,000 Monte Carlo simulations assuming that wages are standard log-normally distributed around the average industry wage; i.e., $\ln w_{ijt} \sim N(\ln w_{jt}, 1)$. We then re-estimate (3) for each of these simulated sets of wages.[5]

In equation (3), the estimates obtained can be interpreted as semi-elasticities with respect to the tariff. Thus let $\mu_{1jt} \equiv \left.\frac{d \ln w_{ijt}}{d \ln \tau_{jt}}\right|_{SKILL_{it}=0} = \lambda_1 \tau_{jt}$, and $\mu_{2jt} \equiv \lambda_2 \tau_{jt}$ the additional effect for skilled workers.

Then, the income effect at any given time for a full abolishment of taxes can be calculated as follows:

$$\frac{\Delta \varphi_{hwt}}{e_t} = -\sum_j \left(\mu_{1jt} \mathbf{EM}_{hjt} + \mu_{2jt} \mathbf{SK}_{hjt}\right) \frac{\Delta \tau_{jt}}{\tau_{jt}} \quad (4)$$

where $\mathbf{EM}_{hjt}$is the number of earners in household *h* working in sector *j*, and $\mathbf{SK}_{hjt}$is the number of skilled workers in household *h* working in sector *j*.

A.1.1Total Effect

The total effect can be calculated as:

$$\frac{\Delta \varphi_{ht}}{e_t} = \frac{\Delta \varphi_{hpt}}{e_t} + \frac{\Delta \varphi_{hwt}}{e_t} \quad (5)$$

In order to investigate the distributional effects of trade policy $\frac{\Delta \varphi_{ht}}{e_t}$ is plotted against logarithmized adjusted household expenditure. A kernel weighted local polynomial smooth is used to model the relation between expenditure and $\frac{\Delta \varphi_{ht}}{e_t}$.

[5] We thank Robert Teh for suggesting this approach.

Appendix B: Data Description

Table B.1: HH survey summary statistics

	2005			2010		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Ln Wage	4390	5.44	0.34	3192	5.90	0.46
Weighted Average Tariff	4390	19.96	7.41	3192	26.10	6.57
Skilled 1: Literate	4390	0.54	0.50	3192	0.67	0.47
Skilled 2: Primary	3847	0.11	0.31	3153	0.11	0.31
Skilled 3: Secondary	3847	0.02	0.14	3153	0.03	0.17
Skilled 4: Post-secondary	3847	0.01	0.09	3153	0.02	0.12
Skilled 5: University	3847	0.00	0.02	3153	0.00	0.05
Age	4390	48.19	12.99	3192	48.87	12.40
Urban Dummy	4390	0.37	0.48	3192	0.42	0.49
Male Dummy	4390	0.64	0.48	3192	0.71	0.45

Table B.2: Expenditure shares

	2005			2010		
Expenditure shares	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Food	12315	41.93%	13.67%	11278	35.78%	12.05%
Clothes and footwear	11265	7.97%	6.88%	10440	8.41%	6.79%
Housing and utilities	12317	21.88%	11.94%	11281	25.53%	12.24%
Transport	9028	9.77%	9.92%	8404	8.98%	8.95%
Communication	9785	4.21%	3.01%	9816	5.61%	3.82%
Recreation	10217	6.18%	6.30%	7102	1.46%	2.97%
Education	7694	4.30%	4.24%	6502	3.40%	3.26%
Personal care	12275	10.17%	8.69%	11038	8.74%	8.21%

Figure B.1: Consumption effect by region expenditure

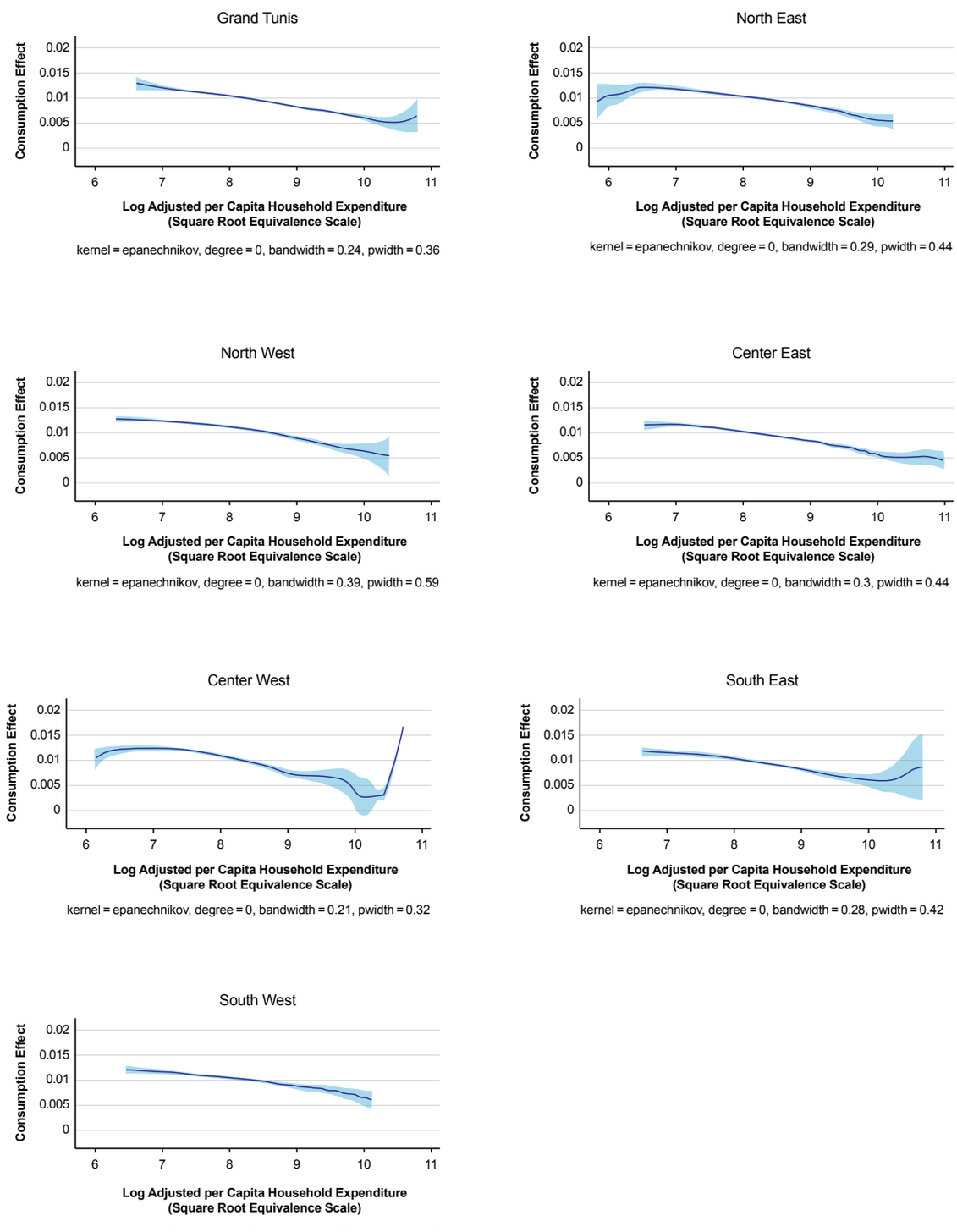
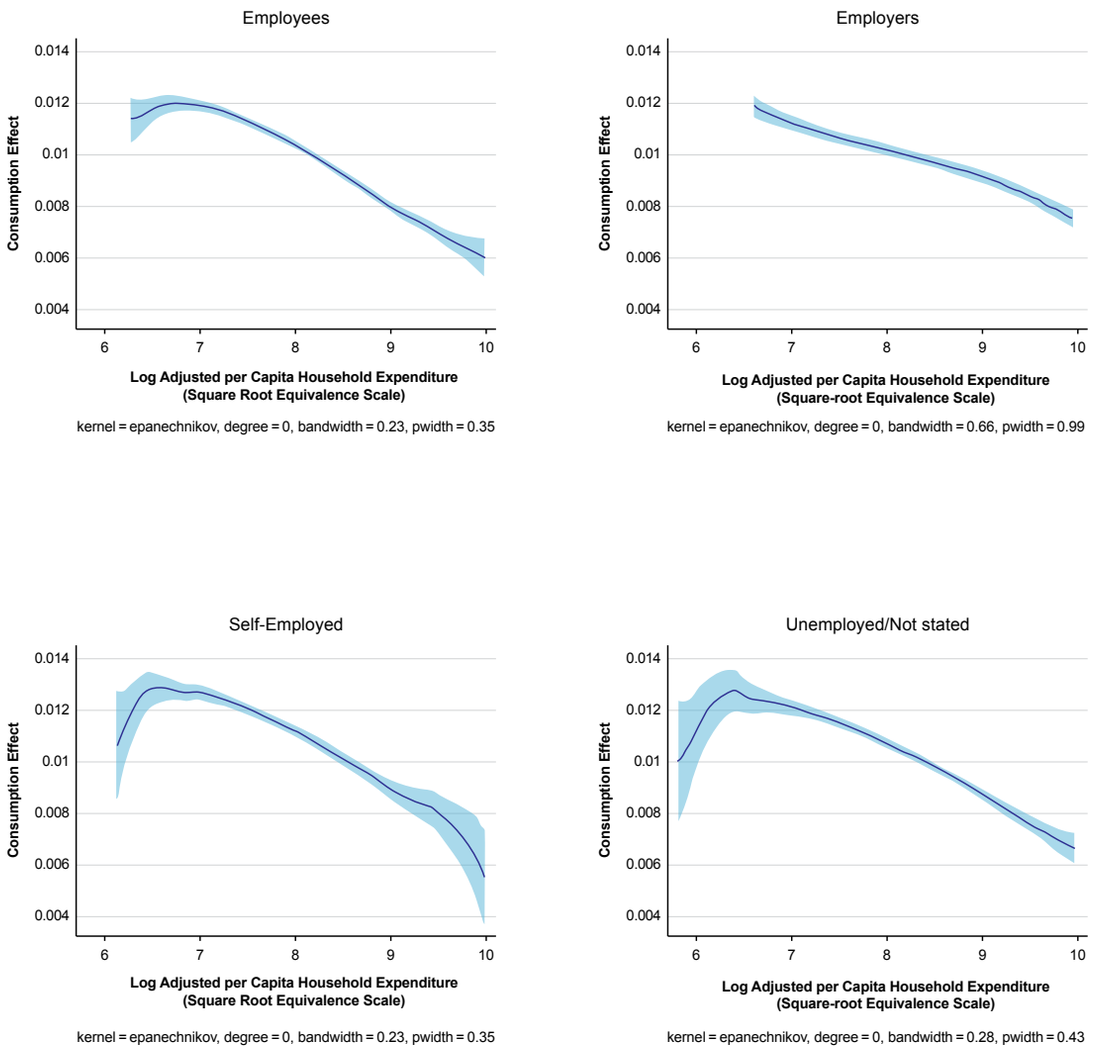


Figure B.2: Consumption effect by employment type



Appendix C: Results for the Mincerian Equation

Table C.1 reports results for equation (3) using robust standard errors in column (1) and industry-clustered standard errors in column (2). There is a negative effect of tariffs on wages. The results are stronger for skilled workers. Introducing standard errors clustered at the industry level renders our results by and large insignificant except for the main effect which remains significant at the 10% level. However, the effect of tariffs and the interaction between tariffs and skills are jointly significant.

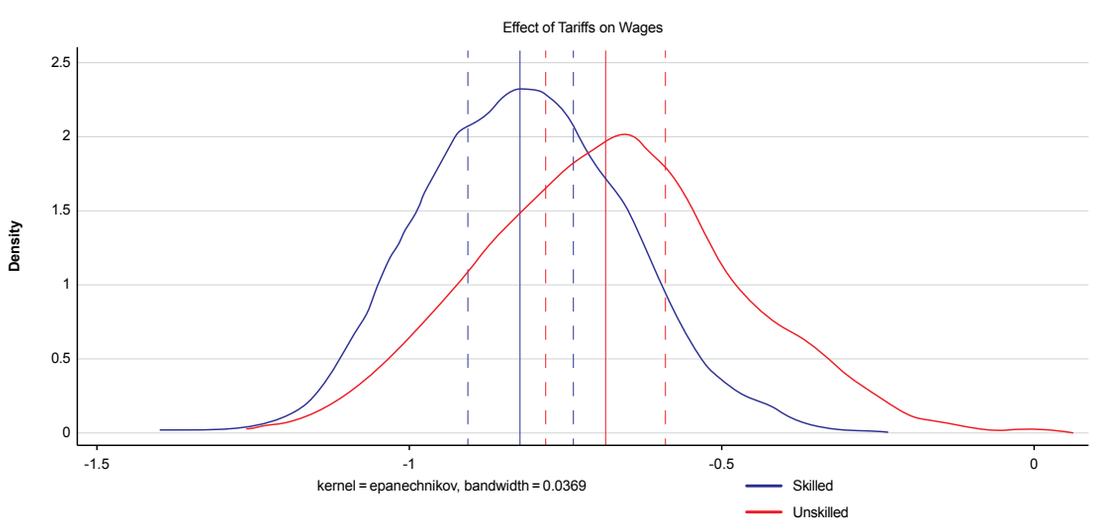
In Figure C.1 we report confidence intervals with robust standard errors (the dashed vertical lines) and point estimates (solid lines). In addition, we add the distribution of point estimates in our Monte Carlo distribution. Evidently, the peak is in all cases close to the original point estimate.

Table C.1: Results mincerian equation

	(1)	(2)
Variables	Robust SE	Clustered SE
Weighted tariff	-0.686[a] (0.0487)	-0.686[c] (0.297)
Weighted tariff[c] skill dummy	-0.136[a] (0.0404)	-0.136 (0.178)
Skill dummy	0.0345[b] (0.0148)	0.0345 (0.0645)
Age	0.00285[a] (0.000835)	0.00285 (0.00185)
Age squared	-2.30e-05[a] (7.42e-06)	-2.30e-05 1.87e-05)
Urban dummy	-0.00886[c] (0.00508)	-0.00886 (0.00856)
Male dummy	0.0153[a] (0.00388)	0.0153 (0.0234)
Constant	7.938[a] (0.0295)	7.938[a] (0.0970)
Observations	9,820	9,820
R-squared	0.877	0.877
Industry FE	Yes	Yes
Time FE	Yes	Yes

Note: standard errors in brackets.
a p<0.01,
b p<0.05,
c p<0.1.

Figure C.1: Monte Carlo simulation results



Gender Welfare Effects of Regional Trade Integration on Households in Ghana

Emmanuel Orkoh, North-West University, South Africa [1, 2]

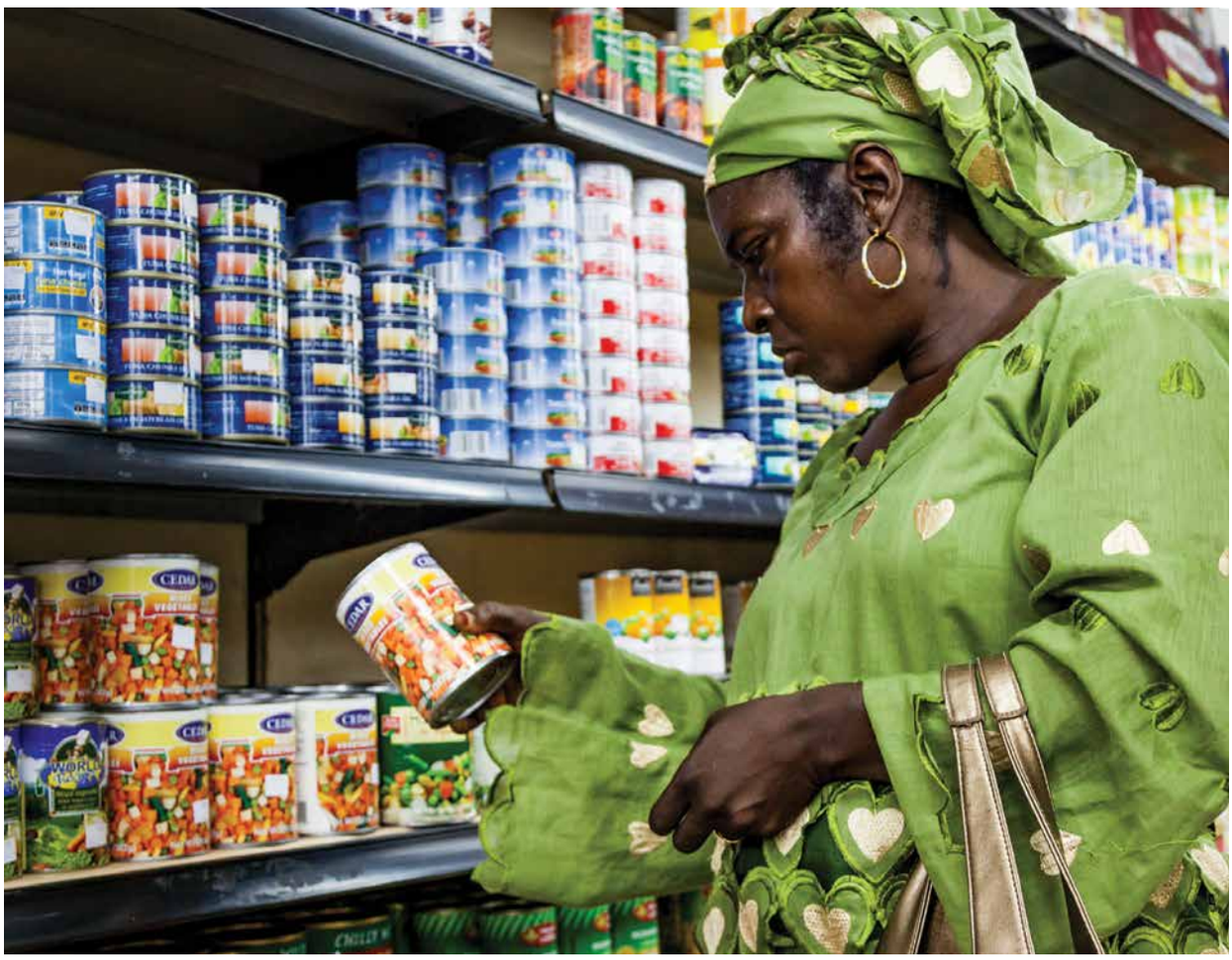
1. Introduction

Over the past two to three decades, a number of developing countries have pursued regional economic integration to harmonize trade policies and increase their weight in global trade. Economic integration, particularly in Africa, has also been seen as a way to diversify the structure of African economies, boost intra-African trade and investment, build supply capacity, and sustainably reduce poverty (Osakwe, 2015). These integration efforts have resulted in the creation of regional blocs such as the Economic Community of West African States (ECOWAS), West African Economic and Monetary Union (WAEMU), Common Market for East and Southern Africa (COMESA), Economic Community of Central African States (ECCAS), Central African Economic and Monetary Community (CEMAC), Southern African Customs Union (SACU), and Arab Maghreb Union (AMU). The trade-related objectives of these blocs include the establishment of custom unions,[3] with a common external tariff (CET) as a major trade policy instrument.

In January 2015, ECOWAS began the implementation of a common external tariff (CET), a process expected to be completed by 2020. The envisioned benefits of the CET include a reduction in lost revenues that arise from competition in external tariff rates between the member states, a reduction in the complexities associated with rules of origin requirements and protection of some emerging sectors. In 2015, about 12% of ECOWAS exports went to other member countries, 6% to other African countries and about 80% outside of Africa. The region ranked third in the 2016 Africa Regional Integration Index (AfDB, OECD, UNDP, 2017). However, the potential challenge for the CET is its coherence with the broader objectives of Africa's Continental Free Trade Area (CFTA), which seeks to harmonize or replace existing arrangements governing trade and the movement of persons in the continent. The concern has been whether the CFTA, (ratified by 44 out of the 55 AU member states during its extraordinary summit held between 17–21 March 2018 in Kigali), will add a layer of complexity or will simplify the existing agreements enshrined in the CETs and other Regional Economic Communities (RECs) (Gutowski, Knedlik, Osakwe, Ramdoo & Wohlmuth, 2016; UNCTAD, 2016).

Regional trade integration through the creation of a customs union with a CET has been found to have both direct and indirect implications for household poverty and welfare in general. Trade integration affects poverty and welfare through three main channels: (a) changes in employment structures and wages; (b) changes in prices and their impact on consumption and production patterns; and (c) changes in financing for social expenditure by

[1] TRADE Research Focus Area, Faculty of Economic and Management Sciences, North-West University, Potchefstroom Campus, South Africa. Email: aorkoh@gmail.com
[2] The author would like to thank David Zavaleta, of Universidad Católica Boliviana, Bolivia, for his very useful advice and excellent mentorship during the development of this study. Sincere appreciation also goes to the Virtual Institute team and Jane Elizabeth Casabianca, of Università Politecnica delle Marche, Italy, whose feedback and guidance have helped shape the study. This work was supported by the government of Finland [grant number 50039].
[3] A customs union is a trade agreement under which certain countries preferentially grant tariff-free market access to each other's imports and agree to apply a common set of tariffs to imports from the rest of the world. That is, they enter into a free trade agreement and apply a common external tariff to imports from non-members (Adams, 1993).



governments (Winters et al., 2004; Harrison and Tang, 2005). Trade reforms can also affect poverty indirectly via economic growth. Increased trade openness resulting from trade reforms can improve access to technology and hence foster productivity growth, leading to faster economic growth and reduced poverty (UNCTAD, 2010). Conversely, increased trade restrictions can impede productivity growth and slow economic growth, leading to increased poverty.

Among the various channels of effects, this study analyses the price channel. The focus on this channel is due to the fact that most often trade policies such as a CET affect import tariffs and thus domestic prices of commodities, which in turn affect the consumption and production decisions of households (Marchand, 2012; Nicita, 2009). We can therefore consider the price channel as the mechanism that affects households more directly in the short term.

Between 2007 and 2015, Ghana alternated between its own tariff system and the CET of the regional economic bloc of which it was a member at a given time. From 2007 to 2011, the country implemented its own tariffs, but in 2012 it adopted the WAEMU CET, before switching back to its own tariff system in 2013 and finally adopting the ECOWAS CET starting in 2015. This followed negotiations by ECOWAS members in Dakar, Senegal, on the CET for the region, which concluded in October 2013 (Roquefeuil et al., 2014).[4]

[4] According to Article 3.2(d) of the revised ECOWAS treaty, one of the aims of ECOWAS is "the establishment of a common market through: (i) the liberalization of trade by the abolition, among Member States, of customs duties levied on imports and exports, and the abolition, among Member States, of non-tariff barriers in order to establish a free trade area at the Community level; (ii) the adoption of a common external tariff and a common trade policy vis-à-vis third countries; and (iii) the removal, between Member States, of obstacles to the free movement of persons, goods, service and capital, and to the right of residence and establishment." (see http://www.courtecowas.org/site2012/pdf_files/revised_treaty.pdf#page=4&zoom=auto,-82,12). The member countries of ECOWAS are Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Sierra Leone, Senegal, and Togo.

Ghana's implementation of the ECOWAS CET will result in significant changes in the country's tariff structure for both agricultural and non-agricultural products (World Bank Group, 2015). Some of the tariff rates will be lower and some will be higher as a result of the CET. For instance, implementation of the CET will reduce the number of commodities admitted under zero percent tariff rates from 725 to 85, but increase the number of commodities admitted under the 5% band from 375 to 2,146. The changes in tariffs related to implementation of the CET will affect prices and, consequently, the welfare of households, depending on their position as either net producers or consumers of these products.

Given the different roles of men and women in society and the economy, trade policies such as those enshrined in the ECOWAS CET have different implications for male- and female-headed households. This assertion has been widely supported by findings of several trade-gender specific studies. For instance, Bird (2004) emphasizes that changes associated with trade integration may be positive or negative for women and men depending on their individual characteristics, including education and skills, marital status, family size, social group characteristics such as whether the household is a net producer or a net consumer of goods whose prices have changed, urban/rural location, and economic and social status. In the Ghanaian context, the extent to which this assertion holds remains an important policy question, especially in the wake of the country's recent adoption and implementation of the ECOWAS CET.

The aim of this study is to measure the effects that implementation of the CET will have on household poverty, income, and consumption through the price channel, with a special focus on gender.

The aim of this study is to measure the effects that implementation of the CET will have on household poverty, income, and consumption through the price channel, with a special focus on gender. A review of the literature reveals that even though some *ex-ante* studies of this nature on Ghana have looked at the poverty and income effects of trade liberalization (Bhasin and Annim, 2005; Bhasin, 2012), no study has focused on the impact

of the different ECOWAS CET bands on household welfare and the gender dimensions of this impact. The aim of this study is to fill these gaps and contribute to the existing literature on the links between international trade policy and household welfare.

To assess the implications of the CET, the study applies a top-down approach by combining a macro computable general equilibrium (CGE) (top-down) model and a micro (bottom-up) household model, with the latter using data at the household level (Bourguignon and Savard, 2008). Section 2 provides an overview of the evolution of Ghana's tariffs and poverty over the years. Section 3 explains the methodology and Section 4 the data used in the study, while Section 5 describes the simulations and presents the results. The final section provides conclusions.

It is hoped that the findings of this study may serve as input to policy makers and industry in formulating gender-aware policies to ensure that all population segments and household categories share appropriately in the gains and losses associated with the country's adoption of the CET. More broadly, it is hoped that the study may help policy makers in formulating policies to enhance gender equality and promote human development.

2. Overview of Ghana's trade reforms and poverty trends

Ghana's trade policy evolved from being fairly liberal in the 1950s to a significantly controlled regime in the 1970s, after which the country embarked on major trade liberalization and other economic reforms in the 1980s. This approach to trade policy has been greatly influenced by developments in international trade under the General Agreement on Trade and Tariffs (GATT) and the World Trade Organization (WTO). It has also been shaped by trade agreements between Ghana and its major trading partners, the country's economic development policy, and the structural adjustment programs of the World Bank and the International Monetary Fund, particularly in the 1980s and 1990s (Ackah and Aryeetey, 2012). Significant trade liberalization in Ghana began with the downward adjustment of tariffs in 1983, from rates of 35%, 60%, and 100% to rates of 10%, 20%, 25%, and 30%. The tariffs were further simplified and lowered to

0%, 25%, and 30% the following year while some import controls remained in place. Further reductions were made in 1986, when the higher rates were lowered to 20 and 25% (Ackah and Aryeetey, 2012).

Major trade policy reforms took place between 2007 and 2015, when the most-favored-nation (MFN) tariff applied by the country was frequently modified. In 2012, the country adopted the WAEMU CET, which was based on four tariff bands comprised of a zero duty on social goods such as medicine and publications, 5% duty on imported raw materials, 10% duty on intermediate goods, and 20%

duty on finished goods (Office of the United States Trade Representative, 2014). In 2013, Ghana switched from the WAEMU CET back to its own national tariffs. In this context, it abolished the non-ad-valorem tariffs applied to petroleum products, and replaced them with ad valorem rates in January 2014. This was accompanied by a reduction of duties on some products and an increase in the duties on others.[5] As shown in Table 1, the average unweighted applied MFN tariff in 2013 was 12.8%, compared to the 12.7% rate in 2007. The MFN rates on agricultural products were generally higher than those on non-agricultural products.

Table 1: Trends in Ghana's most-favored-nation tariffs, 2007–2015 (percent)

Categories	Ghana 2007	WAEMU CET 2012	Ghana 2013	ECOWAS CET 2015	Change 2007–2013[b]	Change 2013–2015[b]
Total	12.7	12.3	12.8	12.3	1.0	-4.0
By Harmonized System category[a]						
Agricultural products	17.5	14.9	17.3	15.6	-1.0	-10.0
Animals and products thereof	19.4	18.5	19.0	23.9	-2.0	26.0
Dairy products	20.0	14.4	20.0	16.0	0.0	-20.0
Fruit, vegetables, and plants	18.9	17.6	18.3	17.6	-3.0	-4.0
Coffee and tea	20.0	17.2	20.0	12.0	0.0	-40.0
Cereals and preparations	17.8	12.7	16.2	13.5	-9.0	-17.0
Oils seeds, fats, oil and their products	14.6	10.5	14.6	14.1	0.0	-3.0
Sugar and confectionary	11.1	13.3	11.0	13.8	-1.0	25.0
Beverages, spirits, and tobacco	19.8	19.0	19.8	17.0	0.0	-14
Other agricultural products	14.4	9.4	15.1	9.5	5.0	-37
Non-agricultural products	12.0	11.8	12.0	11.7	0.0	-3.0
Fish and fishery products	11.1	15.5	9.8	15.4	-12.0	57.0
Minerals and metals	12.2	11.8	12.5	11.7	2.0	-6.0
Chemicals and photographic supplies	11.9	7.7	12.1	8.0	2.0	-34.0
Wood, pulp, paper, and furniture	16.1	11.3	16.8	11.4	4.0	-32.0
Textiles	16.9	16.5	16.8	16.0	-1.0	-5.0
Clothing	20.0	20.0	20.0	20.8	0.0	4.0
Leather, rubber, footwear, and travel goods	14.3	14.2	15.0	12.9	5.0	-14.0
Non-electric machinery	2.8	7.3	3.1	7.0	11.0	126.0
Electric machinery	10.3	11.3	10.6	11.2	3.0	6.0
Transport equipment	6.0	11.0	5.5	10.2	-8.0	85.0
Non-agricultural products n.e.s.	15.6	14.3	15.0	14.3	-4.0	-5.0
Petroleum	9.0	7.9	4.3	7.9	-52.2	84
By ISIC sector						
Agriculture, hunting and fishing	15.7	13	15.1	11.5	-4.0	-24
Mining and quarrying	11.2	5.0	11.2	5.1	0.0	-54
Manufacturing	12.6	12.4	12.7	12.5	1.0	-2.0

Source: Prepared by the author based on data from WTO (2014).
a: The Harmonized Commodity Description and Coding System (HS) is a multipurpose international product nomenclature developed by the World Customs Organization.
b: "Change 2007-2013" and "Change 2013-2015" are the percentage changes in tariffs for 2007–2013 (before the ECOWAS CET), and 2013–2015 (after the ECOWAS CET), respectively. WTO (2014) explains that the 2007 tariff is based on HS 2002 nomenclature consisting of 5,969 tariff lines (at the 10-digit tariff line level). The 2013 tariff is based on HS 2012 nomenclature consisting of 6,062 tariff lines (at the 10-digit tariff line level). The WAEMU tariff schedule consists of 2012 tariff rates (5,550 tariff lines at the 10-digit tariff line level) based on the HS 2007 nomenclature, while the ECOWAS tariff schedule is based on HS 2012 nomenclature consisting of 5,899 tariff lines (at the 10-digit tariff line level). According to WTO (2014), the tariff data were obtained from Ghanaian authorities. CET: common external tariff; ECOWAS: Economic Community of West African States; ISIC: International Standard Industrial Classification; n.e.s.: not elsewhere specified; WAEMU: West African Economic and Monetary Union.

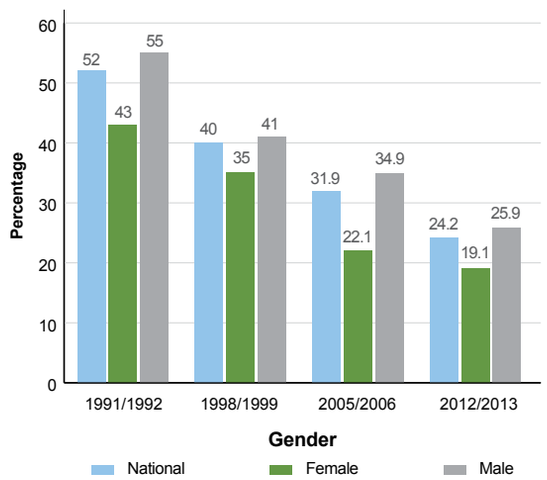
[5] Items for which duties were reduced from as high as 20% to duty-free included fish livers, roe and flour, seeds, clinker and bulk cement, gasoil and related products, fishing yarn and equipment, mosquito nets, and contact lenses. Items for which tariffs increased included mobile phones, online telephone sets, cordless handsets, rough wood, ferrous and non-ferrous metal scrap, air coolers, and battery chargers.

Subsequently, as a member of ECOWAS, Ghana endorsed the ECOWAS CET, which was adopted by ECOWAS Ministers of Finance on 20 March 2014, and came into effect on 1 January 2015. The ECOWAS CET is based on the four tariff bands of the WAEMU CET and an additional fifth band involving a 35% duty on goods in 'sensitive' sectors such as poultry and rice that the government sought to protect. The revision of Ghana's trade policy triggered by implementation of the ECOWAS CET in 2015 resulted in considerable changes in Ghana's tariff structure for agricultural and non-agricultural products. Overall, there was a slight reduction in the country's average unweighted applied MFN tariff from 12.8 to 12.3%.

The implications of changes in import tariffs for poverty and household welfare are important policy issues. Poverty indicators based on reports of the last four rounds of the Ghana Living Standard Survey (GLSS) show that poverty in the country declined considerably from 1991 to 2013,[6] although there were some variations across regions and across segments of the population. The decline in poverty since 1998/1999 was concentrated mostly in the Central, Western, Eastern, Upper East, and Northern regions of Ghana. Households of farmers in general, the non-farm self-employed, and public sector employees enjoyed the greatest gains in their standard of living, while private sector employees and households with unemployed heads experienced the smallest gains. Consistent with the general reduction in the poverty level, female-headed households appear to be better off than male-headed households and are increasingly less impoverished (Figure 1) (Ghana Statistical Service, 2007).

Poverty at the national level decreased by 52.5% between 1991 and 2012—with the reduction in poverty of female-headed households being slightly greater than that of male-headed ones (54.3% and 52% reductions, respectively). The poverty level remained consistently lower among female-headed households than male-headed households, which is contrary to the "feminization of poverty" hypothesis. This may be partly due to the fact that over these years, Ghana's economic growth was largely driven by the services and agricultural sectors, where the shares of women's employment are higher than the shares of men's employment.

Figure 1: Poverty distribution in Ghana between 1991 and 2013



3. Methodology

This study applies a top-down approach by combining a macro CGE (top) model and a micro (bottom) household model (Bourguignon and Savard, 2008). The CGE model used for the macrosimulation is based on the dynamic (recursive) computable general equilibrium (DCGE) model developed by Breisinger et al. (2008). The model is an extended version of a static standard CGE model developed in the early 2000s by Löfgren et al. (2002) at the International Food Policy Research Institute (IFPRI) (Diao, 2011). The Ghana DCGE is an economy-wide, multisectoral model that simultaneously and endogenously solves for a series of economic variables, including commodity prices. It is made up of households aggregated into a small number of representative household. On the other hand, the micro (bottom) model considers all the households in the Ghana Living Standard Survey and models their behavior.

[6] Poverty indicators are based on reports of the last four rounds of the Ghana Living Standards Survey (GLSS). These data are subject to two caveats. First, the contribution of the various tariff reforms to this reduction in poverty remains an important policy question. This is because there have been several policy interventions, including the Livelihood Empowerment Against Poverty Programme and the Ghana School Feeding Programme. Their contribution to the reduction in poverty among households will be difficult to disentangle from the effects of the reform. Second, the poverty estimates of the 2012/2013 survey may not be fully comparable with the estimates of the previous four GLSS rounds because of changes in the Consumer Price Index basket and new consumer items that have been introduced onto the market, leading to changes in household consumption. Only the 2005/2006 indicators were adjusted by the Ghana Statistical Service to make them comparable to the 2012/2013 indicators (Ghana Statistical Service, 2014).

The top-down approach required that the two frameworks would be used sequentially: first, we used the CGE model to simulate the effect of tariff changes between 2013 and 2015 on commodity prices. Then in the second stage, the simulated percentage changes in prices of goods and services were passed down to the microsimulation model, taking into consideration the gender of the household head, as shown in Figure 2. In linking the parameters from the CGE to the microsimulation model to assess the consumption and poverty effects, we matched the commodities in the SAM with the same commodities in the household survey data, and then applied the first-order approach as described in Deaton (1989). This approach consists of calculating the share of household consumption expenditure and income (where the household is also a producer in the case of farmers) related to the commodities for each household. These shares are multiplied by the changes in prices obtained from the CGE model, and added to obtain the total change in welfare.

Following Deaton (1997), the function for the net welfare effect of the changes in prices for each commodity can be specified as:

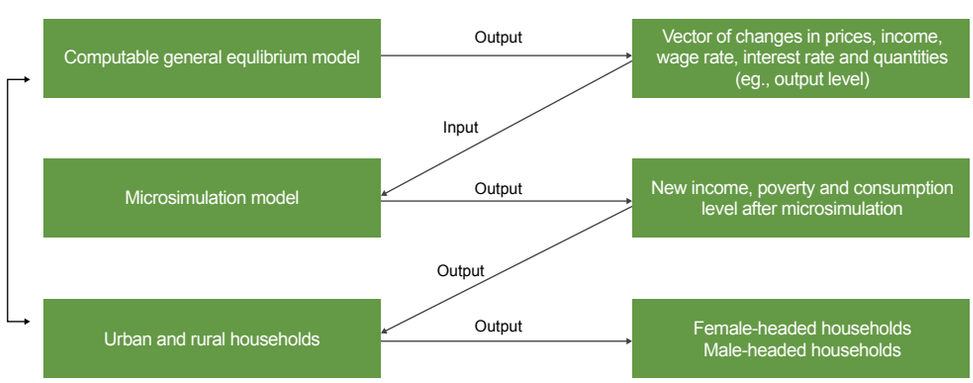
$$\frac{\partial_{X0}}{Y} = S_i \partial lnP_i - S_i^* \, \partial lnPi = (S_i - S_i^*) \partial lnP_i, \qquad (1)$$

where S_i and S_i^* are, respectively, the income and budget shares of commodity *i*, and $\frac{\partial_{X0}}{Y}$ is the compensating variation associated with a change in the price of good *i*. The compensating variation is the revenue that the social planner (government) would have to provide to the household to compensate for the effects of the price change. It is imperative to stress that the household can be both a consumer and a producer of the commodity. Assuming that the price increases and the household is a net producer ($S_i > S_i^*$), it will benefit from this price change. On the other hand, if the household is a net consumer ($S_i < S_i^*$), then a price increase will make it worse off.

4. Data and description of household statistics

The CGE model used in this study was built using the 2005 SAM for Ghana, which was constructed by IFPRI based on the fifth round of the Ghana Living Standard Survey.[7] Effort was made to update the model to 2013, but the needed data were not available. As a result, the model was used to simulate the changes in prices from 2007 to 2013 (before the ECOWAS CET), and from 2013 to 2015, after implementation of the ECOWAS CET. The model is a comprehensive dataset that encapsulates all the information contained in the national income and product accounts and the input-output table, as well as the monetary flows between institutions in the country. The SAM estimates the structure of the Ghanaian economy in 2005 and includes detailed information on 56 production sectors, six factors of production, income and expenditures of rural and urban households, the government budget, and the balance of payments (Breisinger et al., 2007). The data on tariffs (presented in Table 1), obtained from WTO (2014), were based on calculations of the WTO Secretariat using data provided

Figure 2: The top-down computable general equilibrium approach



Source: Adapted from Bourguignon and Savard (2008).

[7] The SAM dataset was obtained from the IFPRI website, and the GLLS6 dataset from the Ghana Statistical Service. The SAM can be downloaded from IFPRI at http://www.ifpri.org/publication/ghana-social-accounting-matrix-2005 and the GLSS6 from the Ghana Statistical Service at http://www.statsghana.gov.gh/nada/index.php/catalog/72.

by Ghanaian authorities. Table 2 shows the import structure based on the SAM.

In building the microsimulation model, the study relied on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6), which provides nationally and regionally representative indicators covering a broad range of topics such as education, health, employment, housing conditions, migration, tourism, poverty, household agriculture, access to financial services, and asset ownership. In order to address the needs of Savannah Accelerated Development Authority (SADA) areas and also to provide nationally representative quarterly labor force statistics, the numbers of primary sampling units and households were increased from 580 and 8,700 to 1,200 and 18,000, respectively. This represents an increase of about 107% compared to the GLSS5 (Ghana Statistical Service, 2014). The household survey data used for the micro-level analysis covered 16,772 household heads, with more male-headed households (69.5%) than female-headed households (30.5%) (Table 3). Most of the female household heads lived in urban areas.

Figure 3 compares the structure of employment and average consumption expenditure across different categories of households (female/male and rural/urban) and shows that, in general, female-headed households spend more on food than male-headed households.

Table 2: Ghana's imports of selected commodities as a percentage of total imports

Commodity	Import share	Commodity	Import share
Maize[a]	0.2	Clothing	4.5
Rice	3.4	Footwear	0.9
Other grains[a]	0.1	Pulp and paper	0.4
Other crops[a]	0.2	Oils[a]	9.6
Chicken	1.5	Fuel	4.7
Beef[a]	0.7	Fertilizers	2.6
Goat[a]	0.2	Chemicals	6.4
Other livestock[a]	0.4	Metals	2.7
Formal food processing	8.2	Capital goods	43.9
Dairy	0.2	Electricity[a]	0.1
Meat	2.8	Other services[a]	4.9
Textile	1.4		

Source: Author's calculations based on Ghana's 2005 Social Accounting Matrix (SAM).
Note: The structure of the SAM shows that there is not an import share for all commodities.

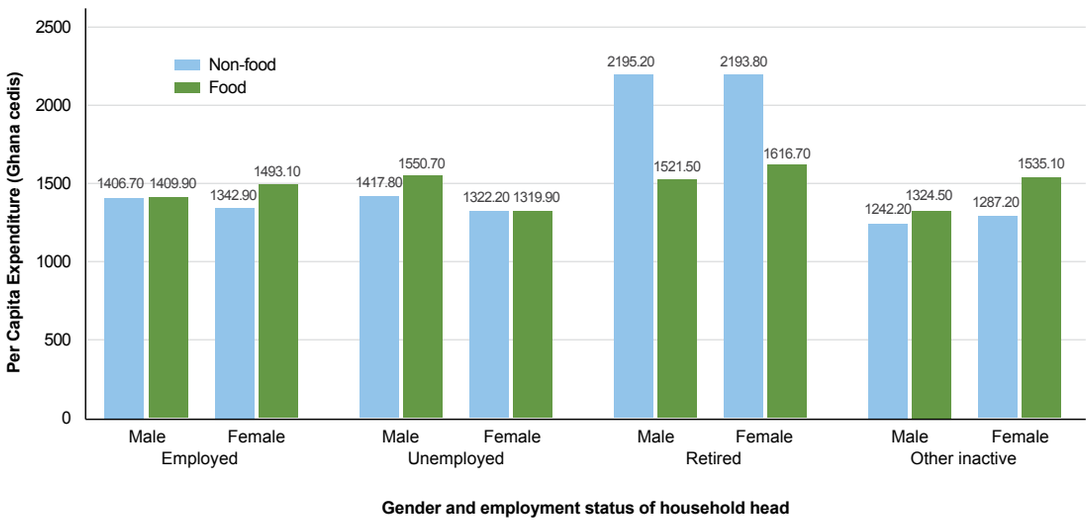
a Though the SAM reports imports for these commodities, no import tariffs are reported.

Table 3: Distribution of households by gender of household head and place of residence

Gender and place of residence	Number of households	Share (%)
Male household head	11,652	69.50
Female household head	5,120	30.50
Total	16,772	100.00
Female household heads in rural areas	1,950	11.63
Female household heads in urban areas	5,532	32.98
Male household heads in rural areas	3,170	18.90
Male household heads in urban areas	6,120	36.49
Total	16,772	100.00

Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

Figure 3: Structure of employment and average consumption by gender of household head

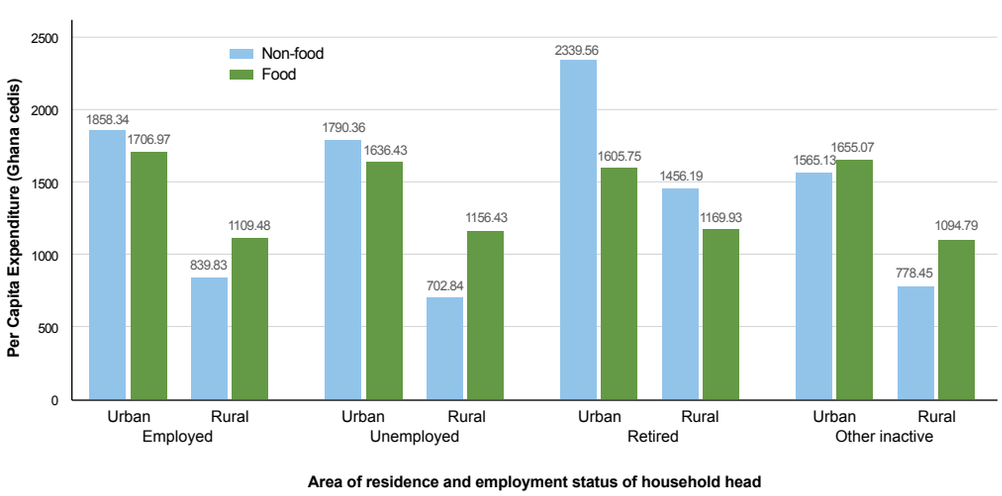


Source: Prepared by the author based on the Ghana Living Standard Survey (GLSS6) data.

This observation is consistent across all the categories of employment status except households in which the head is unemployed. Conversely average expenditure on non-food items is higher in all the categories of male-headed households, except those in which the head is not employed. Observe further that average expenditure and the differences in expenditure between food and non-food items are relatively higher in households in which the head is retired compared to the other households. This could be due to the fact the households with a retired head are more likely to have more members who are in the labour-force than the other category of households.

Figure 4 shows that on average, urban households spend more on both food and non-food items than their rural counterparts. Apart from a household headed by a retiree, all the households in the rural areas spend more on food than non-food items. As in the distribution across gender of the household head, the average expenditure on non-food items and the difference between expenditure on food and non-food items are higher for households in the urban area headed by a retiree than the other households. Households in the rural areas that have unemployed heads spend the least on food. These distributions suggest that any changes in the prices of

Figure 4: Structure of employment and average consumption by area of residence



Source: Prepared by the author based on the Ghana Living Standard Survey (GLSS6) data.

commodities due to the introduction of the CET may have differential effects on the income and consumption of households depending on the gender of the head and geographical local location of the household.

5. Simulations and results

Following the methodology described in Section 4, we use the CGE model to simulate the changes in prices of commodities after the implementation of the ECOWAS CET. Then we introduce the resulting changes in commodity prices in the microsimulation model to simulate the changes in welfare. This section provides a disaggregation of the dataset based on the gender of the household heads. We further disaggregate the data into female-headed and male-headed households in rural and urban areas, as well as across the 10 regions of the country, to determine potential winners and losers from the reform based on gender and residence.

5.1 Computable general equilibrium results

This sub-section presents the simulated results on prices from the CGE model. In simulating the changes in prices, we introduced the changes in tariffs (Table 1) as the trade shocks. The simulated prices (Table 4) involved 60 food and non-food commodities and services. The simulated results for the 2007/2013 and 2013/2015 periods show that most of the commodities whose prices decreased were non-food items. These include pulp and paper, fertilizers, chemicals, clothing, textiles, and metals. Among the 33 food items, only the price of rice decreased. This reduction may have a positive impact on households as consumers, since rice is the second most widely consumed cereal by Ghanaian households, after maize. Available statistics suggest that in 2014, Ghanaians consumed 754,698 metric tons of rice and imported 52% of that. This price reduction will therefore benefit consumers and may further increase demand for rice, while at the same time potentially reducing local rice production if domestic producers cannot withstand foreign competition.

Changes in the prices of imported commodities (that reported import tariffs in the SAM—Table 2) depend on the change in the tariff: an increase in tariffs results in higher prices and a decrease in tariffs results in lower prices (Table 4). For all other commodities, the changes in their prices come from indirect effects, given the general equilibrium nature of the CGE model.

5.2 Non-parametric regression results

This sub-section presents the analysis of the effects of changes in commodity prices on household welfare. The analysis is carried out for female- and male-headed households separately and also considers regional (urban and rural) and geographical disparities. The estimation of non-parametric regressions is useful because they do not require specific assumptions on the distribution of the data or any econometric specification of the functional form of the relationship between the variables of interest (Deaton, 1989; Calvo, 2014). In this analysis, the dependent variable is the change in welfare due to changes in prices. The explanatory variable is the log of per capita expenditure. The objective is to assess the welfare effect of the CET on households. We divide the analysis into three steps: the welfare effect on households as consumers (through their expenditure), on households as producers (through their income), and the net welfare effect.

First, we calculate the welfare effects of implementation of the CET on households as consumers by multiplying the budget share of each consumed item by its change in price[8] simulated by the CGE model (Table 4). Figure 5 shows the results of the non-parametric regression. The downward sloping curve suggests a pro-poor effect of implementation of the CET for households as consumers. Figure 5 also shows that implementation of the CET favors poor female-headed households more than poor male-headed households. The expected improvement in the welfare of poor households as consumers may be due to the reduction in the price of the commodities that are consumed most within these households.[9] Moreover, female-headed households stand to be better off than male-headed households because the budget share of items whose price decreases is higher for female-headed households than for male-headed households.

[8] This corresponds to the expression $-S_i^* \partial lnP_i$ in Equation 1. The negative sign indicates that an increase in price results in a decrease in welfare for households as consumers.
[9] For instance, Table 4 shows that the price of rice decreases by more than 2 per cent and the budget share of rice is higher in poor households.

Table 4: Simulated prices of commodities from 2007 to 2015

Commodity	Log Sim1 2007–2013	Log Sim2 2013–2015	Change in price (%)
Maize	0.444	0.445	0.064
Yams	0.225	0.226	0.080
Groundnuts	1.024	1.026	0.215
Export vegetables	1.450	1.465	1.513
Chicken	-0.001	0.035	3.637
Forest	0.001	0.001	0.000
Cocoa processing	0.001	-0.001	-0.200
Footwear	0.053	0.030	-2.303
Diesel	0.457	0.456	-0.063
Capital goods	0.625	0.642	1.698
Other nuts	0.022	0.026	0.391
Plantain	0.002	0.000	-0.200
Rice	1.320	1.299	-2.025
Cocoyam	-0.313	-0.313	0.000
Other nuts	-0.499	-0.496	0.329
Plantain	-0.276	-0.273	0.263
Eggs	0.001	0.001	0.000
Fish	0.001	0.007	0.598
Dairy	0.108	0.099	-0.902
Wood products	0.107	0.104	-0.270
Fuel	0.001	0.001	0.000
Construction	0.003	0.002	-0.100
Transport	0.025	0.023	-0.195
Public administration	0.001	0.002	0.100
Sorghum and millet	1.206	1.206	0.030
Cowpea	1.204	1.206	0.120
Domestic fruits	0.808	0.81	0.134
Cocoa	2.342	2.339	-0.241
Beef	0.001	0.000	-0.100
Mining	0.001	0.001	0.000
Meat	0.035	0.041	0.577
Pulp and paper	0.119	0.067	-5.195
Fertilizers	0.093	0.061	-3.240
Water	0.149	0.151	0.172
Communication	0.018	0.013	-0.492
Education	0.001	0.006	0.498
Other grains	0.001	0.001	0.000
Soya beans	0.684	0.685	0.151
Export fruits	-0.128	-0.121	0.68
Other crops	0.985	0.984	-0.037
Goat	0.001	0.000	-0.100
Formal food processing	0.093	0.103	0.907
Textile	0.103	0.093	-0.907

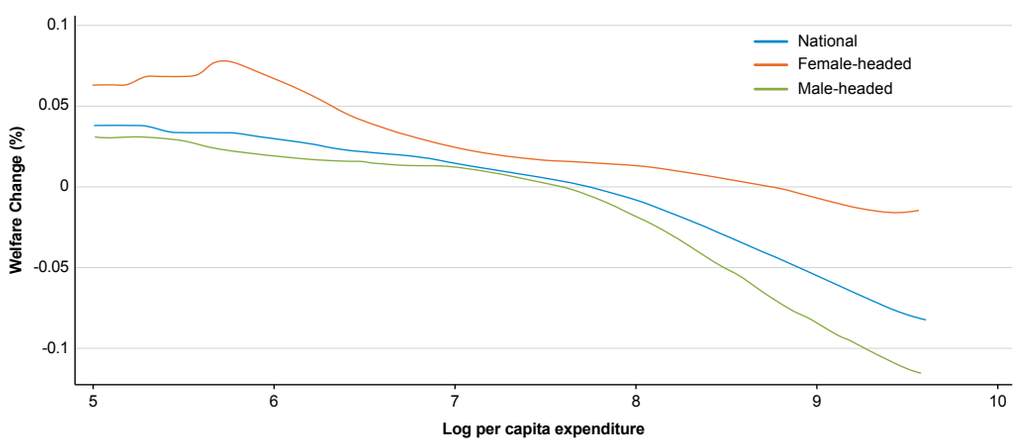
continued

Table 4: Simulated prices of commodities from 2007 to 2015 (continued)

Commodity	Log Sim1 2007–2013	Log Sim2 2013–2015	Change in price (%)
Oil	0.001	0.001	0.000
Chemicals	-0.088	-0.102	-1.429
Electricity	0.001	0.007	0.598
Business services	0.115	0.112	-0.268
Health	0.001	0.005	0.399
Cassava	-0.728	-0.726	0.207
Palm oil	0.913	0.918	0.480
Domestic vegetables	0.903	0.902	-0.122
Other export crops	1.707	1.718	1.155
Other livestock	0.001	0.000	-0.100
Local food processing	0.001	-0.001	-0.200
Clothing	0.032	0.033	0.097
Petrol	0.491	0.490	-0.061
Metal	-0.666	-0.669	-0.390
Trade	0.154	0.154	0.086
Real estate	0.002	-0.004	-0.601

Source: Prepared by the author using the computable general equilibrium model for Ghana.
Note: The variables labelled *Log Sim* show the simulated prices of the commodities. For instance, *Log Sim1* is the simulated price of the commodities in from 2007-2013. These values were used as the base values for the simulation of the prices from 2013-2015 (*Log Sim2*), which represents the period in which Ghana switched from its own tariff to the ECOWAS CET. The third column (change in price) is the difference between the first two columns, the log of prices in from 2007-2013 (before the ECOWAS CET) and 2013-2015 (the period of the ECOWAS CET).

Figure 5: Change in welfare of households as consumers

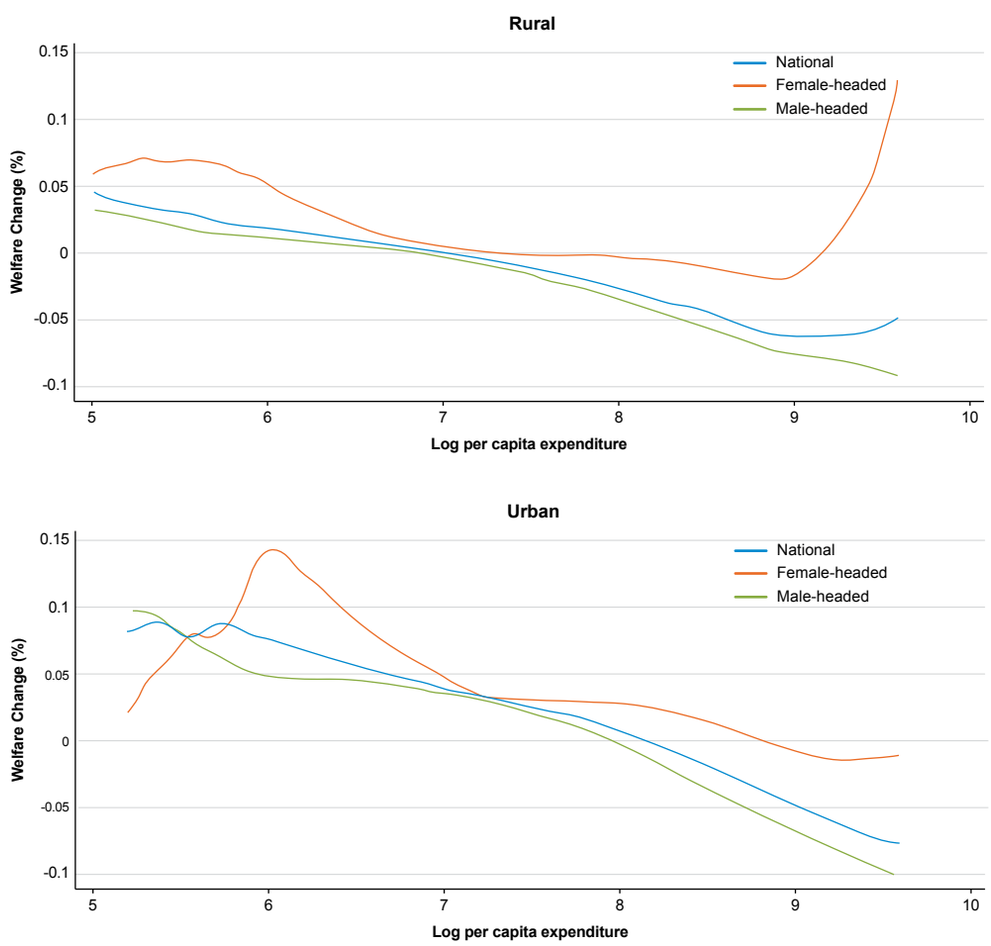


Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).
Note: The consumption shares of the commodities, used as an indicator of welfare changes due to changes in expenditure, were obtained by dividing each household's expenditure by total household expenditure and multiplying the result by the change in price obtained from the macrosimulation (computable general equilibrium).

Figure 6 presents the change in welfare of households as consumers based on their region of residence. The curves for both rural and urban areas follow the same downward sloping shape as for the whole population. The regression curve for female-headed households lies above the one for male-headed households, indicating a pro-poor and pro-female effect of implementation of the CET. The only exception is for very poor urban households, where female-headed households benefit less than their male counterparts. In both urban and rural areas, the welfare gap between male-headed and female-headed households is larger at the extremes of the expenditure distributions and much narrower in the middle, which may be due to a more homogeneous consumption structure across middle-income households. Welfare rises for both urban and rural households at higher levels of per capita expenditure. However, the increase is sharper for the latter than the former, possibly due to higher gains in purchasing power from a reduction in the domestic prices of goods.

We now move to the analysis of the welfare effects of the CET on households as producers. As indicated in the methodology discussion, some households are not only consumers, but also producers who earn income from producing some of the commodities analysed in this study. The relationship between the change in welfare of households as producers[10] ($S_i \partial lnP_i$ in Equation 1) and the

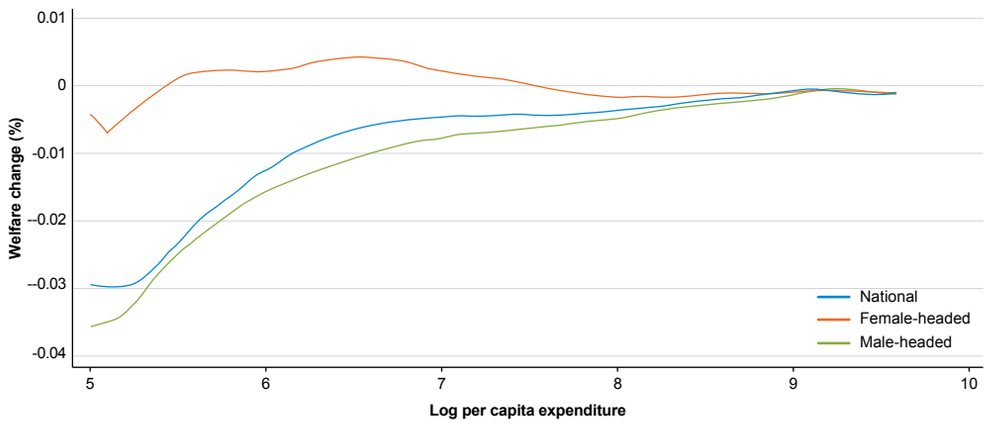
Figure 6: Change in welfare of households as consumers by area of residence



Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

[10] In this case, the welfare effect is given by $S_i \partial lnP_i$ as shown in Equation 1. The expression has a positive sign, indicating that an increase in prices increases the welfare of producers.

Figure 7: Change in welfare of households as producers



Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).
Note: The share of commodity income used as the measure of welfare due to changes in income was obtained by dividing the share of income obtained by households from the sale of commodities by total income of the household. The results were further multiplied by the change in price of the commodities from the macrosimulation.

level of expenditure is positive, and the overall change in welfare at the national level is negative (Figure 7). This means that implementation of the CET will reduce the welfare of both poor and rich households as producers, but poor households are the most disadvantaged. The tariff reduction will redistribute income from producers to consumers as the domestic prices of commodities decline, and the purchasing power of producers will fall as their income declines. Poor producers stand to lose more than richer producers. Male-headed households will be the most affected, while the effect on female-headed households is almost zero at all income levels. This may be due to the fact that most producers are poor male-headed households, for example rural farmers, for whom the prices of their products have decreased (e.g. rice or cocoa).

The net welfare effect for female-headed households is positive for those at the lower and middle ends of the income categories, but negative for the rich.

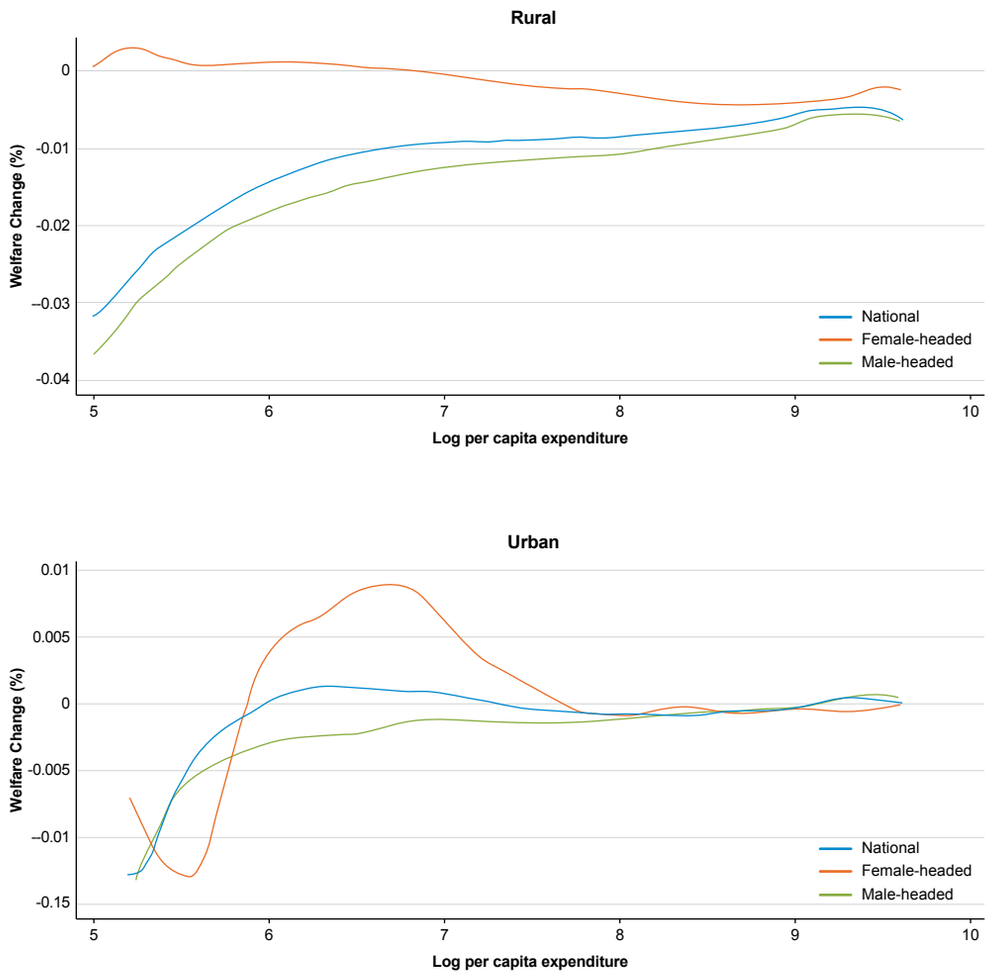
Households as producers in rural areas experience greater losses in welfare than those in urban areas (Figure 8): the average reduction in welfare is 0.028% in rural areas and 0.014% in urban areas. In both rural and urban areas, male-headed households are more affected than female-headed households. These differences in welfare losses can be partly explained by the greater reliance on agriculture in rural households than in urban households, and in male-headed households than in female-headed households (about 83% of households for which agriculture is the main occupation are in rural areas, and they are largely male-headed). About 3.2 million households, representing 46% of all households, operate non-farm enterprises, with 52% of them in urban areas. Almost half (49.5%) of all businesses involve trading, while the rest involve some kind of manufacturing activity. Women operate 72% of these businesses (Ghana Statistical Service, 2014).

We now assess the net welfare effect of the CET on households by adding the welfare effect on households as producers and as consumers, as shown in Equation 1. Figure 9 depicts the relationship between the welfare effect and household per capita expenditure. The curve resembles the welfare effect on households as consumers (Figure 5), because the welfare effect on households as producers (Figure 7) is much smaller than the one on households as consumers. The net welfare effect for male-headed households is around zero for the poor and negative for the rich. The net welfare effect for female-headed households is positive for those at the lower and middle ends of the income categories, but negative for the rich.

In a nutshell, the main finding of this study is that implementation of the CET will lead to a decrease in prices of most items consumed by poor households, especially female-headed households, resulting in an improvement in the welfare of these households. At the same time, it will reduce the welfare of households that are net producers. This conclusion differs from the findings of a similar study conducted in Nigeria, which finds that implementation of the CET produces net welfare gains due to a reduction in prices of most agricultural products (Kareem, 2014). This difference in findings could be due to differences in methodological approaches, as the author used the pass-through effect approach which takes into account the combined effect of wage and prices. Although the results show a pro-poor and pro-female welfare effect, the variations in welfare are small (less than 0.1%), perhaps because some prices increase and some others decrease after implementation of the CET.

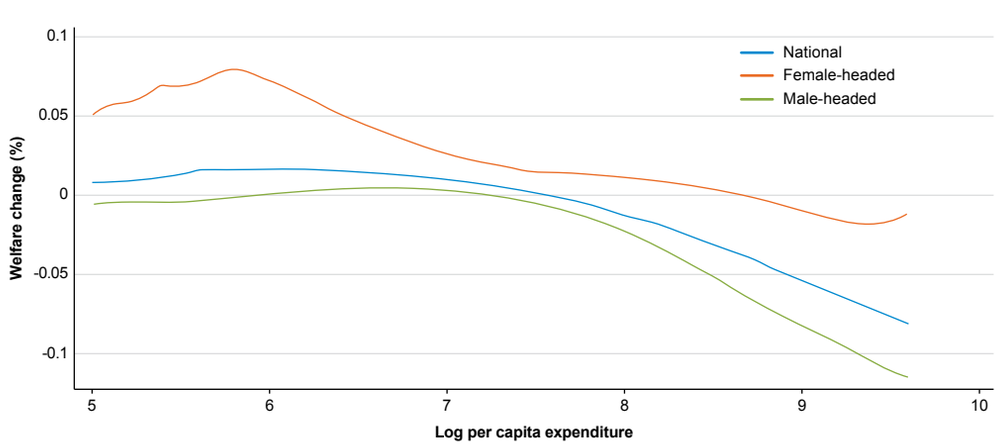
This same analysis was also performed for Ghana's10 regions (Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West) to explore the regional dynamics of the welfare effects of the CET. The results (Figure A.1 in the Appendix) reveal the same structure as that for the national level in some locations (Greater Accra, Volta, Ashanti, and Upper West). In these cases, therefore, implementation of the CET is expected to have pro-poor and pro-female effects. However, the results are different for other regions. For example, in the Western region, where oil exploitation has been under way for a little over four years, the effect is pro-female but not pro-poor, since the net welfare function first decreases, then increases, and then decreases again as per capita expenditure increases (a sort of a U-shaped curve). In the Central region, the effect of the CET is pro-poor, but not pro-female. In the Brong Ahafo region, where agriculture is the predominant occupation, the results indicate a net welfare loss for all categories of households, regardless of the income status or the gender of the household head. These variations in the net welfare effect across the 10 regions could be explained by the heterogeneity in the production and consumption structures of households.

Figure 8: Change in welfare of households as producers by area of residence



Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

Figure 9: Net welfare effect



Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

To conclude, this analysis has shown that implementation of the CET is likely to affect households in different ways, depending on their positions as either net producers or net consumers. Other determinants are the gender of the household head, geographical location, and changes in the prices of the commodities.

To conclude, this analysis has shown that implementation of the CET is likely to affect households in different ways, depending on their positions as either net producers or net consumers. Other determinants are the gender of the household head, geographical location, and changes in the prices of the commodities. Overall, female-headed households stand to be better off than male-headed households. Likewise, poor households will gain, while rich households will lose marginally. The gain will favor households in coastal regions and urban areas more than those in non-coastal regions and rural areas. Moreover, the increase in commodity prices is expected to reduce welfare, while the opposite holds for the commodities for which prices are expected to decrease. These findings are consistent with those of the earlier studies (see Ackah & Aryeetey, 2012 and Quartey, Aidam, & Obeng, 2013) who suggest that trade liberalization has differential effects on the incidence, depth, and severity of poverty among households in Ghana.

6. Conclusions

In 2015, ECOWAS members, including Ghana, agreed to implement a common external tariff in order to harmonize the tariff structure and foster regional trade and economic growth. The objective of this study has been to assess the impact of the new tariff system on prices and the resulting effect on household welfare, with particular attention to gender differences.

The descriptive analysis shows that female-headed households spend more on average on food than male-headed households. Since poverty indicators in Ghana are based on consumption expenditure, female-headed households exhibit lower levels of poverty than male-headed households. The macrosimulation analysis (done through a CGE model) shows that implementation of the CET is likely to lead to mixed effects on commodity prices, given that some tariffs were scheduled to increase and others to decrease following implementation. When we introduce the changes in prices from the CGE into the microsimulation for the welfare analysis, the results reveal that implementation of the CET will have a positive consumption welfare effect on poor households, but a negative effect on rich households. Moreover, the CET will reduce the welfare of both poor and rich households as producers, with poor households being the most affected.

From a gender perspective, female-headed households will be better off as consumers than their male counterparts. As producers, male-headed households will be the most affected by the reduction in welfare, while the effect on female-headed households will be almost zero. When we consider only commodities for which prices increase, there will be a reduction in household welfare. However, for commodities whose prices decrease, there will be an improvement in the welfare of households, meaning that the dominant effect is the one on households as consumers. The net welfare analysis shows that implementation of the CET will lead to a net loss for all income categories of male-headed households and for rich, female-headed households. However, there will be a positive effect on female-headed households in lower- and middle-income categories. Households in urban areas stand to gain more than their rural counterparts. Thus, urban households tend to benefit more from trade liberalization. On the basis of these findings, this paper concludes that a comprehensive tariff reform could be pro-poor in Ghana.

This study used the top-down approach. This general-equilibrium analysis has the advantage of capturing the direct and indirect effects of tariffs on prices. However, it is important to add some caveats. First, the feedback effects from household behavior are not taken into account. Second, the CGE model uses data from Ghana's 2005 Social Accounting Matrix. Having an updated SAM for 2013 may produce more accurate results. A further, useful step would be to include production factor effects in the analysis, given that the CGE model also simulates changes in wages and capital. However, this would require additional efforts to match the survey with the SAM, an analysis that was not within the scope of the present work.

References

Ackah C. and E. Aryeetey (2012). *Globalization, trade and poverty in Ghana*. International Development Research Centre. Ottawa.

Adams C. (1993). *For Good and Evil: The Impact of Taxes on the Course of Civilization*. Rowman and Littlefield.

AfDB, OECD and UNDP (2017). African Economic Outlook 2017: entrepreneurship and industrialization. OECD Development Centre, Paris. Available at: www.africaneconomicoutlook.org

Bhasin, V.K. and S. Annim (2005). Impact of elimination of trade taxes on poverty and income distribution in Ghana. Revised Report submitted to the Global Development Network (January).

Bird, K. (2004). A framework to analyse linkages between trade policy, poverty reduction and sustainable development. Paper for the Africa Trade and Poverty Programme of the Department for International Development. London.

Bourguignon, F. and L. Savard (2008). Distributional effects of trade reform: An integrated macro-micro model applied to the Philippines. In: *The Impact of Macroeconomic Policies on Poverty and Income Distribution: Macro-micro Evaluation Techniques and Tools*, F. Bourguignon, M. Bussolo, and A. Pereira da Silva, eds. Palgrave-Macmillan. Houndmills, United Kingdom.

Breisinger, C., J. Thurlow and M. Duncan (2007). A 2005 social accounting matrix (SAM) for Ghana. International Food Policy Research Institute. Washington, DC.

Breisinger, C., X. Diao, J. Thurlow and R.M. Al-Hassan (2008). Agriculture for development in Ghana: New opportunities and challenges. IFPRI Discussion Paper 00784. International Food Policy Research Institute. Washington, DC.

Calvo, P.A. (2014). Welfare impact of wheat export restrictions in Argentina: Non-parametric analysis on urban households. In: *Trade Policies, Household Welfare and Poverty Alleviation: Case Studies from the Virtual Institute Academic Network*. UNCTAD/DGS/2014/3. United Nations Conference on Trade and Development. New York and Geneva. Available at: http://vi.unctad.org/tap/docs/chapters/argentina.pdf.

De Melo, J., and A. Laski (2014). Reflections on adapting to the ECOWAS CET. FERDI Policy Brief B-107. Fondation pour les Études et Recherches sur le Développement International. Available at: http://archive-ouverte.unige.ch/unige: 46919.

Deaton, A. (1989). Rice prices and income distribution in Thailand: a non-parametric analysis. *The Economic Journal* 99: 1–37.

Diao, X. (2011). Economywide impact of Avian influenza in Ghana–A dynamic computable general equilibrium (DCGE) model analysis. *International Journal of Livestock Production* 2(10): 145–58.

Ghana Statistical Service (2007). Pattern and trends of poverty in Ghana, 1991–2006. Ghana Statistical Service. Accra.

Ghana Statistical Service (2014). Ghana Living Standards Survey round 6 (GLSS 6): Main report. Ghana Statistical Service. Accra.

Gutowski, A., T. Knedlik, P. N. Osakwe, I. Ramdoo and K. Wohlmuth (Eds.). (2016). *Africa's Progress in Regional and Global Economic Integration-Towards Transformative Regional Integration* (Vol. 18). LIT Verlag Münster.

Harrison, A. and H. Tang (2005). *Trade Liberalization: Why so Much Controversy in Growth in the 1990s: Learning from a Decade of Reforms*. Edited by N. Roberto Zagha, World Bank, 2005.

Kareem, O.I. (2014). The welfare impact in Nigeria of the ECOWAS common external tariff: A distributional effects analysis. In: *Trade Policies, Household Welfare and Poverty Alleviation: Case Studies from the Virtual Institute Academic Network*. UNCTAD/DGS/2014/3. United Nations Conference on Trade and Development. New York and Geneva. Available at: http://vi.unctad.org/tap/docs/chapters/nigeria.pdf.

Löfgren, H., R.L. Harris and S. Robinson (2002). A standard computable general equilibrium (CGE) model in GAMS (vol. 5). International Food Policy Research Institute. Washington, DC.

Marchand, B.U. (2012). Tariff pass-through and the distributional effects of trade liberalization. *Journal of Development Economics* 99(2): 265–81.

Nicita, A. (2009). The price effect of tariff liberalization: Measuring the impact on household welfare. *Journal of Development Economics* 89(1): 19–27.

Office of the United States Trade Representative (2014). 2014 National trade estimate report on foreign trade barriers. Available at: https://ustr.gov/sites/default/files/2014%20NTE%20Report%20on%20FTB.pdf.

Osakwe, P.N. (2015). Transformative regionalism, trade and the challenge of poverty reduction in Africa. UNCTAD Trade and Poverty Paper Series No. 1. United Nations Conference on Trade and Development. New York and Geneva.

Quartey, P., P. Aidam and C.K. Oben (2013). The impact of trade liberalization on poverty in Ghana. Available at: https://www.gtap.agecon.purdue.edu/resources/download/2665.pdf.

Roquefeuil, Q.D., D. Plunkett and F. Ofei (2014). The impact of closer regional economic integration on food security in West Africa: Focus on the ECOWAS common external tariff. ECDPM Discussion Paper 154. European Centre for Development Policy Management. Maastricht.

UNCTAD (2010). Virtual Institute teaching material on trade and poverty. United Nations Conference on Trade and Development. New York and Geneva.

UNCTAD (2012). Virtual Institute teaching material on contemporary issues in international macroeconomics, trade and finance. UNCTAD/GDS/2011/2. United Nations Conference on Trade and Development. New York and Geneva.

UNCTAD (2016). African Continental Free Trade Area: Policy and negotiation options for trade in goods. United Nations Conference on Trade and Development. New York and Geneva. Available at: http://unctad.org/en/PublicationsLibrary/webditc2016d7_en.pdf.

United Nations (2008). ISIC Revision 4.0. International Standard Industrial Classification of All Economic Activities. Available at: http://unstats.un.org/unsd/cr/registry/isic-4.asp

Winters, L.A., N. McCulloch and A. McKay (2004). Trade liberalization and poverty: the evidence so far. *Journal of Economic Literature* 42(1): 72–115.

World Bank Group (2015). Assessing the Economic Impact of the ECOWAS CET and Economic Partnership Agreement on Ghana. World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/23242 License: CC BY 3.0 IGO."

WTO (2014). Trade policy review report by the secretariat, Ghana. Report No. WT/TPR/S/298. Geneva. World Trade Organization.

Appendix

Table A.1: Summary statistics of the net welfare effect by commodity

No	Commodity	No. of observations	Mean	Standard deviation	Minimum	Maximum
1	Cassava	5,750	0.000146	0.000828	-0.00152	0.006
2	Yams	5,750	0.000062	0.000825	-0.00206	0.008
3	Plantains	5,750	4.84E-05	0.000752	-0.0042	0.007
4	Oils	5,750	-1.8E-05	0.000406	-0.00167	0.005
5	Vegetables	5,750	-0.00016	0.000461	-0.004	0.004
6	Domestic fruits	5,750	3.61E-05	0.000522	-0.00192	0.007
7	Maize	6,643	0.001613	0.002319	-0.00252	0.006
8	Rice	6,643	-0.00021	0.002597	-0.015	0.013274
9	Cocoa beans	6,647	0.000942	0.001619	0.0000	0.004
10	Processed cocoa	16,750	-6.64E-06	2.17E-05	-0.001	0.0000
11	Sorghum	6,643	0.000143	0.000723	-0.00222	0.006
12	Groundnuts	6,643	0.00082	0.001898	-0.00144	0.007
13	Goats	7,145	0.000482	0.00153	-0.00269	0.008
14	Other livestock	7,145	0.000422	0.001489	-0.0065	0.007
15	Palm oil	5,750	-1.3E-05	0.000738	-0.009	0.009
16	Chicken	7,145	0.00215	0.009269	-0.02122	0.042
17	Fishing	7,145	6.72E-05	0.000416	-0.00098	0.003
18	Cocoyam	5,753	1.05E-05	0.000158	0.0000	0.005
19	Wood	6,647	1.29E-06	0.000068	0.0000	0.004
20	Other crops	6,647	9.09E-05	0.000661	0.0000	0.007
21	Other nuts	6,647	0.000219	0.001297	0.0000	0.01
22	Beef	16,750	-5.6E-05	0.000128	-0.00392	0.000
23	Dairy products	16,750	-0.00039	0.000383	-0.005	0.000
24	Eggs	16,750	-3.8E-05	7.14E-05	-0.0032	0.000
25	Petrol	16,750	-4.1E-05	0.00016	-0.00375	0.000
26	Transport	16,750	-0.00014	0.000221	-0.00463	0.000
27	Other services	16,750	-4.1E-05	8.77E-05	-0.004	0.000
28	Clothing	16,750	-0.00184	0.000836	-0.004	0.000
29	Electricity	16,750	-0.00038	0.000597	-0.005	0.000
30	Fuel	16,750	-3.3E-05	7.62E-05	-0.00095	0.000
31	Furniture	16,750	0.00061	0.002368	0.000	0.038022
32	Textile	16,750	0.000119	0.000172	0.000	0.004405
33	Fertilizers	16,750	0.0003	0.001678	0.000	0.024262
34	Footwear	16,750	0.000581	0.001044	0.000	0.016
35	Formal processed food	16,750	-4.44E-07	1.86E-06	-.0000793	0.000

Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

Figure A.1: Net income share by gender and region of residence

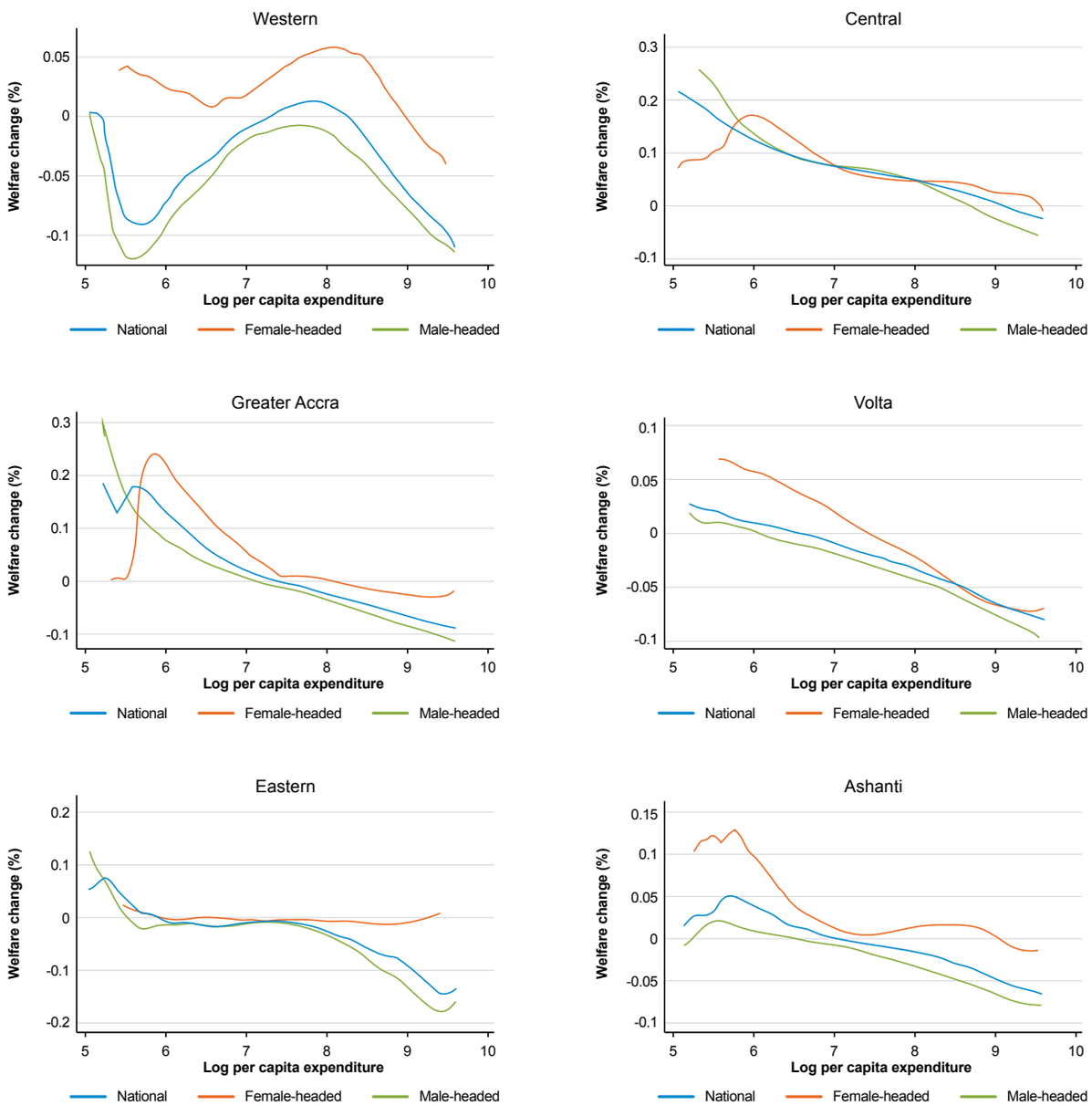
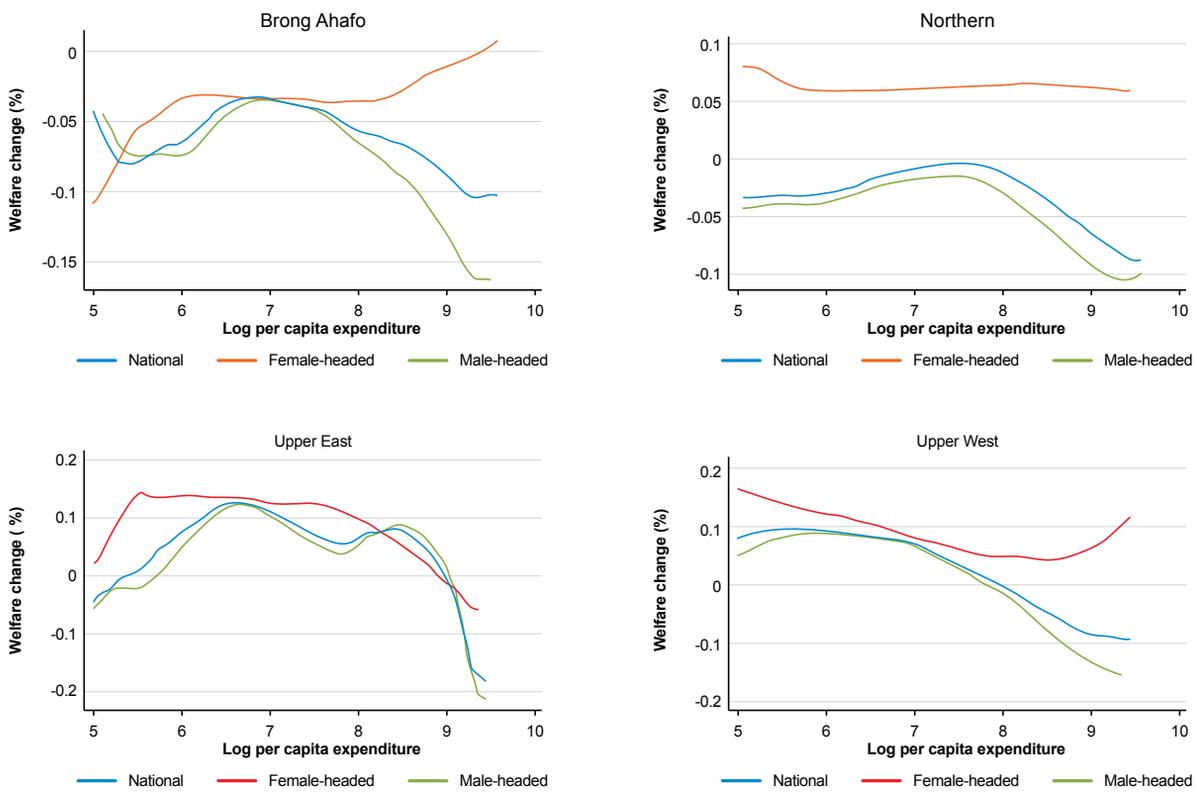


Figure A.1: Net income share by gender and region of residence *(continued)*



Source: Prepared by the author based on the 2012/2013 round of the Ghana Living Standard Survey (GLSS6).

Exporting, Importing and Wages in Africa: Evidence from Matched Employer-Employee data[1]

Marta Duda-Nyczak, United Nations Economic Commission for Africa (UNECA)[2]
Christian Viegelahn, International Labour Organization (ILO)[3]

1. Introduction

The economic and social development of the African continent has been on the agenda of policy makers and the international community for decades. With over a billion inhabitants and the fastest growing population worldwide, the African market presents an enormous potential. Despite remarkable economic growth rates, however, many countries on the continent struggle to translate this potential into significant improvements in socio-economic indicators. International trade is considered by many as one of the main contributors to reductions in poverty and the improvement of livelihoods (Dollar and Kraay, 2004; Le Goff and Singh, 2014). This stance has been adopted in global policy making, with trade forming an integral part of the 2030 Sustainable Development Agenda of the United Nations. The Sustainable Development Goals (SDG) include the objective to double the share of least developed countries' (LDC) exports in global exports by 2020. Thirty-four of the 48 LDCs are located on the African continent, implying that this endeavor is particularly relevant for Africa.

International trade is also viewed by a large number of policy makers in Africa as a potential driver of sustainable economic and social development. This has found expression in the rapid shift towards a more integrated African market in recent years. In particular, trade within some of the Regional Economic Communities (RECs) has been liberalized continuously. Current trade policy focuses on connecting some of the existing free trade areas to create an even larger internal market, with the ultimate objective of a customs union that integrates all countries in Africa. Negotiations for the Tripartite Free Trade Area, a free trade agreement between the Common Market for Eastern and Southern Africa, the East African Community and the Southern Africa Development Community, consisting of 27 countries, were launched in 2011. Also, negotiations are underway to create the Continental Free Trade Area integrating the trade in goods and services between 54 member states of the African Union.

These developments are likely to increase the number of African firms that are able to engage in trade. The question arises whether this opening up to trade can benefit workers in terms of higher wages. Wages are an important form of labor income in many countries. The share of workers in wage and salaried employment has been growing rapidly, even in Africa where informal employment arrangements still tend to dominate.

[1] All views expressed in this paper are those of the authors and do not reflect those of the institutions they are affiliated with. The authors would like to thank colleagues from the International Labour Organization, the African Development Bank, the World Bank and the World Trade Organization for their comments on earlier versions of this paper. In particular, we would like to thank Paul Brenton, Michela Esposito, Marcus Bartley Johns, Linguère Mously Mbaye, Mustapha Sadni Jallab, Bill Shaw and Robert Teh. The authors would also like to thankfully acknowledge comments from participants of the African Economic Conference in Addis Ababa in December 2017.
[2] United Nations Economic Commission for Africa (UNECA). Email:duda-nyczak@un.org
[3] International Labour Organization (ILO), Research Department. Email: viegelahn@ilo.org

A current trade policy focuses on connecting some of the existing free trade areas to create an even larger internal market, with the ultimate objective of a customs union that integrates all countries in Africa.

According to ILO estimates (ILO, 2018), almost one-third of all workers in Africa were wage earners in 2017, many of them employed by the private sector. The wage level determines these workers' standard of living, and low wage levels are often directly related to the prevalence of poverty. Indeed, labor income in Africa is often not sufficient to lift workers above poverty levels, and about 56% of all African workers lived in either moderate or extreme poverty, on less than $3.10 PPP a day, in 2017.

This paper uses a novel dataset that includes firm-level and employee-level data to explore the relationship between exporting, importing and wages in African manufacturing firms. This dataset forms part of the World Bank Enterprise Survey and comprises 65 firm-level surveys conducted in 47 African countries over 2006–2014, with information on firms' export and import status, as well as information on the average wage. For 16 of these firm-level surveys, matched employee data with information on individual worker wages are available to complement the firm-level analysis. These data are comparable across all countries included and enable us to control for individual worker characteristics, which is unique for Africa. The data also facilitate analysis of the relationship between firms' export and import status, and wages, by sector and by country.

There is a large body of literature that has looked at the relationship between trade at the firm level and average wages that firms pay to their workers, with studies largely confirming a wage premium of firms engaged in trade. For manufacturing firms in the United States, it has been documented that both importers and exporters pay higher wages on average than non-traders (Bernard, Jensen, Redding and Schott, 2007, 2012). Based on employer-employee level data for Germany and Italy, it has been found that exporters pay higher wages than non-exporters, after controlling for various firm and worker characteristics (Schank, Schnabel and Wagner, 2007; Macis and Schivardi, 2016). There is also evidence of a positive wage premium of exporting for China, driven by different firm characteristics such as ownership, export orientation and location (Fu and Wu, 2013). Also for Mexico, exporting has been found to increase wages, especially at the upper end of the wage distribution (Frías, Kaplan and Verhoogen, 2012). Firm-level evidence from Indonesia suggests that increased access to foreign inputs through trade liberalization has led to higher wages, while the impact of a decline in output tariffs is less pronounced (Amiti and Davis, 2011).

There are various channels through which firms' export and import status can affect wages at the firm level. For a firm to participate in international trade, it is important to have a high-skilled workforce, which in the presence of a skill premium on wages then leads to a higher average firm-level wage. The trading activity of a firm can also give rise to technology upgrading, induced by technology transfers from the trading partner, which may increase workers' productivity and can therefore lead to higher wages. Moreover, the extension of a firm's business to export markets increases the scale of a firm, allowing it to benefit from economies of scale, and some of these benefits may be passed on to workers in terms of higher wages. Assuming a certain degree of rent sharing between firms and workers, any standard bargaining model would predict that the gains in productivity that are reaped by the firm would at least partially passed on to workers in terms of higher wages, depending on workers' bargaining power.

The wages that firms are able to pay are strongly related to firm performance. Both exporting and importing involves fixed costs that only the most productive firms can afford to pay, which implies that only firms whose productivity exceeds a certain threshold engage in trade (Melitz, 2003; Kasahara and Lapham, 2013). At the same time, firms can learn by exporting, as they have to satisfy the needs of foreign customers which may be more demanding in terms of product quality, and also face competition from foreign producers, which may force them to become more productive (De Loecker, 2013). But it is also likely that firms can derive productivity gains from importing once they have started to import, for example through learning from new technologies embedded in foreign inputs, access to a better quality of inputs, or access to a larger variety of inputs (Ethier, 1982; Markusen, 1989; Grossman and Helpman, 1991). The empirical literature confirms such a positive impact of increased access to foreign inputs on firm productivity (Amiti and Konings, 2007; Stone and Shepherd, 2011; Halpern, Koren and Szeidl, 2015), while restricted access

Labor income in Africa is often not sufficient to lift workers above poverty levels, and about 56% of all African workers lived in either moderate or extreme poverty, on less than $3.10 PPP a day, in 2017.

to foreign inputs in turn can lead to within-firm input reallocation with a negative impact on firm performance (Vandenbussche and Viegelahn, 2016).

There is a vast body of literature that confirms that wages that women receive are on average lower than those of men (Blau and Kahn, 2017). The question arises whether the wage premium of exporting and importing for women differs from the corresponding premium for men. Empirical evidence has so far been mixed. Using employer-employee-level data from Norway, the gender wage gap has been found to be larger within exporting firms than within non-exporting firms, provided that women are perceived by employers to be less committed workers than men (Boler, Javorcik and Ulltveit-Moe, 2015). Policy measures that decrease these perceived gender differences in commitment are found to narrow differences in the gender wage gap. Other studies in contrast find evidence for a lower gender wage gap in exporting firms and higher wages for women in exporting firms (World Bank, 2012).

The number of studies that look into the firm-level consequences of trade in the African context is limited, given the scarcity of firm-level databases from this region. Milner and Tandrayen (2007) investigate the relationship between exporting and wages, using employer-employee matched data for manufacturing firms in six countries in Sub-Saharan Africa. They find a positive overall association between individual earnings and the export status of the firm. Yet, they find that the wage premium is positive only when firms export to African markets, and it turns negative when exporting to more competitive markets. In a study with larger country coverage, exporting is found to have positive spinoffs on employment and wages across a wide range of developing countries, including countries on the African continent (Brambilla et al., 2017). There are to our knowledge no studies in the African context that focus on importing and its impact on the labor market.

Other studies focus on the relationship between exporting and productivity. Based on firm-level data

from Cameroon, Ghana, Kenya and Zimbabwe, there is evidence for both firm self-selection into exporting and learning-by-exporting (Bigsten et al., 2004). A causal relationship between exporting and productivity has also been found on the basis of firm-level data for Ethiopian manufacturing firms, with strong evidence in favor of both the self-selection and learning-by-exporting hypotheses, demonstrating that exporters pay higher average wages and employ more workers than non-exporters (Bigsten and Gebreeyesus, 2009). Mengistae and Pattillo (2004) show an average total factor productivity premium and a premium in productivity growth for exporting manufacturers in Ethiopia, Ghana and Kenya. Some evidence also has recently been provided on the impact of increased access to foreign inputs. Bigsten et al. (2016) analyze firm-level data for Ethiopian manufacturing firms and show that a reduction in output tariffs has no impact on firms' productivity, while reductions in input tariffs increase firms' productivity.

This paper contributes to the literature in four ways. First, this is among the first papers that uses employer-employee level data in the African context. With these data, we are able to measure the average firm-level wage premium of exporting and importing, controlling for a variety of firm-level characteristics. Similarly, we are able to determine the average wage premium of individual workers, after controlling not only for firm-level but also for individual worker characteristics. Second, this paper considers the relationship of both exporting and importing to wages, adding to the literature that has predominantly, and in the context of wages exclusively, focused on exporting. Third, this paper investigates the channels that make trading firms pay wages that are different from non-trading firms. Finally, this paper adds to the so far scarce literature on the gender wage gap and its relation to firms' exporter and importer status.

The results presented in this paper suggest that firm-level wages paid by exporters to their workers are on average higher than in firms not engaged in exporting, even after controlling for firm characteristics such as capital intensity, electricity intensity, foreign ownership and firm age. The average wages paid by importers and non-importers are statistically not significant from each other, after adding firm age as a control variable. A positive exporting premium on wages is confirmed when using employer-employee data, which allows us to control for individual worker characteristics. On the basis of these data, we also do not find any positive wage premium of importing, in line with the firm-level results. If anything, workers employed by importers receive lower wages, when compared to their counterparts in non-importing firms.

This paper also investigates the channels that are driving our results. We find that neither productivity gains through increased skill utilization or the employment of certain types of workers, nor productivity gains through technology transfers can fully explain the positive wage premium of exporting. Instead, it appears that the positive wage premium of exporters is due to productivity gains through economies of scale. The paper also finds indirect evidence for a weaker bargaining power of workers employed by importers, when compared with those employed by non-importers. Finally, the paper shows that there is no significant gender wage gap within trading firms in the sample. This is different from non-trading firms, where a statistically significant wage gap can be identified.

The next section describes in more detail the data that are used in this paper. Section 3 presents the underlying empirical methodology to estimate the wage premium of exporting and importing, both at the firm level and at the employee level. Section 4 discusses the results. The final section concludes.

2. Data

2.1 Firm-level data

This paper uses firm-level data for manufacturing firms from the World Bank Enterprise Surveys. The data are cross-section data, comparable across different surveys. The database consists in total of over 15,391 observations for manufacturing firms, comprising data from 65 surveys conducted in 47 African countries between 2006 and 2014. For one country, the Democratic Republic of Congo, data from three surveys are available. For 16 countries, we have data from two surveys. For the remaining 30 countries, data have only been collected once. For different surveys, the sample size varies

between 21 observations for a survey conducted in 2009 in Liberia, and 2,015 observations for a survey conducted in 2013 in Egypt. The average sample size across surveys is 237 observations. Appendix A lists all the surveys that are considered in this paper.

The firm-level data that are included in the database are representative of formally registered, privately owned firms that employ at least 5 workers. On the basis of the information provided in the survey, firms can be assigned to the manufacturing sectors in which they operate. We distinguish between 8 manufacturing industries, namely food and beverages, textiles and garments, wood and paper, chemicals, non-metals and plastics, metals and machinery, furniture and all other manufacturing not included in the preceding categories.

Table 1 shows basic descriptive statistics for the firm-level database that is used in this paper. The table indicates that 53% of all firms in the sample are importers, while only 23% are exporters. Out of all firms, 17% are both exporters and importers, 5% are exporters but do not import, 36% do not export but are importers, and 42% neither export nor import. Firms are on average 17.4 years old and 11% of them are foreign-owned, defined as foreign investors having an ownership share that is greater than 50%. In terms of workforce characteristics, the average number of full-time permanent employees reported by firms is 82. Twenty-one percent of these workers are women and 77% are production workers. The average share of temporary employees in total employment (temporary plus full-time permanent) is almost 12%. The average years of education of firms' production workforce is 8.7 years.[4] The average repurchase value of firms' capital stock is more than double its annual sales revenue. Firms pay electricity costs that on average amount to around 3% of their sales revenue. The annual average wage is just above 6170 USD (constant 2011).

To measure technological advancement, we estimate total factor productivity (TFP), where a Cobb Douglas production function is estimated in logarithmic form, separate for each survey. As input factors, we consider the repurchase value of the capital stock, labor costs and raw material expenses. The estimated residual

Table 1: Descriptive statistics on African manufacturing firms

	Mean	Sd.	Min	Max	N
Exporter dummy (1=exporter)	0.23	0.42	0.00	1.00	14,972
Importer dummy (1=importer)	0.53	0.50	0.00	1.00	13,837
Firm age	17.40	15.29	0.00	190.00	9,808
Ownership (1=foreign)	0.11	0.31	0.00	1.00	15,075
Capital stock value over sales	2.16	4.47	0.00	51.37	9,244
Electricity costs over sales	0.03	0.06	0.00	0.48	12,273
Sales (million 2011 USD)	17.03	595.31	0.00	52,578.34	13,757
Average wage (000 2011 USD)	6.17	119.89	0.00	9453.91	13,270
Labor productivity (000 2011 USD)	24.84	146.25	0.00	6,460.50	11,185
Log(TFP)	-0.02	0.59	-2.03	2.70	8,817
Production workers' average education (years)	8.68	3.77	1.55	14.92	10,833
Employment (full-time permanent)	82.40	609.68	1.00	64,000.00	15,207
Female share in employment (%)	21.25	25.58	0.00	100.00	13,847
Production worker share in employment (%)	76.69	18.03	0.00	100.00	12,113
Temporary employment share (%)	11.93	19.36	0.00	99.67	14,585

Source: Monetary values are converted into USD (2011 constant), using data on exchange rates and GDP deflators from World Bank's *World Development Indicators* database.

[4] The average years of education of firms' production force are reported only for less than two thirds of all firms. The remaining firms report intervals (e.g. 0-3 years, 3-6 years etc.) instead. For these firms, we transform intervals into years, by using the corresponding average value for each category that is obtained on the basis of the sample of firms that report the exact years. For example, the category from 0-3 years translates into a value of 1.55, as 1.55 is the average years of education for firms that fall into that category, based on available data.

corresponds to TFP. More details on the TFP estimation procedure can be found in Appendix B.

2.2 Matched employer-employee level data

Employee-level data for at least some firms are available in 16 of the 65 surveys. In total, we have data for 7,692 employees working in 1,385 firms, with between 1 and 10 employees per firm. For 353 firms, data on 10 employees are collected. For 25 firms, only data on one employee are available. The employee data are available from surveys in Angola, Botswana, Burundi, Democratic Republic of Congo, Gambia, Ghana, Guinea, Guinea-Bissau, Mauritania, Namibia, Rwanda, South Africa, Swaziland, Tanzania, Uganda and Zambia, which are all Sub-Saharan African countries. Data are from surveys conducted in 2006 and 2007.

Table 2 shows employee-level descriptive statistics. We find that 21% of employees in our sample work for exporters while 56% work for importers. The respective shares of workers that work for exporters and importers are hence very similar to the share of exporting and importing firms in the firm-level database, reported in Table 1. Among the employees, 28% are women, 53% are married and 94% have a full-time permanent contract. With regards to the education level, 22% of employees have no or only primary education, 17% took part in vocational training and 6% have a university degree. The remaining 55% of employees have secondary education. Twenty-one percent of workers are trade union members. The average worker age is 32 years. Workers have on average more than 8 years of work experience, of which more than 5 years is experience with the current employer. The average monthly wage of a worker in the database is 540 USD (constant 2011), which translates into an annual wage of 6480 USD (constant 2011), which is very close to the average annual firm-level wage reported in Table 1. The average monthly wage of female workers in the database is 850 USD (constant 2011), translating into an annual wage of 10200 USD (constant 2011). While the average wage for women is higher than the average wage for men in the sample, the standard deviation of women's wage is almost double the standard deviation of the overall wage, indicating a large wage variation among women.

3. Methodology

In this paper, we run two types of empirical analyses. First, we use firm-level data to estimate the wage premium of exporting and importing, controlling for a variety of firm-level characteristics. Then we take the estimation to the employer-employee level, which enables us to add

Table 2: Descriptive statistics on employees in African manufacturing firms

	Mean	Sd.	Min	Max	N
Exporter dummy (exporter=1)	0.21	0.41	0.00	1.00	7,682
Importer dummy (importer=1)	0.56	0.50	0.00	1.00	7,692
Employee wage (monthly, 000 2011 USD)	0.54	6.78	0.00	364.89	6,648
Female employee wage (monthly, 000 2011 USD)	0.85	12.19	0.00	364.89	1,835
Female (yes=1)	0.28	0.45	0.00	1.00	7,692
Married (yes=1)	0.53	0.50	0.00	1.00	7,649
Full-time permanent employed (yes=1)	0.94	0.24	0.00	1.00	7,667
No or primary education only (yes=1)	0.22	0.42	0.00	1.00	7,692
Vocational training (yes=1)	0.17	0.37	0.00	1.00	7,692
University degree (yes=1)	0.06	0.25	0.00	1.00	7,692
Trade union member (yes=1)	0.21	0.41	0.00	1.00	7,672
Age (years)	31.98	8.21	12.00	71.00	7,669
Experience with current employer (years)	5.23	4.86	0.00	48.00	5,880
Total experience (years)	8.11	6.62	0.00	54.00	5,838

Source: Monetary values are converted into USD (2011 constant), using data on exchange rates and GDP deflators from World Bank's *World Development Indicators* database.

individual worker characteristics to our set of firm-level control variables. Reported standard errors are always robust.

At the firm-level, we estimate the following equations:

$$\log W_{ctmi} = \alpha + \beta \cdot EX_{ctmi} + \gamma \cdot IM_{ctmi} + \delta X_{ctmi} + \epsilon_{ct} + \epsilon_m + \epsilon_{ctmi} \quad (1)$$

$$\log W_{ctmi} = \alpha_m + \beta_m \cdot EX_{ctmi} + \gamma_m \cdot IM_{ctmi} + \delta_m X_{ctmi} + \epsilon_{ct} + \epsilon_{ctmi} \quad (2)$$

$$\log W_{ctmi} = \alpha_{ct} + \beta_{ct} \cdot EX_{ctmi} + \gamma_{ct} \cdot IM_{ctmi} + \delta_{ct} X_{ctmi} + \epsilon_{ctmi} \quad (3)$$

where equation (1) is estimated on the full sample of manufacturing firms, equation (2) is estimated by manufacturing sector *m* and equation (3) is estimated by survey conducted in country *c* and year *t*. Index *i* stands for a particular firm that belongs to a manufacturing sector *m* and is observed in the survey conducted in country *c* and year *t*.

The dependent variable log*W* stands for the logarithm of the average wage paid by the firm to its employees, calculated as total labor costs divided by the number of full-time permanent employees.[5] The exporter dummy variable *EX* takes a value of one if the firm exports at least some of its goods, including direct exports and exports through an intermediary. Similarly, the importer dummy variable IM takes a value of one if the firm imports at least some of its raw material inputs, including both direct imports and imports through an intermediary. β, β_m and β_{ct} are the main coefficients of interest and measure the overall, sector-specific and survey-specific wage premium of exporting. γ, γ_m and γ_{ct} are the respective coefficients that measure the wage premium of importing. The wage premia of exporting and importing should be interpreted respectively as average premia across export destination countries and import origin countries.[6] ε_{ct} is a survey fixed effect, ε_m is a sector fixed effect and ε_{ctmi} is the error term.

With regards to firm-level control variables, as summarized in vector *X*, we control for the type of economic activity by including capital intensity—the ratio between the repurchase value of the capital stock and sales—and electricity intensity—the ratio between electricity costs and sales—into the regression. The latter is intended to control for the type of technology that is used. Electricity costs are likely to be lower if production mainly occurs through manual labor than if production is largely automated. Moreover, we include foreign ownership status and firm age as variables that might be correlated with the average wage. Finally, we include the logarithm of firm age to control for differences in wages between start-ups and firms that have been longer in the market.

When moving to the employer-employee level, the estimated equations look as follows:

$$\log W_{ctmiw} = \alpha + \beta \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_1 X_{ctmi} + \delta_2 Y_{wt} + \epsilon_{ct} + \epsilon_m + \epsilon_{ctmi} \quad (4)$$

$$\log W_{ctmiw} = \alpha_m + \beta_m \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_{1m} X_{ctmi} + \delta_{2m} Y_{wt} + \epsilon_{ct} + \epsilon_{ctmi} \quad (5)$$

$$\log W_{ctmiw} = \alpha_{ct} + \beta_{ct} \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_{1ct} X_{ctmi} + \delta_{2ct} Y_{wt} + \epsilon_{ctmi} \quad (6)$$

where equation (4) is estimated on the full sample of manufacturing firms, equation (5) is estimated by manufacturing sector *m* and equation (6) is estimated by survey conducted in country *c* and year *t*. The equations are similar to (1)–(3), but now include variables that carry a subscript *w* that stands for an individual employee. Now wages are employee-specific and a new vector of control variables accounts for individual worker characteristics, *Y*.[7]

As control variables, we include dummy variables that respectively take on a value of one when the worker is a woman, married, full-time permanent employed, or trade union member. We also consider dummy variables that indicate workers' education level, including no or only primary education, vocational training or a university degree. We include workers' age, workers' total work experience, and workers' experience with the current employer as explanatory variables. Moreover, we account for the same set of firm characteristics as in the firm-level regressions, with the exception of firm age, which is only available in 3 out of the 16 surveys that have employee data.[8]

[5] This measure for the average wage is a proxy, given that labor costs in the numerator are the costs for all workers, while full-time permanent employment in the denominator does not include all workers. The use of the ratio between labor costs and the sum of full-time permanent and temporary employment as an alternative proxy does not affect any of our main results in this paper.

[6] Data on import origin countries are not available. Data on export destination countries are only available for 22% of exporting firms, over half of which declare zero exports to developed countries. Most firms focus their trade on African countries. Some firms declare a mix of export destinations (with a third category of other countries). The non-existent or limited data on import origin countries or export destination countries prevent us from undertaking any analysis along these dimensions.

[7] The survey fixed effects in equations (1) and (2) correspond to country-year fixed effects. The survey fixed effects in equations (4) and (5) also correspond to country-year fixed effects, which in this case are equivalent to country fixed effects, given that there is only one survey with employer-employee level data per country.

[8] The employee-level data also includes information on whether a worker is foreigner, which could have an impact on the wage level. Still we decided to not use this variable as control variable, as only 5% of all workers in our sample are foreigners. We made sure that the main results of this paper also hold when excluding foreigners from our sample.

In order to investigate the differences in the gender wage gap between exporting and non-exporting firms, and between importing and non-importing firms, we also estimate equation (4) after adding as explanatory variables two interaction terms between the dummy variable that indicates whether a worker is a woman, and firms' exporter and importer status, respectively.

4. Results

4.1 Firm-level results

This section starts by showing evidence derived from firm-level data. Table 3 shows the Africa-wide coefficients for firms' exporting and importing status, which respectively correspond to the estimated average difference in wages between exporters and non-exporters, and between importers and non-importers. In the most basic specification, in which there are no control variables aside from sector and survey fixed effects, exporters are estimated to have a wage premium of 18% over non-exporters (column 1), while importers' wage premium over non-importers is estimated at 19% (column 2). This is in line with previous results in the literature that firms engaged in trade pay higher wages (Bernard, Jensen, Redding and Schott, 2007, 2012).

The positive wage premium of exporters and importers is confirmed when including both exporting and importing status simultaneously as explanatory variables into the regression (column 3). Also, the estimated wage premia of exporters and importers remain positive and statistically significant after controlling for capital stock value and electricity costs relative to sales, and foreign ownership (columns 4 and 5). The difference between exporters and non-exporters is estimated to be larger than the difference between importers and non-importers. Results change partially, however, when adding firm age as an additional control variable. The coefficient for importer status then becomes insignificant, while the coefficient for exporter status remains significant and implies that exporters pay almost 18% higher wages than non-exporters (column 6). This implies the absence of any differences in wages between importers and non-importers that have the same firm age.

Table 4 indicates that results are not driven by a particular sector, but hold across many sectors. The table shows the results obtained from estimating the specifications in columns (3) and (6) of Table 3 on samples that are restricted to firms in particular sectors. In the more basic specification, a positive wage premium of exporting

Table 3: Exporting, importing and the average wage (firm-level)—full sample
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.178[a] (0.038)		0.210[a] (0.037)	0.268[a] (0.035)	0.234[a] (0.036)	0.175[a] (0.062)
Importer		0.191[a] (0.028)	0.155[a] (0.028)	0.081[a] (0.027)	0.064[b] (0.027)	-0.004 (0.051)
Capital stock over sales				-0.032[a] (0.005)	-0.031[a] (0.005)	-0.034[a] (0.007)
Electricity costs over sales				-2.351[a] (0.401)	-2.327[a] (0.398)	-2.108[a] (0.520)
Foreign owned					0.322[a] (0.045)	0.344[a] (0.088)
Log(Firm age)						0.071[a] (0.026)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.71	0.73	0.73	0.80	0.80	0.75
Number of observations	13137	12319	12254	8818	8787	3827

a Indicate statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.
b Indicate statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.

is found for firms in the food and beverages, textiles and garments, chemicals, and non-metals and plastics sectors. In this specification, importing can be associated with a positive wage premium in the food and beverages, wood and paper, and metals and machinery sectors, as well as in other manufacturing that is not classified in any of the other sectors. In the more elaborate specification, exporting remains associated with higher wages in firms that belong to the textiles and garments, and non-metals and plastics sectors, and becomes associated with higher wages in the wood and paper sector. The wage premium of importing, in contrast, disappears for all sectors except other manufacturing.

Table 5 includes results obtained from estimating the specifications in columns (3) and (6) of Table 3 on individual survey datasets. We only run the regression on samples with at least 100 firm-level observations. We again find strong evidence for a wage premium of exporting. Out of 34 survey datasets with at least 100 observations, we find for 18 survey datasets evidence for a positive wage premium of exporting and only for one dataset evidence for a negative premium. Also in the more elaborate specification, we find evidence for positive wage premia of exporting for 2 out of 10 survey datasets. With the inclusion of firm age as a control variable, the underlying number of observations is too small to obtain reliable results for most of the countries.

Based on the specification that only includes exporter and importer status, we estimate a positive wage premium of importing for 18 out of the 34 survey datasets and a negative premium for 3 datasets. When in addition controlling for capital intensity, electricity intensity, ownership and firm age, we estimate one significantly positive and one significantly negative coefficient for the relationship between firms' importing status and the wages they pay to their workers on average.

The results presented in this section so far point to only limited evidence for a wage premium of importing, with no wage premium estimated in the specification that includes firm age as a control variable. The results, however, point strongly to the existence of a positive wage premium of exporting. To explore why exporters pay higher wages than non-exporters, the next section investigates which channels contribute to the wage premium of exporting.

4.2 What are the channels?

There are numerous channels that can explain differences in wages between trading and non-trading firms. This

Table 4: Exporting, importing and the average wage (firm-level)—by sector
Dependent variable: Log(Wage)

Sector	Regressors: Exporter/Importer			Regressors: Exporter/Importer Capital stock over sales Electricity costs over sales Foreign owned Log(Firm age)		
	N	Exporter	Importer	N	Exporter	Importer
Food & beverages	3,079	0.299[a]	0.110[b]	851	0.120	-0.036
Textiles & garments	2,365	0.191[a]	0.045	815	0.344[a]	-0.050
Wood & paper	1,364	0.155	0.171[b]	433	0.392[b]	-0.102
Chemicals	752	0.255[b]	0.100	242	0.229	-0.063
Non-metals & plastics	1,159	0.278[b]	0.145	444	0.393[c]	0.109
Metals & machinery	1,582	0.215	0.245[a]	502	0.135	0.012
Furniture	1,314	-0.130	0.006	314	-0.238	-0.281
Other manufacturing	639	0.137	0.391[a]	226	0.052	0.399[b]

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (2) with OLS on samples of firms from different sectors.

b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (2) with OLS on samples of firms from different sectors.

c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (2) with OLS on samples of firms from different sectors.

Table 5: Exporting, importing and the average wage (firm-level)—by survey
Dependent variable: Log(Wage)

Survey	Regressors: Exporter/Importer			Regressors: Exporter/Importer Capital stock over sales Electricity costs over sales Foreign owned Log(Firm age)		
	N	Exporter	Importer	N	Exporter	Importer
Angola 2006	212	0.096	-0.097			
Botswana 2006	113	0.069	0.189			
Burundi 2006	102	0.802[a]	0.688[a]			
Côte d'Ivoire 2009	152	1.036[a]	0.944[a]			
DRC 2006	149	0.359	0.294[a]			
DRC 2010	104	1.381	-0.209			
DRC 2013	212	1.079[c]	0.480[c]			
Egypt 2013	1,776	0.231[a]	0.053	1195	0.306[a]	0.038
Ethiopia 2011	191	0.792[b]	0.344			
Ghana 2007	292	0.169	-0.319[a]			
Ghana 2013	286	0.330	0.356*	105	0.256	-0.258
Guinea 2006	135	0.181	0.249			
Kenya 2007	396	0.175[c]	0.308[a]			
Kenya 2013	321	0.318[c]	0.524[a]	206	0.270	0.238
Madagascar 2009	180	0.027	0.148	107	0.030	0.153
Madagascar 2013	214	0.081	-0.042	110	-0.262	0.160
Mali 2007	301	0.448[a]	0.190[a]			
Mauritius 2009	131	0.082	0.204			
Morocco 2013	132	-0.089	0.246			
Mozambique 2007	341	0.810[b]	0.291[a]			
Namibia 2006	103	0.470[c]	0.361[c]			
Nigeria 2007	948	0.620[a]	-0.274[a]			
Nigeria 2014	622	-0.759[c]	-0.733[c]	256	0.551	-1.746[a]
Senegal 2007	259	0.610[a]	0.263[a]			
Senegal 2014	179	0.617[b]	0.736[a]			
South Africa 2007	680	0.438[a]	0.148[b]			
Tanzania 2006	272	-0.030	0.431[a]			
Tanzania 2013	173	0.113	0.690[a]	103	-0.014	0.646[a]
Tunisia 2013	297	0.010	-0.142	224	0.044	-0.200
Uganda 2006	307	0.382[b]	0.476[a]			
Uganda 2013	221	0.223	0.106			
Zambia 2007	304	0.406[a]	0.290[b]			
Zambia 2013	270	0.397[b]	0.601[a]	110	0.294	0.115
Zimbabwe 2011	353	0.298[c]	0.027	327	0.289[c]	0.035

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (3) with OLS on samples of firms belonging to different surveys.

b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (3) with OLS on samples of firms belonging to different surveys.

c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (3) with OLS on samples of firms belonging to different surveys.

section empirically investigates the role of some of the main channels that have been discussed in the literature over the recent years.

Discussion of the channels

One channel that can explain differences in wages between trading and non-trading firms involves differences in *skill utilization* across firms (Brambilla, Lederman and Porto, 2012; Frazer, 2014). Exporters often need to produce high quality products to compete successfully in foreign markets, especially if these markets are in developed economies (Verhoogen, 2008). To produce high quality products, exporters are likely to have a large share of high-skilled workers in their workforce. Importers are likely to require high-skilled workers to be able to absorb and work with the knowledge and technology embedded in imported inputs (Kugler and Verhoogen, 2012). Both exporters and importers rely on operational services related to logistics, marketing and finance, tasks that are typically executed by highly-skilled workers (Matsuyama, 2007). Provided that skills are remunerated through higher wages, trading firms would be expected to pay higher average wages, simply because they have on average a higher-skilled workforce.

There are also other *workforce composition effects* that may be a channel for wage differences between trading and non-trading firms. Trading and non-trading firms may differ in the share of temporary employees, female employees and production workers in their total workforce. This will affect the average wage level, provided that temporary employees, female employees and production workers have a wage that differs from the wage paid to permanent employees, male employees and non-production workers, respectively.

Recent evidence points to an increased use of temporary employment among trading firms (Machikita and Sato, 2016). This may be driven by a preference for lower dismissal costs and more flexibility which come with temporary employment contracts (Aleksynska and Berg, 2016). It may also be driven by reduced incentives for firms to employ workers that acquire firm-specific skills, which typically are permanent rather than temporary employees. Similarly, there is also evidence for a more female workforce, especially among exporters (Duda-Nyczak and Viegelahn, 2016). Also, due to the increased need of firms for trade-related operational services, the share of production workers is likely to be lower in trading firms. All these workforce composition effects can have an impact on the average wage that is paid at the firm level.

The trading activity of a firm can also give rise to *technology upgrading*, induced by technology transfers from the trading partner, which may increase workers' productivity and can therefore lead to higher wages. Export destination has been shown to play a crucial role in determining the wage premium in the case of South Africa (Rankin and Schoer, 2013). Exporters pay higher wages only when exporting to more-developed economies, whereas firms exporting to regional less-developed markets are actually characterized by negative wage premia. Also, a causal relationship between exporting to high-income markets and paying higher wages has been demonstrated globally (Brambilla and Porto, 2016), indicating that firms and their workers may benefit from technology upgrades induced by exports to more developed economies.

Finally, the extension of a firm's business to export markets increases the *scale* of a firm, thus lowering average costs in the presence of increasing returns to scale. This will increase workers' productivity, and hence potentially their wages. The relevance of international scale economies for productivity within exporting firms has empirically been shown for the case of Chinese Taipei (Hwang, 2003).

Empirical results

Table 6 shows results from regressions at the firm level, where we investigate in columns 1–4 the role of the four above-described channels in explaining differences between trading and non-trading firms. In the following, we consider four different variables as measures of the four channels discussed above. To proxy for skills utilization, we use the average number of production workers' years of education. To account for other workforce characteristics, we respectively use the share of women and production workers in full-time permanent employment, and the share of temporary workers in total

employment. To proxy for the level of technology, we use total factor productivity (TFP), which corresponds to the portion of output that is not explained by the amounts of inputs used in production. Finally, for economies of scale, we use firms' total sales.

We start by including these variables one by one as explanatory variables and observe how the estimated coefficients for firms' export and import status react. As expected, we find firms' skill utilization, measured by the average number of production workers' years of education, to positively affect wages (column 1). But even after controlling for skills utilization, the coefficient on exporting remains positive and significant, the coefficient implying a wage premium of 18.2%, which is very close to the 17.5%, obtained from the specification where this variable was not included. This suggests that skill utilization does not explain the difference in wages between exporters and non-exporters. Importing status remains insignificant, even after including a measure for skills utilization in the regression.

Similarly, the coefficient on exporting remains positive and significant when including individual workforce characteristics, including the share of temporary, female and production worker employment, as additional

Table 6: Exporting, importing and the average wage (firm-level)—different channels
Dependent variable: Log(Wage)

	Skill utilization (1)	Workforce characteristics (2)	Technology (3)	Scale (4)	Labour productivity (5)	All (6)
Exporter	0.182[a] (0.064)	0.206[a] (0.062)	0.179[a] (0.060)	-0.154[b] (0.061)	0.072 (0.057)	0.013 (0.058)
Importer	0.010 (0.052)	0.023 (0.051)	0.026 (0.048)	-0.199[a] (0.049)	-0.086[b] (0.046)	-0.071 (0.044)
Capital stock over sales	-0.030[a] (0.005)	-0.037[a] (0.007)	-0.018[a] (0.005)	-0.009 (0.008)	-0.006 (0.009)	-0.009[b] (0.004)
Electricity costs over sales	-1.981[a] (0.537)	-1.892[a] (0.532)	-1.049[c] (0.554)	0.107 (0.456)	0.823[c] (0.484)	0.651 (0.481)
Foreign owned	0.370[a] (0.090)	0.450[a] (0.093)	0.280[a] (0.090)	0.033 (0.081)	0.059 (0.077)	0.037 (0.087)
Log(Firm age)	0.074[a] (0.026)	0.056[b] (0.026)	0.069[a] (0.024)	-0.059[b] (0.024)	0.010 (0.023)	0.011 (0.020)
Log(Average production workers' years of education)	0.106[b] (0.044)					0.025 (0.039)
Female worker share		-0.004[a] (0.001)				-0.000 (0.001)
Production worker share		-0.004[b] (0.002)				-0.001 (0.002)
Temporary worker share		0.006[a] (0.001)				0.001 (0.001)
Log(TFP)			0.348[a] (0.041)			-0.480[a] (0.061)
Log(Sales)				0.290[a] (0.015)		0.002 (0.017)
Log(Labour productivity)					0.503[a] (0.023)	0.723[a] (0.042)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.76	0.76	0.78	0.78	0.81	0.86
Number of observations	3530	3513	3507	3827	3575	2970

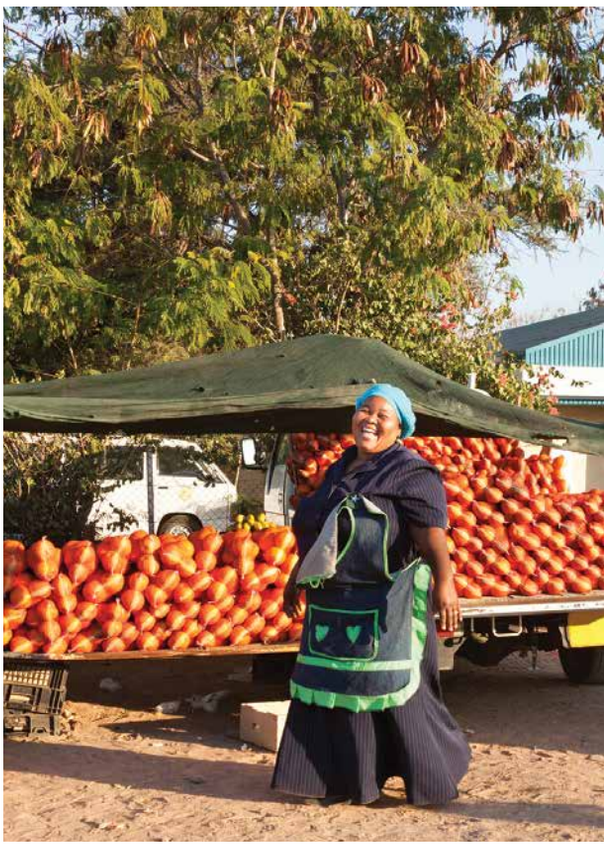
a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.
b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.
c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.

between exporters and non-exporters is estimated to be 20.6%. Importing status once more remains insignificant, even after including measures for different workforce characteristics in the regression.

We then include TFP as a proxy for technology into the regression (column 3). Once more the coefficient on exporting remains positive and significant, with an estimated value of 17.9%. Differences in technology that may arise from technology transfers from trading partners are therefore unlikely to be responsible for the wage premium of exporters. Including TFP into the regression also does not change the statistical insignificance of the estimated importer coefficient.

As proxy for the fourth channel, we include the firm's total sales into the regression (column 4). The positive wage premium of exporting vanishes and even becomes negative. Moreover, the wage premium of importing becomes negative and statistically significant. This finding suggests that economies of scale play a major role in explaining differences between trading and non-trading firms. Achieving economies of scale through exporting hence appears to be a key channel through which exporting firms have higher average wages than non-exporting firms.

All channels that explain wage differences between trading and non-trading firms will work through increased labor productivity. For example, technology transfer in favor of exporting firms can only result in a wage premium if it boosts labor productivity. Labor productivity hence summarizes all channels in one variable. When including labor productivity as an explanatory variable (calculated as the difference between sales and raw material expenses per full-time permanent worker), we find no evidence for a positive wage premium of exporting (column 5). However, we find weak evidence for a negative wage premium of importing. In other words, when comparing importers and non-importers with identical labor productivity, importers pay on average lower wages than non-importers. This result suggests that workers in importing firms reap a smaller share of the value added that is generated per worker, compared to non-importers, which could be evidence in favor of reduced bargaining power of workers in these firms. This, for example, would be in line with evidence



for Belgium that associates increased import competition with decreased bargaining power for workers (Abraham, Konings and Vanormelingen, 2009).

Finally, we include all variables introduced in this section at the same time into the regression (column 6). It should be noted that TFP, sales, and labor productivity are highly correlated by construction, as all include sales as an ingredient, which makes it impossible to interpret the signs of the respective coefficients. More importantly, however, exporter and importer status are insignificant, as expected.

4.3 Employee-level results

The previous section did not find any evidence of a positive wage premium of importing, after controlling for firm age, but strong evidence for a positive wage premium of exporting. An empirical analysis of the channels that are likely to drive this result suggested that the positive wage premium of exporting is mainly the result of productivity gains from economies of scale. Technology transfers from the trading partner, as well

as the composition of firms' workforce in terms of skills, gender, type of contract, and type of task in contrast do not account for the wage differences observed between exporters and non-exporters.

The previous section considered firm-level wages but did not control for individual worker characteristics such as gender, marital status, age, level of education or years of experience, which might be driving some of the results. This section uses matched employer-employee data from 16 surveys, and analyzes whether employee-level wages differ between workers employed by trading firms and those that are employed by non-trading firms. Table 7 shows the relation of firms' exporter and importer status with wages of employees, using different specifications. Without any control variables, we find for our sample of workers that wages of workers in exporting firms are 16% higher than the wages of workers that work for firms not engaging in export markets (column 1). This coefficient is quantitatively similar to that estimated in the firm-level regressions, reported in Table 3. In contrast, the wages of workers in importers are now on average around 5%

Table 7: Exporting, importing and the average wage (employee-level)—full sample
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter	0.163[a] (0.034)		0.186[a] (0.035)	0.166[a] (0.036)	0.106[a] (0.037)		0.125[a] (0.037)	0.090[b] (0.037)
Importer		-0.053[b] (0.027)	-0.088[a] (0.028)	-0.097[a] (0.029)		-0.045[c] (0.026)	-0.070[a] (0.026)	-0.082[a] (0.028)
Capital stock over sales				-0.004 (0.003)				-0.006[c] (0.003)
Electricity costs over sales				-0.145 (0.353)				0.234 (0.387)
Foreign owned				-0.140[a] (0.050)				-0.085[c] (0.048)
Female					-0.044 (0.028)	-0.041 (0.028)	-0.038 (0.028)	-0.018 (0.029)
Married					0.076[a] (0.027)	0.074[a] (0.027)	0.075[a] (0.027)	0.077[a] (0.027)
No or primary education					-0.263[a] (0.029)	-0.266[a] (0.029)	-0.261[a] (0.029)	-0.260[a] (0.029)
Vocational training					0.331[a] (0.034)	0.330[a] (0.035)	0.330[a] (0.034)	0.332[a] (0.035)
University degree					1.017[a] (0.053)	1.033[a] (0.053)	1.022[a] (0.053)	1.038[a] (0.055)
Trade union member					0.005 (0.031)	0.025 (0.029)	0.006 (0.031)	0.017 (0.032)
Experience with employer					0.007[b] (0.003)	0.007[b] (0.003)	0.007[b] (0.003)	0.007[b] (0.003)
Total experience					0.012[a] (0.003)	0.013[a] (0.003)	0.012[a] (0.003)	0.013[a] (0.003)
Worker age					0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.83	0.83	0.83	0.82	0.87	0.87	0.87	0.87
Number of observations	6,641	6,648	6,641	6,286	5,067	5,074	5,067	4,855

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

lower (column 2). Even when including firms' exporter and importer status simultaneously as explanatory variables in the regression, exporter status remains positively associated with wages, while importer status remains negatively associated with wages (column 3). This also holds after including capital intensity, electricity intensity and ownership status of the firm that employs the worker (column 4).

When including individual worker characteristics as control variables, the wage premium of importers remains negative and significant, while the wage premium of exporters remains positive and significant. This holds in all specifications (columns 5–8). As expected, workers that are married and older age receive a higher wage on average. Gender and trade union membership, in contrast, do not appear to be related to individual workers' wages. The education level of workers explains to a large extent individual worker wages, with no or only primary education being associated with lower wages, vocational training being associated with higher wages, and a university degree being associated with much higher wages than workers with secondary education. Total work experience also relates to wages positively, in particular work experience with the current employer.

The employee-level regressions include the same firm-level control variables as the firm-level regressions. The exception is firm age which was included in the firm-level regression, but cannot be included in the employee-level regressions, as it is only available for 3 out of the 16 surveys, resulting in a sample size that is too small.

These results are largely in line with the results obtained from the firm-level regressions. There is strong evidence of a positive wage premium of exporting, and of the absence of a positive wage premium of importing, and even evidence for a negative wage premium. Worker characteristics are also found to only partially explain the differences in wages between trading and non-trading firms, which also confirms the results obtained from firm-level data.

Tables 8 and 9 show the estimations of the specification in columns (3) and (6) of Table 7 by sector and by survey, respectively. The sector-specific results indicate that the negative wage premium for workers in importing firms is particularly driven by workers in the textiles and garments, and metals and machinery sector. The results for workers in exporting firms are dependent on the sector. There is a positive wage premium of exporting

Table 8: Exporting, importing and the average wage (employee-level)—by sector
Dependent variable: Log(Wage)

Sector	Regressors: Exporter/Importer Individual worker characteristics			Regressors: Exporter/Importer Capital stock over sales Electricity costs over sales Foreign owned Individual worker characteristics		
	N	Exporter	Importer	N	Exporter	Importer
Food & beverages	1,427	0.300[a]	0.046	1375	0.301[a]	0.038
Textiles & garments	866	-0.324[a]	-0.339[a]	821	-0.146	-0.464[a]
Wood & paper	646	0.312[a]	-0.084	623	0.313[a]	-0.085
Chemicals	360	-0.113	0.013	360	-0.119	-0.016
Non-metals & plastics	376	0.074	-0.088	347	0.037	-0.174
Metals & machinery	582	0.396[a]	-0.148[b]	568	0.362[a]	-0.076
Furniture	635	0.463[a]	0.027	586	0.003	0.019
Other manufacturing	175	-0.572[a]	0.208	175	-0.541[a]	-0.023

a Indicate statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (5) with OLS on samples of employees from different sectors.

b Indicate statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (5) with OLS on samples of employees from different sectors.

Table 9: Exporting, importing and the average wage (employee-level)—by survey
Dependent variable: Log(Wage)

Survey	Regressors: Exporter/Importer Individual worker characteristics			Regressors: Exporter/Importer Capital stock over sales Electricity costs over sales Foreign owned Individual worker characteristics		
	N	Exporter	Importer	N	Exporter	Importer
Angola 2006	266	0.000	-0.058	246	0.000	-0.062
Botswana 2006	113	0.476[b]	0.127			
Burundi 2006	107	0.162	-0.061			
DRC 2006	342	-0.111	0.032	342	-0.122	0.027
Ghana 2007	566	-0.000	-0.011	546	0.024	-0.020
Guinea 2006	224	-0.009	0.293[a]	193	-0.179	0.181
Mauritania 2006	124	-0.620	-0.140	121	0.478[b]	-0.043
Namibia 2006	279	0.053	0.367[a]	259	0.086	0.454[a]
Rwanda 2006	171	0.051	-0.233	171	0.066	-0.250[c]
South Africa 2007	1,087	0.134[a]	-0.105[b]	1,073	0.136[a]	-0.103[b]
Swaziland 2006	116	0.227	0.131			
Tanzania 2006	336	-0.120	-0.065	326	-0.222[c]	-0.088
Uganda 2006	323	0.010	-0.670[a]	307	-0.075	-0.720[a]
Zambia 2007	899	0.069	0.070	896	0.043	0.104

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (6) with OLS belonging to different surveys.
b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (6) with OLS belonging to different surveys.
c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (6) with OLS belonging to different surveys.

in the food and beverages, furniture, wood and paper, and metals and machinery sector. The wage premium is in contrast negative for textiles and garments, and other manufacturing. The results by survey vary greatly, with both significantly positive and significantly negative coefficients being estimated.

4.4 Gender and the difference in wages

This section examines whether firms' exporting and importing status is related to gender wage differentials. The literature provides plentiful empirical evidence that wages of female workers are on average lower than wages paid to male workers (Blau and Kahn, 2017). Depending on the market, the gender wage gap has various causes, ranging from discriminatory labor practices to overall cultural attitudes. There is, however, no strong theoretical premise that this gender wage gap would be significantly more or less pronounced in exporting compared with non-exporting firms, or in importing compared with non-importing firms.[9]

While we did not find any statistically significant gender wage gap on average for the full sample of workers (see columns 5–8 of Table 7), there might still be differences in the gender wage gap that depend on whether firms are exporters or importers. Therefore we re-do the analysis, but now include two interaction terms between the dummy variable that indicates whether the worker is a woman, and respectively the dummy variables that indicate firms' exporter and importer status. Including these interaction terms enables us to separate workers that are employed by firms engaged in exporting, importing or both, from workers that are employed by non-trading firms. As shown in Table 10, the coefficient estimated for *Female* indicates a gender wage gap for

[9] Boler, Javorcik and Ulltveit-Moe (2015) argue that exporters require a higher commitment from their employees due to more exposure to competition. If commitment is remunerated especially in exporting firms and women are perceived by employers to be less committed, this could explain a more pronounced gender wage gap within exporting firms.

Table 10: Gender and the differences in average wages between trading and non-trading firms (employee-level)—full sample
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)
Exporter	0.092[b] (0.045)		0.115[b] (0.045)	0.069 (0.045)
Exporter* female	0.044 (0.066)		0.033 (0.067)	0.067 (0.068)
Importer		-0.058[c] (0.030)	-0.082[a] (0.030)	-0.093[a] (0.031)
Importer* Female		0.048 (0.053)	0.041 (0.054)	0.043 (0.055)
Capital stock over sales				-0.006[c] (0.003)
Electricity costs over sales				0.246 (0.389)
Foreign owned				-0.085[c] (0.048)
Female	-0.055[c] (0.031)	-0.069[c] (0.037)	-0.070[c] (0.038)	-0.059 (0.039)
Married	0.076[a] (0.027)	0.074[a] (0.027)	0.075[a] (0.027)	0.076[a] (0.027)
No or primary education	-0.262[a] (0.029)	-0.266[a] (0.029)	-0.261[a] (0.029)	-0.260[a] (0.030)
Vocational training	0.331[a] (0.035)	0.331[a] (0.035)	0.331[a] (0.035)	0.333[a] (0.035)
University degree	1.017[a] (0.053)	1.034[a] (0.053)	1.022[a] (0.053)	1.038[a] (0.055)
Trade union member	0.005 (0.031)	0.024 (0.029)	0.006 (0.031)	0.017 (0.032)
Experience with employer	0.007[b] (0.003)	0.007[b] (0.003)	0.007[b] (0.003)	0.007[b] (0.003)
Total experience	0.012[a] (0.003)	0.013[a] (0.003)	0.012[a] (0.003)	0.013[a] (0.003)
Worker age	0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)
Sector FE	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes
R2	0.87	0.87	0.87	0.87
Number of observations	5,067	5,074	5,067	4,855

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

c Indicates statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

non-trading firms in 3 of the 4 specifications. In turn, positive coefficients on interaction terms suggest that there is no evidence for a gender wage gap in trading firms. The results indicate that the wage premium of exporting and importing does not significantly vary with the sex of the worker.

4.5 Robustness checks

Finally, in Appendix B we present the results of a number of robustness checks for the results presented above. First, we assess whether outliers, in the form of the highest and lowest wage observation for each firm may

have overly influenced the results from the employee level analysis. Second, the results of firm-level regressions are based on 65 surveys from 47 countries, while the employee-level regressions are based on 16 surveys from 16 countries. To check the comparability of these regressions we run the firm-level regressions on data from the same 16 surveys for which also employee data are available. Finally, we further limit the firm-level sample to include only those firms for which employee data are available, given that employee data are not available for all firms that form part of the 16 surveys that collected employee-level data. In all cases, these robustness checks confirm the main findings of this analysis.

5. Conclusions

This paper studies the relationship between exporting, importing and wages in Africa, using firm-level data and employer-employee-level data from the World Bank Enterprise Surveys. On the basis of firm-level data, we find that the average wage paid by exporters to their workers is higher, even after controlling for such firm characteristics as capital intensity, electricity intensity, foreign ownership and firm age. The average wage paid by importers relative to non-importers is by contrast not higher, after adding firm age as a control variable. On the basis of employer-employee data, we can confirm a positive exporting premium on wages, even after controlling for individual worker characteristics. Workers that are employed by importers are found to—if anything—receive lower wages, when compared to workers employed by non-importers.

We endeavor to identify the channels that can explain our findings. Productivity gains through economies of scale explain the positive wage premium of exporters; neither productivity gains through increased skill utilization or the employment of certain types of workers, nor productivity gains through technology transfers, contribute to exporters' wage premium. Workers in importers are found to have weaker bargaining power than those employed in non-importers, and are thus able to only reap smaller shares of the value added that is generated.

These results are somewhat surprising, given that the trade literature has typically found that both exporting and importing can be associated with higher wages. The arguments provided by this literature go beyond a mere effect of trade on firm performance through higher sales. The trade literature also associates exports with gains due to increased foreign competition and skill premia, and imports with gains due to access to new technologies, and a better quality and wider variety of inputs. If these gains exist and are at least partially passed on to workers, we would expect to find higher wages in exporting and importing firms.

This paper clearly indicates that there are other factors that contradict these general findings in the African context. On the one hand, African exporters are frequently incapable of competing in terms of product quality in more sophisticated markets outside of Africa. Thus, economies of scale resulting in lower prices remain the only viable channel to enter export markets, largely at the regional level. The strong price sensitivity

The findings indicate that there is no significant gender wage gap within trading firms in the sample, while there is some evidence for a gender wage gap within non-trading firms. These results suggest that trading firms in the African context appear to contribute to gender equality, at least based on the data sample that this paper has worked with.

of African customers, generally characterized by low personal income, reinforces this rationale. This particular mechanism of competing through quantity as opposed to quality can thus explain why economies of scale drives the positive premium on wages of exporters in Africa, and why other channels, such as skill utilization may play a smaller role.

On the other hand, the non-existent or even negative wage premium of importing is likely to be rooted in the nature of imports on the continent. The limited diversification of African economies means that some inputs can only be obtained by importing. This reduces the potential gains reaped from imported inputs, which are rather a source of higher costs than a way of having a comparative advantage over firms sourcing domestically. In the absence of domestic raw material inputs, the higher material costs oblige firms to seek savings by cutting other spending, including wages. In addition, high unemployment and large shares of informality in African countries shifts the bargaining power towards employers, which is confirmed by the negative regression results when controlling for labor productivity.

The paper also included an analysis of the gender dimension. The findings indicate that there is no significant gender wage gap within trading firms in the sample, while there is some evidence for a gender wage gap within non-trading firms. These results suggest that trading firms in the African context appear to contribute to gender equality, at least based on the data sample that this paper has worked with.

Matched employer-employee data are only rarely available, especially for developing countries. In addition to presenting results about the linkages between trade and wages, this paper also showed the value of analysis of employer-employee data to inform policies, pointing to the benefits of regularly collecting such data and increasing its quality. Such data are useful not only to examine the questions addressed in this paper, but also questions that are related to a wider range of labour market issues.

Given the ongoing regional and sub-regional integration efforts of African countries, it is important to better understand under which conditions firms are able to benefit from the potential gains of trade, what the potential bottlenecks to achieving these gains are, and how the gains can be translated into decent jobs for all workers. For trade liberalization to be sustainable and inclusive, it is important to learn about the conditions under which workers can reap at least some of the gains that are being made, especially in a continent like Africa. This paper used available matched employer-employee data to provide evidence on these mechanisms and sought to contribute to a better understanding of the gains from trade and how they are shared with workers in the African context.

References

Abraham, F., J. Konings, and S. Vanormelingen (2009). "The effect on globalization on union bargaining and price-cost margins of firms," *Review of World Economics*, Vol. 145, pp. 13–36.

Aleksynska, M., and J. Berg (2016). "Firms' demand for temporary labour in developing countries: necessity or strategy?". Conditions of Work and Employment Series No. 77, INWORK, Geneva: International Labour Office.

Amiti, M., and D.R. Davis (2011). "Trade, firms, and wages: theory and evidence," *Review of Economic Studie*s, Vol. 79, pp. 1–36.

Amiti, M., and J. Konings (2007). "Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia," *American Economic Review*, Vol. 97, No. 5, pp. 1611–1638.

Bernard, A.B., J.B. Jensen, S.J. Redding, and P.K. Schott (2007). "Firms in international trade," *Journal of Economic Perspectives*, Vol. 21, No. 3, pp. 105–130.

_____(2012) "The Empirics of Firm Heterogeneity and International Trade," *Annual Review of Economics*, Vol. 4, pp. 283–313.

Bigsten, A., and M. Gebreeyesus (2009). "Firm Productivity and Exports: Evidence from Ethiopian Manufacturing," *Journal of Development Studies*, Vol. 45, No. 10, pp. 1594–1614.

Bigsten, A., P. Collier, S. Dercon, M. Fafchamps, B. Gauthier, J.W. Gunning, A. Oduro, R. Oostendorp, C. Pattillo, M. Soederbom, F. Teal, and A. Zeufack (2004). "Do African manufacturing firms learn from exporting?" *Journal of Development Studies*, Vol. 40, No. 3, pp. 115–141.

Bigsten, A., M. Gebreeyesus, and M. Soederbom (2016). "Tariffs and Firm Performance in Ethiopia," *Journal of Development Studies*, Vol. 52, No. 7, pp. 986-1001.

Blau, Francine D., and Lawrence M. Kahn (2017) "The Gender-Wage Gap: Extent, Trends, and Explanations," *Journal of Economic Literature*, Vol. 55, No. 3, pp. 789-865.

Boler, Esther Ann, Beata Javorcik, and Karen Helene Ulltveit-Moe (2015) "Globalization: A Woman's Best Friend? Exporters and the Gender Wage Gap." CEP Discussion Papers 1358, London: Centre for Economic Performance.

Brambilla, I. and G. Porto (2016). "High-income export destinations, quality and wages," *Journal of International Economics*, Vol. 98, pp. 21–35.

Brambilla, I., D. Lederman, and G. Porto (2012). "Exports, export destinations, and skills," *American Economic Review*, Vol. 102, No. 7, pp. 3406–3438.

Brambilla, I., N. Depetris-Chauvin, and G. Porto (2017). "Examining the export wage premium in developing countries," *Review of International Economics*, Vol. 25, No. 3, pp. 447-475.

De Loecker, J. (2013). "Detecting Learning by Exporting," *American Economic Journal: Microeconomics*, Vol. 5, No. 3, pp. 1–21.

Dollar, D. and A. Kraay (2004). "Trade, growth and poverty," *The Economic Journal*, Vol. 114, pp. F22–F49.

Duda-Nyczak, M. and C. Viegelahn (2016). "Exporters, importers and employment: Firm-level evidence from Africa," *Indian Journal of Labour Economics*, Vol. 59, No. 3, pp. 309-341.

Ethier, W. (1982). "National and international returns to scale in the modern theory of international trade," *American Economic Review*, Vol. 72, pp. 389–405.

Frías, J., D. Kaplan, and E. Verhoogen (2012). "Exports and Within-Plant Wage Distributions: Evidence from Mexico," *American Economic Review: Papers and Proceedings*, Vol. 102, No. 3, pp. 435–440.

Frazer, G. (2014). "Imports, import sources and skill utilization." Working Paper.

Fu, D. and Y. Wu (2013). "Export wage premium in China's manufacturing sector: A firm level analysis," *China Economic Review*, Vol. 26, pp. 182–196.

Grossman, G., and E. Helpman (1991). *Innovation and Growth in The Global Economy*, Cambridge, Massachusetts: MIT Press.

Halpern, L., M. Koren, and A. Szeidl (2015). "Imported inputs and productivity," *American Economic Review*, Vol. 105, No. 12, pp. 3660–3703.

Hwang, A.R. (2003). "Exports, Returns to Scale, and Total Factor Productivity: The Case of Taiwanese Manufacturing Industries," *Review of Development Economics*, Vol. 7, No. 2, pp. 204–216.

International Labour Office (2018). World Employment and Social Outlook: Trends 2018, Geneva.

Kasahara, H., and B. Lapham (2013). "Productivity and the decision to import and export: theory and evidence," *Journal of International Economics*, Vol. 89, pp. 297–316.

Kugler, M., and E. Verhoogen (2012). "Prices, plant size and product quality," *Review of Economic Studies*, Vol. 79, No. 1, pp. 307–339.

Le Goff, M., and R. J. Singh (2014). "Does trade reduce poverty? A view from Africa," *Journal of African Trade*, Vol. 1, No. 1, pp. 5–14.

Machikita, T., and H. Sato (2016). "Temporary jobs and globalization." IDE Discussion Paper No. 585, Chiba: Institute of Developing Economies, Japan External Trade Organization (JETRO).

Macis, M., and F. Schivardi (2016). "Exports and Wages: Rent Sharing, Workforce Composition, or Returns to Skills?" *Journal of Labour Economics*, Vol. 34, No. 4, pp. 945–978.

Markusen, J.R. (1989). "Trade in producer services and in other specialized intermediate inputs," *American Economic Review*, Vol. 79, pp. 85–95.

Matsuyama, K. (2007). "Beyond Icebergs: Towards a Theory of Biased Globalization," *Review of Economic Studies*, Vol. 74, No. 1, pp. 237–53.

Melitz, M.J. (2003). "The impact of trade on intra-industry reallocations and aggregate industry productivity," *Econometrica*, Vol. 71, No. 6, pp. 1695–1725.

Mengistae, T., and C. Pattillo (2004). "Export Orientation and Productivity in Sub-Saharan Africa," IMF Staff Papers, Vol. 51, No. 2, pp. 327–353.

Milner, C., and V. Tandrayen (2007). "The Impact of Exporting and Export Destination on Manufacturing Wages: Evidence for Sub-Saharan Africa," *Review of Development Economics*, Vol. 11, No. 1, pp. 13–30.

Rankin, N., and V. Schoer (2013). "Export Destination, Product Quality and Wages in a Middle-Income Country. The Case of South Africa," *Review of Development Economics*, Vol. 17, No. 1, pp. 64–73.

Saliola, Federica, and Murat Seker (2011). "Total factor productivity across the developing world." Enterprise Surveys, Enterprise Note Series, Enterprise Note No. 23, Washington DC: World Bank.

Schank, T., C. Schnabel, and J. Wagner (2007). "Do exporters really pay higher wages? First evidence from German linked employer-employee data," *Journal of International Economics*, Vol. 72, No. 1, pp. 52–74.

Stone, S., and B. Shepherd (2011). "Dynamic gains from trade: the role of intermediate inputs and equipment imports." OECD Trade Policy Papers No. 110, Paris: Organization for Economic Co-operation and Development.

Vandenbussche, H., and C. Viegelahn (2016). "Trade protection and input switching." CEPR Working Paper No. 11395, London: Centre for Economic Policy Research.

Verhoogen, E. (2008). "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector," *The Review of World Economics*, Vol. 123, No. 2, pp. 489–530.

World Bank (2012). "Globalization's impact on gender equality: What's happened and what's needed," Chapter 6 in *World Development Report 2012: Gender equality and development* , Washington D.C.: World Bank.

Appendix

Appendix A: Methods

Table A.1: Surveys

	Country	Years		Country	Years
1	Angola	2006,[a] 2010	25	Madagascar	2009, 2013
2	Benin	2009	26	Malawi	2009, 2014
3	Botswana		27	Mali	2007, 2010
4	Burkina Faso	2009	28	Mauritania	2006,[a] 2014
5	Burundi	2006,[a] 2014	29	Mauritius	2009
6	Cameroon	2009	30	Morocco	2013
7	Cape Verde	2009	31	Mozambique	2007
8	Central African Republic	2011	32	Namibia	2006,[a] 2014
9	Chad	2009	33	Niger	2009
10	Congo, Republic of	2009	34	Nigeria	2007, 2014
11	Côte d'Ivoire	2009	35	Senegal	2007, 2014
12	DRC	2006,[a] 2010, 2013	36	Rwanda	2006,[a] 2011
13	Djibouti	2013	37	Sierra Leone	2009
14	Egypt	2013	38	South Africa	2007,[a]
15	Eritrea	2009	39	South Sudan	2014
16	Ethiopia	2011	40	Sudan	2014
17	Gabon	2009	41	Swaziland	2006
18	Gambia	2006	42	Tanzania	2006,[a] 2013
19	Ghana	2007,[a] 2013	43	Togo	2009
20	Guinea	2006[a]	44	Tunisia	2013
21	Guinea-Bissau	2006	45	Uganda	2006,[a] 2013
22	Kenya	2007, 2013	46	Zambia	2007,[a] 2013
23	Lesotho	2009	47	Zimbabwe	2011
24	Liberia	2009			

Notes: This table lists all the surveys with firm-level data that are included in the analysis.
a This survey also has employee-level data available.

Appendix B: Estimation of firm-level total factor productivity

This paper relies on firm-level estimates of total factor productivity (TFP) as a measure of firm efficiency. To estimate TFP, we follow Saliola and Seker (2011) and use a simple Cobb-Douglas production function, that can be specified as follows:

$$Y = TFP \cdot L^{\alpha} K^{\beta} M^{\gamma} \qquad (7)$$

with Y denoting output, L denoting labor input, K denoting capital input and M denoting material inputs. We estimate this production function in logarithmic form, where the estimated equation can be written as:

$$\log Y = \alpha \log L + \beta \log K + \gamma \log M + e \qquad (8)$$

As measure of output, we use firm-level sales. The capital stock is measured as the replacement value of machinery, vehicles, equipment, land and buildings. Labor input is given by the number of fulltime permanent employees, while material input in the data corresponds to raw material expenses. The residual of the estimated equation corresponds to an estimate of total factor productivity, in logarithmic form.

Appendix C: Robustness checks

C.1 Controlling for outliers

To validate the findings presented in this paper we checked that the estimated coefficients are not exceedingly driven by certain outliers. The first robustness check considers whether outlier observations overly affect the results of the employee-level analysis. The highest and lowest wage observation per firm are dropped from the dataset, and the same employee-level analysis is conducted as in section 4.3.

Excluding for each firm the worker observation with the highest and lowest wage, we obtain results that are very similar to those based on the full-sample analysis. Table Annex C.1. presents the estimated coefficients for the variables of interest in specifications (1)–(6), where the control variables respectively correspond to the control variables included in the regressions whose results were shown in Table 7 of this paper. In the case of both importing and exporting premia, the coefficients maintain the same sign as in the full-sample estimation, i.e., negative for

Table C.1: Importing, exporting and the average wage (employee-level)—no outliers
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter	0.135[a] (0.039)		0.164[a] (0.041)	0.141[a] (0.041)	0.091[b] (0.043)		0.116[a] (0.043)	0.074[c] (0.042)
Importer		-0.076[b] (0.031)	-0.108[a] (0.032)	-0.124[a] (0.033)		-0.061[b] (0.030)	-0.087[a] (0.030)	-0.105[a] (0.031)
Capital stock over sales				-0.004 (0.004)				-0.009[c] (0.005)
Electricity costs over sales				-0.179 (0.382)				0.137 (0.386)
Foreign owned				-0.128[b] (0.061)				-0.080 (0.058)
Female					-0.002 (0.029)	0.003 (0.030)	0.006 (0.029)	0.029 (0.030)
Married					0.031 (0.030)	0.027 (0.030)	0.030 (0.030)	0.034 (0.030)
No or primary education					-0.239[a] (0.032)	-0.243[a] (0.032)	-0.237[a] (0.032)	-0.237[a] (0.033)
Vocational training					0.326[a] (0.037)	0.325[a] (0.038)	0.327[a] (0.037)	0.327[a] (0.038)
University degree					0.913[a] (0.062)	0.930[a] (0.062)	0.918[a] (0.063)	0.945[a] (0.066)
Trade union member					-0.006 (0.037)	0.013 (0.034)	-0.005 (0.037)	0.003 (0.038)
Experience with employer					0.008[b] (0.004)	0.008[b] (0.004)	0.008[b] (0.004)	0.009[b] (0.004)
Total experience					0.009[a] (0.003)	0.009[a] (0.003)	0.009[a] (0.003)	0.009[a] (0.003)
Worker age					0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)	0.009[a] (0.002)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.86	0.86	0.86	0.86	0.89	0.89	0.89	0.89
Number of observations	4161	4166	4161	3931	3253	3258	3253	3121

a Indicate statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of employees (16 surveys), where the employees with the highest and lowest wage per firm have been excluded.

b Indicate statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of employees (16 surveys), where the employees with the highest and lowest wage per firm have been excluded.

c Indicate statistical significance at the 10% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of employees (16 surveys), where the employees with the highest and lowest wage per firm have been excluded.

importing and positive for exporting. In addition, they are significant in all the estimated specifications, which is also the case in the original regressions. Results are hence not driven by outlier observations for wages.

Limiting country coverage

The results of firm-level and employee-level regressions on the full sample cannot be directly compared. While the results of firm-level regressions are based on 65 surveys from 47 countries, the employee-level regressions are based on 16 surveys from 16 countries. One way to make these regressions somewhat comparable is to run the firm-level regressions on the data from the same 16 surveys for which also employee data are available.

Table Annex C.2 shows results of the firm-level regressions presented in Table 3 of this paper, but for the restricted sample. The coefficients on both exporting and importing status are positive and statistically significant in all but the last specification. This corresponds to the results obtained from the regressions run on the full sample. Estimated magnitudes of the coefficients based on the restricted sample tend to be larger than those based on the full sample, reinforcing earlier findings. When including firm age in the regression (column 6), however, both exporting and importing status become insignificant. When estimated on the full-sample, this was only the case for importing status. Given, however, that firm age is only available in 3 out of the 16 surveys, the number of observations is too small to draw any reliable conclusions from that.

Limiting country and firm overage

As a third robustness check, we further limit the firm-level sample to include only those firms for which employee data exist (employee data are not available for all firms that form part of the 16 surveys that collected employee-level data). The model specifications are identical with the regressions used in the firm-level analysis of section 4.1 and reported in Table 3 of this paper.

Running the firm-level regressions on the sample restricted in size to firms represented in the employee dataset yields similar results, as illustrated in Table Annex C.3. Exporting and importing status are both positively associated with wages. The specification that includes firm age as a control variable results in a sample that is too small to provide any meaningful results.

Table C.2: Importing, exporting and the average wage (firm-level) – only surveys represented in employee-level data
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.314[a] (0.043)		0.257[a] (0.043)	0.227[a] (0.044)	0.191[a] (0.044)	-0.002 (0.153)
Importer		0.245[a] (0.033)	0.195[a] (0.033)	0.180[a] (0.033)	0.157[a] (0.033)	-0.099 (0.142)
Capital stock over sales				-0.036[a] (0.006)	-0.035[a] (0.006)	-0.063[b] (0.028)
Electricity costs over sales				-2.867[a] (0.640)	-2.794[a] (0.626)	-7.144[a] (2.010)
Foreign owned					0.331[a] (0.052)	0.388 (0.461)
Log(Firm age)						0.135[b] (0.057)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.85	0.85	0.85	0.86	0.86	0.92
Number of observations	2961	2961	2960	2838	2837	164

a Indicates statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the sample of firms that belong to the 16 surveys for which also employee data are available.

b Indicates statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the sample of firms that belong to the 16 surveys for which also employee data are available.

Table C.3: Importing, exporting and the average wage (firm-level)—only firms represented in employee-level data
Dependent variable: Log(Wage)

	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.325[a] (0.064)		0.292[a] (0.065)	0.272[a] (0.066)	0.254[a] (0.065)	-0.079 (0.189)
Importer		0.176[a] (0.046)	0.130[a] (0.046)	0.120[a] (0.045)	0.100[b] (0.045)	0.005 (0.184)
Capital stock over sales				-0.038[a] (0.007)	-0.036[a] (0.006)	-0.121[b] (0.046)
Electricity costs over sales				-2.731[a] (0.631)	-2.802[a] (0.636)	-1.451 (5.662)
Foreign owned					0.301[a] (0.072)	-0.565[b] (0.267)
Log(Firm age)						0.015 (0.084)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.86	0.86	0.86	0.87	0.87	0.93
Number of observations	1382	1383	1382	1311	1310	80

a Indicate statistical significance at the 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the sample of firms that belong to the firms within the 16 surveys that also report employee data.

b Indicate statistical significance at the 5% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the sample of firms that belong to the firms within the 16 surveys that also report employee data.

The Poverty Impact of Modernising Dar es Salaam Port[1]

Nicolás Depetris-Chauvin, Geneva School of Business Administration, HES-SO[2]
Pablo Depetris-Chauvin, Universidad Torcuato Di Tella[3]
Francis Mulangu, Millennium Challenge Corporation[4]

1. Introduction

This study assesses the likely impact of the modernization of the Port of Dar es Salaam on household welfare and poverty in Tanzania and neighboring countries. Trade volumes in Tanzania increased more than 10% per year in the last decade, and international trade has been one of the engines of growth in the country. However, the current state of Dar es Salaam port is a severe constraint on further growth. Increasing the efficiency of the port is a key challenge; container vessels have to wait an average of more than 10 days before berthing, and dwell times average another 10 days. The costs associated with the inefficiencies in the port are partially related to congestion. The situation is more critical for imports than for exports; the inefficiencies act as an implicit tax on imports and to a lesser extent as a tax on exports (Morisset, 2013).

We assume that port modernization would result in a reduction of 5% in border prices for bulk cargo, and measure the impact on the economy and on poverty in the short run. The analysis proceeds in two-steps: first, the extent of the transmission of border prices to retail and farm gate prices will be evaluated; second, these estimated price changes will be used to determine the welfare effects for different demographic groups, particularly the impact on urban versus rural households and on different income levels.

The study is organized as follows. The next section presents basic information regarding the planned infrastructure and operational improvements for the Dar es Salaam Port. Section 3 introduces the trade and poverty methodology based on the use of micro data, which enables the identification of the different channels through which trade may affect poverty. Section 4 describes trade and industrial policy and the structure of production and trade flows in Tanzania. Based on the findings of section 4 and on complementary information on market structure and infrastructure, section 5 estimates the expected impact of the port project on trade flows and prices. It covers a limited basket of goods which are a small proportion of the cargo going through the port, but make up a very large share of the consumption basket of poor households and are also an important source of their income. Section 6 presents a poverty profile for Tanzania. In particular, it describes consumption and income patterns for different levels of livelihood, distinguishing between rural and urban households. Section 7 combines the information on price changes (section 5) and the household data (section 6) to provide estimations of the short-term welfare impact. Section 8 concludes with some recommendations.

[1] This study has been funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the UK Government's opinions or official polices. We thank Tim Bushell and DFID Tanzania seminar participants for useful comments and discussion. All errors are our responsibility.
[2] Geneva School of Business Administration, HES-SO.
[3] Universidad Torcuato Di Tella.
[4] Millennium Challenge Corporation.

2. Enhancement of the Dar es Salaam Port

Dar es Salaam Port handles approximately 90% of the country's international sea trade and serves as a transit port for landlocked countries Burundi, Democratic Republic of Congo, Rwanda, Uganda, Zambia and Malawi. The port has a rated capacity of 4.1 million (dwt) dry cargo and 6.0 million (dwt) bulk liquid cargo. It has a total quay length of about 2,000 metres with eleven deep-water berths.

As a consequence of inadequate investment and a deterioration in port management, the port suffers from insufficient capacity, frequent power cuts, high dwell time and exceptionally high port congestion. Bulk, RoRo and Container customers generally rely on their own operations. Dar es Salaam port is one of the least efficient in the world. Tanzania was ranked only 86th in UNCTAD's Liner Shipping Connectivity index, behind South Africa (31st), Ghana (64th) and Kenya (85th) on the African continent. The problem is further heightened by weak road and rail connectivity to and from the port. The poor performance of the port acts as an implicit tax on exports and imports, and constrains growth in Tanzania and the landlocked neighbors served by the port.

Trade has been one of the engines of growth in recent years in Tanzania. Since 2000 export volumes have increased 7.74% a year and import volumes 11.65% a year. In 2013 Dar Port handled a total of 13.5 million tons of cargo (compared to 12.1 million tons in 2012) and merchandise trade amounted to more than US$17 billon, almost 52% of Tanzania's GDP. Given the strategic role played by the port in the economy of the country and

the region, and the evident deterioration in its capacity to deal with increasing trade flows, the Tanzania Ports Authority, the Ministry of Transport and Trade Mark East Africa (TMEA) worked together to put forward a support program. The Government later agreed to partner with TMEA, the United Kingdom Department for International Development (DFID) and the World Bank to implement a series of reforms to increase the efficiency and handling capacity of Dar Port through improvements in port infrastructure and cargo clearance procedures so that it is better able to handle future growth in trade.

While there is a long-standing consensus among academics and policy-makers on the positive role of port infrastructure investments in fostering trade and growth, the link with poverty reduction is weaker. The trade literature emphasizes the gains from trade, but it also acknowledges that there are unavoidably winners and losers from trade. This creates a potential distributional conflict as well as potential adverse effects on equality. In what follows the research develops a methodology to estimate the welfare impact of the proposed improvement in the Dar es Salaam port, identifying the winners and losers from increased trade.

3. Trade and poverty methodology

There is no general framework that predicts the effect of trade on poverty. Globalization poses both risks and opportunities for developing countries and poor citizens of those countries. Access to new markets for exporting firms in developing countries potentially creates employment and increases the salary of workers in those sectors. Local firms can also access better inputs and technology, helping to close the productivity gap observed in most developing countries. However, in the presence of market failures it is not clear that the gains from trade will be observed. Moreover, trade could potentially increase unemployment, poverty and income inequality in the short and medium term, making it unsustainable socially, economically, and politically (Artuc et al., 2015; Artuc and Porto, 2016; and Dix-Carneiro, 2014). This suggests that the relationship between international trade and poverty is complex. The overall effect of globalization in a developing country may depend on the provision of complementary policies, institutions, and infrastructure, highlighting the importance of public policies.

Food is often the largest household expenditure for poor people, while much of their income will come from wages and, for rural households, from sales of agricultural produce. The modernization of the port should reduce delays, wastage and losses, and probably increase the level of competition in the logistics associated with trade. This will reduce the prices of imported goods (though the level of pass-through will depend on other complementary policies) and increase the level of competition with local producers. It will also provide enhanced export opportunities both for local producers and landlocked neighboring countries. All these changes will have distributional impacts.

The conceptual framework in this paper is organized around the two-step approach of the trade and poverty literature.[5] The first step involves an assessment of how the infrastructure project will affect trade flows and how these changes in trading opportunities will affect the prices of goods and production factors. This step will require an assessment of the effect of the reform on border prices and how those changes on border prices would be transmitted to retail and producer prices and potentially to wages. The extent of pass-through will depend, among many factors, on the trade and production structure, the existing trade and industrial policy, sectoral market structure (level of competition among importers and exporters) and the degree of market integration in Tanzania. The second step uses household surveys to assess the poverty impacts of those changes in trade. It will follow the standard first order effects approach, as in Deaton (1989, 1997). Using microdata from the household surveys, consumption and income shares derived from the production and consumption of different goods will be used to evaluate the consumption, income, and overall impacts of a given price change.

[5] See Chapter 1 of World Bank and World Trade Organization (2015) for the macroeconomic links between growth, trade, and poverty.

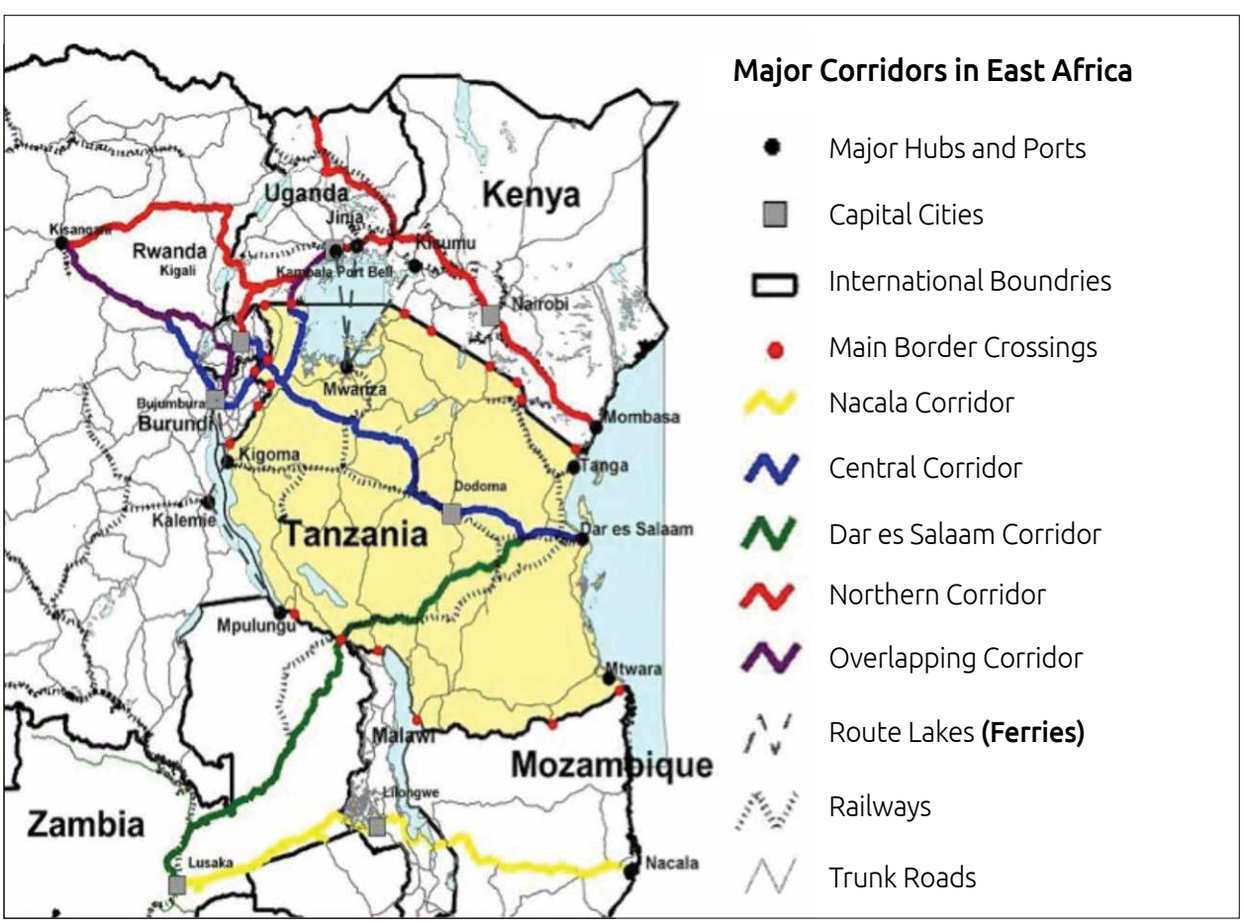
4. Production and trade patterns and policy in Tanzania

Tanzania experienced rapid economic growth over the past decade and a half. GDP increased on average 6.7% per year from 2000 to 2016, compared to 3% during 1990–2000. During the same period, the share of the agricultural sector, which employs 75% of the labour force, in GDP declined. In 2016 agriculture accounted for 31% of Tanzania's GDP, industry accounted for 2%, and services for 42%.

An analysis of the impact of trade on poverty in Tanzania needs to take into account several trade and industrial policy issues. First, while external trade tariffs have fallen sharply in Tanzania over the years and tariffs on trade with neighbors have been mainly eliminated through its membership in the East African Community Customs Union, non-tariff barriers (NTBs) remain major impediments to trade and business development in the EAC. In addition, poor transport infrastructure and the pattern of specialization of the involved countries severely limit regional exchanges. Finally, sectoral policies that affect trade in key commodities can have an important impact on poverty. These include food export bans and import quotas for rice and sugar, among others.

The most important trade partners of the country are in Asia and Europe. Trade with neighboring countries is growing but is still small, except perhaps for Kenya. Dar es Salaam port provides transit services for neighboring landlocked countries, but faces competition from Mombasa (Kenya), Durban (South Africa) and to a less extent Nacala (Mozambique) (see Figure 1).

Figure 1: Major trade corridors in East Africa



Understanding the agricultural sector is essential for estimating the poverty impact of the enhancement of the port of Dar es Salaam, as most families, and in particular most poor households, are involved in agriculture. Farming or livestock husbandry is the main occupation for the majority of the population in all regions except for Dar es Salaam and Mjini Magharibi. The main activity for 79.4% of the families in rural areas is farming, livestock husbandry or fishing, compared to 30.5% in urban areas (Tanzania, 2012).

In the agricultural sector, production is dominated by food crops and livestock. The main products include meat (US$783 million), bananas (US$711 million), dry beans (US$685 million), maize (US$668 million), milk (US$578 million), cassava (US$571 million) and rice (US$482 million). Tobacco, cotton and cashew were the largest cash crops for the export market (FAOStat, 2015).

Tanzania's three main import products in terms of value are wheat, oil palm, and refined sugar. The three products are mainly imported through Dar es Salaam port. However, as will be seen in the household data, these products do not account for a large share of the consumption basket of households under the national poverty line (mostly rural households). These products are more important for urban households, including those below the international poverty line of US$3 per day. Cost reductions from port improvements may not be passed to consumers of these three products, for a number of reasons. Imports of sugar are controlled by the Sugar Board of Tanzania, and the price is kept artificially high to encourage investments by local producers. Imports of wheat are dominated by one firm (SSB), which accounts for almost three quarters of the market. Palm oil competes with other sources of edible oil produced locally (sunflower, seeds, and cotton).

The main agricultural export products are coffee, tobacco, and cashew. Food crop exports are very low. Between 2000 and 2011, the configuration of Tanzania's top agricultural export items has not changed. Export growth has been important in the case of tobacco but disappointing for coffee and cashews. These are products that are exported with little domestic processing, and the required level of technology to produce them has not changed. The country could potentially increase its share in global markets for these and other cash crops, and a more efficient port could contribute to that.

5. The expected impact of the port project on trade flows and prices

This study assumes that the project's rearrangement of existing port infrastructure and improvements in administrative procedures would reduce border prices for bulk imports, and increase border prices for exports, by 5%. World Bank (2013) finds that the total cumulative cost of the delays and additional monetary costs for the Dar es Salaam port are equivalent to a tariff of about 5% on bulk imports. This figure was obtained by comparing the performance of Dar es Salaam with the port of Mombasa. The tariff equivalent was computed as the sum of the direct monetary costs, the cost of waiting at anchorage and the inventory cost, based on an average value of US$1,137 per ton for dry bulk imports. Interviews with several local stakeholders confirmed that this is a reasonable figure.

Estimating the impact on exports of port improvements is complicated. While an improvement in the efficiency of the port should increase the competitiveness of Tanzanian exports, producers in Tanzania face many constraints other than the inefficiencies of the port. According to the KPMG/World Bank (2013) "Pulse of the Tanzanian Economy" survey, the state of the port is a serious constraint for one third of the mid-size firms surveyed. In addition, 43% of the respondents cited corruption, followed by tax rates and regulations (29%) and access to finance (24%) as major constraints. Moreover, other surveys point to deficiencies in railways and road infrastructure, as well as unreliable energy supply, as important constraints on businesses. The lack of an adequately-educated force is also a severe constraint. Tanzania is ranked 131st out of 189 countries in *Doing Business 2015* (World Bank), somewhat better than position 145 in 2014.

To study the transmission of border prices to retail and farmgate prices, it is important to consider the level of competition in the value chains for the different products that are produced and traded in a country (Horn

and Levinshon, 2001; Porto et al., 2011; Swinnen and Vandeplas, 2010 and 2014). In Tanzania, international market conditions combine with domestic market configurations in shaping agriculture growth and poverty reduction. While the farming sector is composed mostly of smallholders, the lower layers of the value chains are usually dominated by a small number of firms. Farmers may suffer from the non-competitive behavior of other agents along the chain, or be constrained from selling output in markets because transport and other services are not available or are too costly.

This study uses a model developed by Depetris-Chauvin et al. (2017) to estimate the impact of the enhancement of the port of Dar es Salaam on poverty. This model explains the allocation of factors of production to various cash and food crops and how this allocation depends on competition along the supply chain and on the constraints faced by different types of farmers. The model describes the behavior of farms, exporters and importers in a simple partial equilibrium setting. There are different versions of the model to deal with the three basic scenarios that we face in our empirical work. That is, a first version of the model explores the case of cash crop production (mostly for exports). In the case of exported cash crops, farmers sell products to oligopsonies, which then undertake the international trading. This version can be used to study crops such as cotton, coffee, tea, tobacco, cacao, vanilla, etc. This model is then adapted to deal with the case of a country that is a net exporter of a food crop. In this case, there are oligopsonies in charge of exports, but there is also a domestic residual market of net-consumers of that crop. Food crop exports can include any relevant crop in a particular country, namely maize, rice, fish, livestock, etc. Finally, a different version of the model is developed for the case of a country that is a net importer of a food crop whereby excess demand is met via international trade, and net-consumers must purchase these agricultural goods from oligopolies. The three versions of the model share common elements, such as the structure of utility, the constraints on production and the market structure, but differ in the way the models are solved to account for exportable and importable prices.

The model traces how the allocation of factors of production to various cash and food crops depends on competition along the supply chain and on the constraints faced by different types of farmers. Farmers choose how to allocate their resources (land, labor) to the production of subsistence food for their own consumption, production of marketable food surplus, or production of cash crops for exports.[6] These activities offer different prices and entail different production costs. In equilibrium, because of risk and food security issues, all farmers produce for their own consumption. However, depending on farm-gate prices, costs, and other constraints (such as infrastructure, transport costs, risks), some farmers specialize in food production altogether, while others devote some resources to export products. We develop a game-theory model of supply chains in cash crop agriculture, where market structure is characterized by many smallholders and a few exporters. These exporters buy raw inputs from the farmers and sell them (perhaps after some processing) in international markets at given prices. Firms enjoy oligopsony power internally and set farm-gate prices.

The oligopsony game delivers the equilibrium farm-gate prices that the firms offer to farmers. In setting these prices, each exporter takes into account its own characteristics, the characteristics of other exporters, and the endogenous responses of the farmers (which in turn affect food and cash crop production). Once the equilibrium of the model is found, it is possible to perform comparative static exercises to study how farm-gate prices depend on various parameters of the economy, including the degree of imperfect competition and competition policies, household costs and constraints, and so on. In this study, the model is used to study how changes in border prices from a reduction in the cost of using the port affect domestic prices for a given level of market structure, based on key parameters that capture various household constraints and institutional access.

A 5% reduction in the implicit tax imposed by the port inefficiencies will increase the price of exportable crops (Table 1, first half). Farmers producing cotton receive 9.41% more for their cash crop in the current scenario

[6] The agricultural household model is based on the well-known models of Barnum and Squire (1979), Singh, Squire and Strauss (1986), de Janvry, Fafchamps, and Sadoulet (1991), Benjamin (1992), and Taylor and Adelman (2003).

Table 1: Effect of increased efficiency of Dar es Salaam Port on farm gate and retail prices

	Baseline	Perfect Competition
Increase of 5% in:		
Border Price for cotton	9.41	20.45
Border Price for cassava	5.79	6.89
Reduction of 5% in:		
Border Price for rice	-4.42	-4.12
Border Price for maize	-4.21	-4.33
Border Price for dairy	-3.80	-2.62
Border Price for wheat	-2.07	-16.39

Source: Model simulations.
Note: Figures denote percentage change.

but could receive up to 20.45% more if there were more competition in the supply chains for cotton. This estimation of the pass through is very high and takes into account the supply responses of the farmers in equilibrium. However, the supply response to an increase in the price of cotton and most other agricultural products is limited because of the many constraints affecting farmers in Tanzania. The impact on cassava farmgate prices is smaller than for cotton. This is because foreign markets play a very small role in cassava with most of the production consumed locally, often as own consumption or informally traded. Processors in cassava are very competitive, so the results for the simulation assuming perfect competition are similar to the baseline.

The price reductions for four imported food products are not fully transmitted to the domestic economy (second part of Table 1). For wheat, where imports are concentrated among a few importers and local production is a very small fraction of domestic consumption, more than half of the price reduction is captured by the importers. However, in the extreme case of perfect competition, the local price of wheat could fall more than 16% following a 5% reduction in border prices. The pass through to local consumers for dairy products, rice, and maize is less than 100%, but nevertheless significant. In these sectors local production satisfies a large share of the local demand, with imports being in most cases residual. In the three sectors there is already a healthy level of competition, so the results for simulations assuming perfect competition are not significantly different from the results for the status quo.

These results are more relevant for Dar es Salaam and neighboring regions than for the whole country. Infrastructure and logistics in Tanzania are poor, even by African standards. While Dar es Salaam has connections to all inland regions and neighboring countries through a series of trunk and regional roads, and in some cases railways and lake ferries, the state of the infrastructure is deficient. Most regions have very low densities of roads, and unpaved roads are not exploitable during the rainy season (Iimi et al., 2015). Thus, the degree of geographical market segmentation is likely very high in Tanzania. Moreover, according to the National Sample Census of Agriculture 2007/2008, the prices of otherwise homogenous goods differ by up to 50% between regions. For perishable goods the differences can be even higher, 400% in the case of milk. This confirms a high level of market segmentation within Tanzania, so that port modernization is likely to have little short-term significant impact on regions distant from Dar es Salaam, including the neighboring land-locked countries.

The methodological framework presented above does not take into account the impact of changes in prices caused by trade policy and trade facilitation on wages, for example in expanding sectors vis-à-vis contracting sectors. Also, the impact on the wages of skilled workers may differ from that on the wages of unskilled workers. Unfortunately, data required to estimate the wage impact were not available for this study. As the poverty profile in next section will show, wages actually make up only 16.2% of Tanzanian households total income, much lower in rural areas (8.9%) than in urban areas (47.7%).

6. Poverty profile of Tanzania

While poverty rates have fallen over the last 15 years, poverty remains high in Tanzania. Roughly 90% of the population live on less than three US$3 a day at 2005 PPP (2008/2009 Tanzania National Panel Survey). Poverty is more common in rural than in urban areas: using the national poverty line, one third of the households in rural areas live in poverty and approximately 90% of Tanzania's poor people live in rural areas.[7]

The household survey provides detailed information on income and consumption patterns, which are used in identifying the potential welfare effect of trade. For rural households, cash expenditures account for 59.2% of the total budget, while own consumption accounted for the remaining 40.8% (Table 2). By contrast, 93.9% of urban households' expenditures is cash spending. At the national level, 65.4% of households' budgets is allocated to food. This share is larger for rural households (69.6%) than for urban households (50.9%), because incomes are higher among urban households, who thus spend more on other goods and services than on food. Maize accounts for the largest share of household food consumption. On average, maize represents 15.7% of Tanzania's household expenditure (17.7% of rural expenditure and 8.6% of urban expenditure). Rice accounts for 4.8% of the budget, with slightly higher shares among urban households. Cassava accounts for 4.8% of expenditures in rural areas and for only 1.1% in urban areas.

Rural households' income comes mostly from own consumption, while cash income makes up only 32.4% of income (of which sales of agricultural products account for 16.9% points and wages 8.9% points) (Table 3). By

Table 2: Budget shares

Tanzania	Total	Rural	Urban
Total consumption per capita	**100.0**	**100.0**	**100.0**
Expenditures	66.9	59.2	93.9
Food	32.3	28.8	44.8
Manufactures	15.2	14.7	16.8
Services	19.4	15.7	32.3
Other	0.0	0.0	0.0
Own-consumption	33.1	40.8	6.1
Own-consumption food	33.1	40.8	6.1
Own-consumption other	0.0	0.0	0.0
Total food consumption	**65.4**	**69.6**	**50.9**
Total crops	39.4	43.2	26.2
Maize	15.7	17.7	8.6
Rice	4.8	4.4	6.4
Livestock	5.9	6.1	5.1
Cassava	3.9	4.8	1.1
Cowpea	4.4	4.9	2.7
Yam	0.3	0.3	0.1
Wheat	1.0	1.0	1.2
Groundnut	1.5	1.8	0.4
Sweet potato	1.9	2.3	0.5
Milk	1.9	2.1	1.1

Source: Tanzania National Panel Survey (2008/2009).

[7] The household data for our analysis come from the 2008/2009 Tanzania National Panel Survey. The dataset contains information on 3280 households. The sample is representative at the national level but not for each region. Thus, the study can only distinguish impacts between urban and rural areas but not among regions.

contrast, cash accounts for 78.4% of total income of urban households. Of that 78.4%, wage income accounts for 47.7% age points and enterprise (mostly informal) income 20.2% age points. Maize represents 20.7% of rural household income and 7.4% of urban household income. Rice (4.5%), livestock and milk (5.6 and 3.9%) and cassava (6.4%) are also important sources of income in rural areas, but not so much in urban areas. While important as a source of export revenue, cash crops such as coffee, tea, cotton, tobacco, and groundnuts do not on average generate a large share of income for Tanzanian households. This is because in general, smallholder farmers prefer food crops and when they do produce cash crops, they do not specialize. The data also shows that except for cotton, cash crops for the export market are mostly produced by farmers in households with incomes above the national poverty line.

7. The poverty impact of the port improvement

This section presents a discussion of the poverty impacts of the simulation results from section 5. It distinguishes three different levels of livelihood. Households below the poverty line in the National Panel Survey (NPS) are defined as poor, households above the NPS poverty line but below the US$3 a day (PPP) as vulnerable, and households above the US$3 a day line as non-poor. The analysis is done using the first order approximation analysis of Deaton (1989, 1997), which implies that the impact of a price change can be approximated using income shares and budget shares as measures of exposure.

The welfare impacts of the price changes from the port project are reported in Table 4 for six important cash and food crops in Tanzania. The Table reports average

Table 3: Income shares

Tanzania	Total	Rural	Urban
Total income per capita	**100.0**	**100.0**	**100.0**
Incomes	41.1	32.4	78.4
Food (agriculture)	15.1	16.9	7.2
Wage	16.2	8.9	47.7
Enterprises	8.0	5.2	20.2
Transfers	1.8	1.4	3.3
Own-consumption	58.9	67.6	21.6
Own-consumption food	58.9	67.6	21.6
Own-consumption other	0.0	0.0	0.0
Total food income and AC	**74.0**	**84.5**	**28.8**
Total crops	49.2	56.6	17.0
Maize	18.2	20.7	7.4
Rice	4.0	4.5	1.6
Livestock	5.0	5.6	2.4
Cassava	5.4	6.4	1.1
Cowpea	4.4	5.2	1.2
Yam	0.4	0.5	0.0
Wheat	0.8	1.0	0.0
Groundnut	2.6	3.0	1.2
Sweet potato	2.8	3.3	0.2
Cotton	1.4	1.7	0.2
Tobacco	0.7	0.9	0.0
Milk	3.5	3.9	1.6

Source: Tanzania National Panel Survey (2008).

results for the total population, the poor, the vulnerable, and the non-poor, for rural households and for those households that are producers of the crop for which the price changes. The tables show, for each demographic group, changes in the monetary income, expenditure and welfare attributed to each crop.

The income effects of price changes as a result of port modernization vary by commodity. The largest change in income is generated by the rise in the price of cotton, as total household income increases by 1.4% and the income of producer households by 17.1%. One reason is that raw cotton is only produced and not consumed directly by households, so affected households can only benefit from the price rise. By contrast, all income groups are on average net consumers of rice, maize, cassava, and wheat, so they will benefit from price reductions (cheaper imports) and will be hurt by price increases (more expensive exportable food crops). The opposite is true for households that are net producers. While on average households are net consumers of milk, in rural areas households are net producers.

For most crops, shocks, and affected populations, the welfare impacts of the simulations are less than 1% of total household expenditures. The only exception is the impact on cotton producers. These results are expected, given the nature of the exercise considered here, and they are comparable to other results in the literature on the topic (Lederman and Porto, 2013).

The results also point to the distributional impact of the port improvements. First, urban households benefit more than rural households do from cheaper imported food crops. This is expected, as urban households are mostly consumers of food while rural households are both consumers and producers. Moreover, monetary expenditures on food are typically higher for urban households, as an important share of the food consumed in rural areas is home produced, particularly among the poorest households. While the study does not take into account explicitly the reduction in cost of containerized imports, it is likely that this will benefit urban households more than rural ones, as urban households' propensity to consume imported manufactured goods is larger. The poor and the vulnerable benefit from the decrease in the prices of maize, rice, dairy and wheat and from the increase in the price of cotton, and are only hurt by the increase in the price of cassava. Overall, the poor and the vulnerable as a whole are likely to benefit from the improvements in the port. From the simulations it is hard to predict whether urban or rural poor will benefit most. However, given the high degree of market segmentation within Tanzania, it is likely that the poor and vulnerable households around Dar es Salaam will benefit the most. Finally, it is not clear whether poor, vulnerable or non-poor households would benefit more. However, the structure of Tanzania's imports and the structure of consumption of poor and non-poor households suggests that the reform will favor non-poor or vulnerable households more than those with incomes below the national poverty line.

Given the high degree of market segmentation within Tanzania, it is likely that the poor and vulnerable households around Dar es Salaam will benefit the most from port improvements.

Table 4: Welfare impact of port improvement (Baseline Scenario)

	Income	Expenditure	Welfare		Income	Expenditure	Welfare
Maize				Wheat			
Total	0.82	6.31	0.23	Total	0.02	0.49	0.01
Poor	0.69	4.29	0.15	Poor	0.02	0.57	0.01
Vulnerable	1.28	10.13	0.37	Vulnerable	0.02	0.42	0.01
Non poor	0.80	8.20	0.31	Non poor	0.01	0.32	0.01
Rural	0.98	6.01	0.21	Rural	0.03	0.31	0.01
Rural poor	0.91	3.79	0.12	Rural poor	0.03	0.31	0.01
Rural vulnerable	1.10	9.78	0.37	Rural vulnerable	0.03	0.31	0.01
Rural non poor	1.02	8.11	0.30	Rural non poor	0.02	0.31	0.01
Producers	4.99	3.66	-0.06	Producers	4.25	0.37	-0.08
Rice				Cotton			
Total	0.79	3.30	0.11	Total	1.40	0.00	0.13
Poor	0.66	4.00	0.15	Poor	1.65	0.00	0.16
Vulnerable	0.82	3.42	0.11	Vulnerable	1.33	0.00	0.12
Non poor	1.10	2.11	0.04	Non poor	0.23	0.00	0.02
Rural	0.93	2.45	0.07	Rural	1.71	0.00	0.16
Rural poor	0.83	2.90	0.09	Rural poor	1.89	0.00	0.18
Rural vulnerable	0.92	3.02	0.09	Rural vulnerable	1.66	0.00	0.16
Rural non poor	1.09	1.71	0.03	Rural non poor	0.45	0.00	0.04
Producers	11.45	1.07	-0.46	Producers	17.09	0.00	1.61
Cassava				Dairy			
Total	0.02	1.01	-0.06	Total	0.49	0.59	0.00
Poor	0.01	0.55	-0.03	Poor	0.55	0.70	0.01
Vulnerable	0.03	1.14	-0.06	Vulnerable	0.47	0.57	0.00
Non poor	0.05	1.65	-0.09	Non poor	0.36	0.39	0.00
Rural	0.03	1.04	-0.06	Rural	0.54	0.48	0.00
Rural poor	0.01	0.49	-0.03	Rural poor	0.63	0.54	0.00
Rural vulnerable	0.04	1.21	-0.07	Rural vulnerable	0.58	0.52	0.00
Rural non poor	0.05	1.50	-0.08	Rural non poor	0.40	0.42	0.00
Producers	6.88	0.05	0.40	Producers	12.79	0.23	-0.48

Note: Figures denote percentage change.

One argument of why the poor could benefit from the port reform and trade in general (World Bank, 2013) is through improved access to cheaper inputs, tools, and materials. For instance, rural poor would benefit from cheaper fertilizers and urban poor from cheaper construction materials. However, these effects are likely to be limited in Tanzania. Fertilizer is at the moment only imported, and in 2013/2014 the two largest companies (Yara and Premium Agro) accounted for 56% of the market (the five largest companies had 98.1 %). It is unlikely that they would pass much of the savings from lower fertilizer prices to farmers, as the recently-cancelled fertilizer subsidy program showed. Moreover, the fertilizer adoption rate among poor farmers is almost zero, as fertilizer is in general used by well off, medium-size farmers producing cash crops for the export market. In the case of construction material, besides the protection of the local cement industry, imports of clinker are also concentrated with one company (Maweni Limestone) accounting for 68.8% of the market. Most of this imported construction material is used in urban areas and therefore will not benefit much the households under the poverty line (92% are based in rural areas) but may benefit vulnerable urban households (incomes above the poverty line but less than US$3 a day).

8. Conclusions

This contribution assesses the poverty impact of proposed improvements to the Dar es Salaam Port. Currently, the port suffers from several infrastructure and operational deficiencies that increase the cost both for imported and exported goods. These costs partially reflect port congestion, where the situation is more critical for imports than for exports. These inefficiencies act as an implicit tax on imports and to a lesser extent as a tax on exports. An improvement in the operations of the port could reduce border prices up to 5% for bulk cargo.

The simulations of the short-term effect on selected bulk goods show that the pass through from border prices to retail and farm gate prices will be less than a 100%, limiting the potential impact of cheaper imports. This is due partially to importers' market power, which enables them to capture some of the cost saving. The effect of the port improvement would be geographically concentrated in Dar es Salaam, as inadequate roads and railways result in a high level of market segmentation.

The short-term impact on poverty of the port improvements is positive, albeit small. However, the reduction in poverty may be accompanied by an increase in inequality, as non-poor households are expected to benefit proportionally more than the poor and vulnerable ones. In the long run, a better functioning port could more significantly reduce rural poverty and raise agricultural productivity if complementary policies and infrastructure improvements (particularly for inland transport) were adopted to improve access of the poor to export opportunities and to cheaper imported food, tools and inputs.

The study does not consider the effect of the port project on wages. In general, in the short run, increased trade reduces wages in import-competing sectors and increases wages in export sectors. The port improvements are likely to increase imports but have little effect on exports in the short run. In the long run, cheaper manufactured imports may negatively affect the development of some labor-intensive manufactures, and this sector can have a positive impact on poverty reduction. However, more work is needed to understand this effect, especially given the very fast process of urbanization taking place in Tanzania. Besides the concrete impact on poverty and inequality, it also would be important to estimate the efficiency gains from the port improvements, and develop metrics that allow us to quantify any possible trade-off between efficiency gains and inequality or poverty.

Finally, beyond the concrete findings of this study, it is important to note that international trade has undoubtedly greatly contributed to the growth performance of Tanzania in the last ten years. While this high growth has not translated in drastic reductions in poverty for many reasons (Atkinson and Lugo, 2010), trade has contributed to the steady reduction in the poverty headcount and the poverty gap. The impressive growth in trade and the inadequate investments to keep up with this growth are why the port is currently suffering from severe congestion. Failure to significantly improve port operations could severely constrain Tanzania's exports and imports, jeopardizing one of the engines of growth and poverty reduction of the country.

References

Artuc, E., D. Lederman, and G. Porto (2015). "A Mapping of Labor Mobility Costs in the Developing World," *Journal of International Economics* 95(1), pp. 28-41.

Artuc, E., and G. Porto (2016). Global Labor Market Frictions and The Dynamics of the Gains from Trade. Work in Progress.

Atkinson, A., and M. Lugo (2010). Growth, poverty and distribution in Tanzania. Working Paper 10/0831. International Growth Centre.

Barnum, H., and L. Squire (1979). "A model of an Agricultural Household. Theory and Evidence," World Bank Occasional Papers No 27.

Benjamin, D. (1992). "Household Composition, Labor Markets, and Labor Demand: Testing for Separation in Agricultural Household Models," *Econometrica* 60, No.2, pp. 287–322.

de Janvry, A., M. Fafchamps, and E. Sadoulet (1991). "Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained," *Economic Journal* 101, pp. 1400–1417.

Deaton, A. (1989). Rice Prices and Income Distribution in Thailand: a Non-parametric Analysis. *Economic Journal* 99 (Supplement), pp. 1-37.

Deaton, A. (1997). *The Analysis of Household Surveys - A Microeconometric Approach to Development Policy.* Baltimore: Johns Hopkins Press.

Dix-Carneiro, R. (2014). "Trade Liberalization and Labor Market Dynamics," *Econometrics.*

Depetris-Chauvin, N., G. Porto, and F. Mulangu (2017). *Agricultural Supply Chains, Growth and Poverty in Sub-Saharan Africa: Market Structure, Farm Constraints and Grass-root Institutions.* Springer.

Food and Agriculture Organization of the United Nations (2015). FAOSTAT statistics database.

Horn, H. and J. Levinsohn (2001). "Merger Policies and Trade Liberalisation," *Economic Journal* 111, pp. 244–277.

Iimi, A., R. Humphreys and S. Melibaeva (2015) Firms? Locational Choice and Infrastructure Development in Tanzania: Instrumental Variable Spatial Autoregressive Model. World Bank Policy Research Working Paper No. 7305.

KPMG/World Bank (2013): "Pulse of the Tanzanian Economy." Survey.

Lederman, D. and G. Porto (2014). The Price is Not Always Right: On the Impacts of (Commodity) Prices on Households (and Countries). World Bank Policy Research Working Paper No. 6858.

Morisset, J. (2013). Tanzania economic update: opening the gates : how the port of Dar es Salaam can transform Tanzania. Tanzania economic update; issue no. 3. Washington DC ; World Bank.

Porto, G., N. Depetris-Chauvin, and M. Olarreaga (2011). Supply Chains in Export Agriculture, Competition, and Poverty in Sub-Saharan Africa. The World Bank and Centre for Economic Policy Research.

Singh, I., L. Squire, and J. Strauss, eds. (1986). Agricultural Household Models: Extensions, Applications and Policy. Baltimore, Johns Hopkins Press for the World Bank.

Swinnen, J., and A. Vandeplas (2010). "Market Power and Rents in Global Supply Chains," *Agricultural Economics* 41, pp. 109–120.

Swinnen, J., and A. Vandeplas (2014). "Price Transmission and Market Power in Modern Agricultural Value Chains," LICOS Discussion Paper #347/2014.

Tanzania (2012). Population and Housing Census of 2012. National Bureau of Statistics.

Taylor, E. and H. Adelman (2003). "Agricultural Household Models: Genesis, Evolution and Extensions," *Review of Economics of the Household* 1(1).

World Bank (2013). Tanzania Economic Update: Opening the Gates - How the Port of Dar es Salaam Can Transform. Tanzania economic update, Issue no. 3. Washington DC. World Bank.

World Bank and World Trade Organization (2015). "The Role of Trade in Ending Poverty". Washington DC: World Bank.

Agricultural Logistics in Lagging Regions: Evidence from Uganda

Charles Kunaka, Macroeconomics, Trade and Investment Global Practice, World Bank

1. Introduction

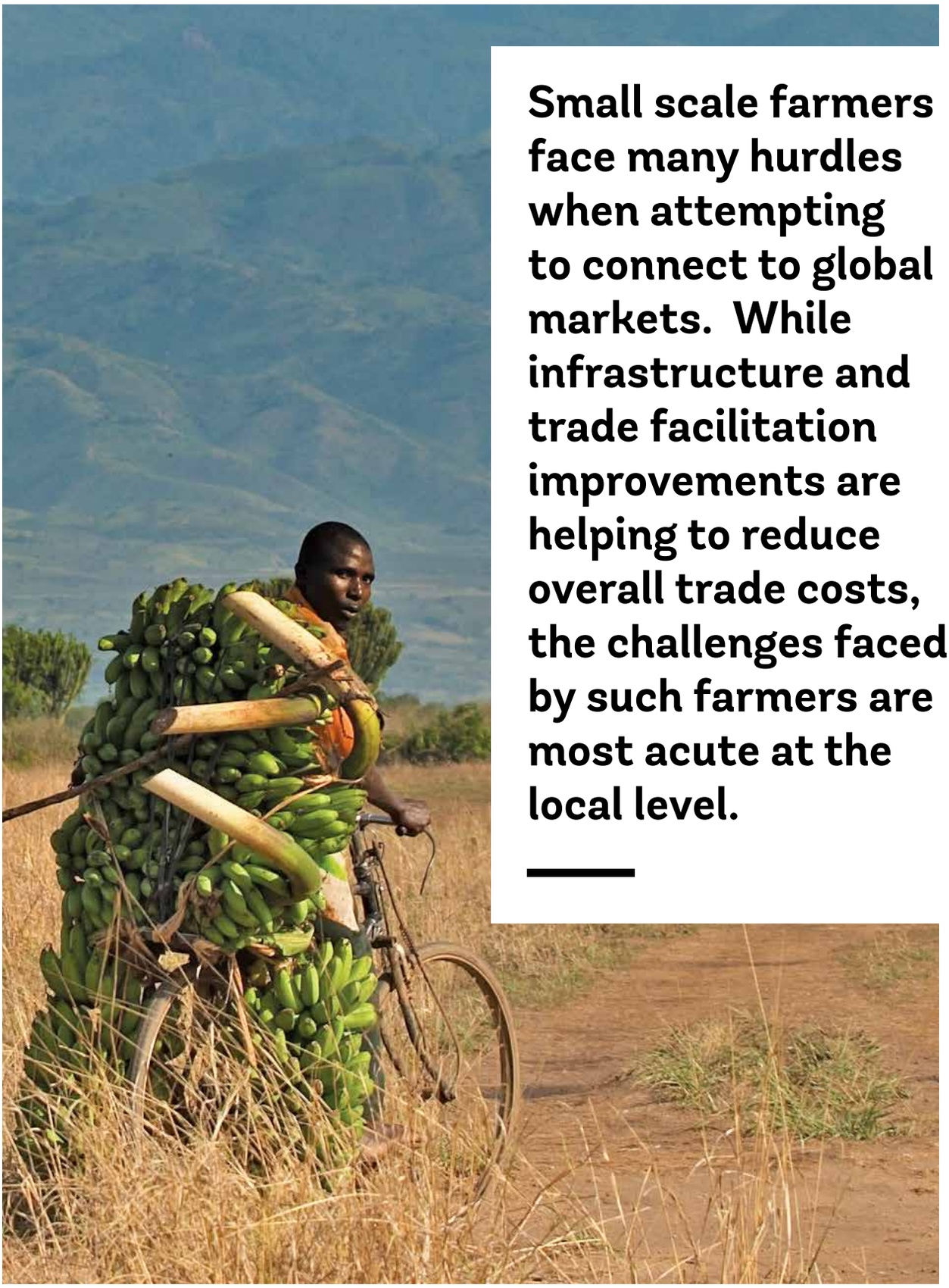
Small scale farmers face many hurdles when attempting to connect to global markets. While infrastructure and trade facilitation improvements are helping to reduce overall trade costs, the challenges faced by such farmers are most acute at the local level. Efforts to eradicate poverty therefore need to start with constraints at the farmgate. The problems faced are compounded by the general lack access to proper agricultural inputs, technology and intermediate services.

However, in the research on market access there has not been much attention paid to the needs of poor areas within countries and the constraints faced by small producers in isolated regions to reach domestic and international markets. A few studies, such as Raballand et al. (2010) and Kunaka (2010), applied micro-level analysis by looking at the relationship between road infrastructure and road transport and the access of small producers to markets. The present paper aims to contribute to this growing knowledge base by exploring measures to lower costs to market for producers in areas that can be characterized as lagging.[1] It underscores policies and factors that favor the development of logistic services and enable small scale producers in remote regions to improve their access to markets in support of strategies for inclusive growth, cross-border regional trade in staple foods, and regional cooperation in trade and transport infrastructure development.

The economies of lagging regions are typically dominated by trade in agricultural products, which have a high elasticity to logistics costs. Rural connectivity is defined as the "degree to which rural dwellers can take advantage of their access to infrastructure, services, and markets to pursue economic opportunities" (World Bank, 2014). It is important to identify options for governments and the private sector to contribute to reductions in trade costs, by implementing interventions to broaden access to logistics services at the sub-national or regional level, in order to expand the participation of remote regions in domestic and global supply chains.

Stifel and Minten (2008) claim that the positive correlation between poverty and isolation is driven by high transportation costs. In turn, high costs have typically been linked either to a lack of passable roads and/or lack of transportation services. Casaburi et al. (2013) find that improvements to rural roads reduce the market prices of local crops; the effects are stronger in markets that are further from major urban centers and in less productive areas. In addition, Gollin and Rogerson (2010) look at the link between transport costs and the size of the quasi-subsistence sector in Uganda and conclude that the high dispersion of prices across geographic space reflects underlying transportation costs that prevent any

[1] The approach should be applicable generally to logistics analysis at a sub-national scale in both leading and lagging regions.



Small scale farmers face many hurdles when attempting to connect to global markets. While infrastructure and trade facilitation improvements are helping to reduce overall trade costs, the challenges faced by such farmers are most acute at the local level.

arbitrage between regions. Also in Uganda, Raballand et al. (2009) find that after a certain threshold of access to rural road infrastructure is met, the effects of additional investments are not only empirically unclear, but also probably economically unsustainable considering the low volumes generated by smallholder farming production systems. Moreover, in order to have affordable road freight services—where competition is achieved—consolidation and the use of ICT are probably needed.

Proximity to markets is seemingly a key factor in farming outcomes. For instance, agricultural production and proximity to urban markets in Sub-Saharan Africa are highly correlated (Dorosh, Wang and You, 2008). Moreover, about 60% of total crop production in Sub-Saharan Africa, but only about 40% of the population, is between 2 and 9 hours away from a market. Also, the adoption of high-input technology, such as modern seeds and fertilisers, is negatively correlated with travel time to urban markets.

Minten et al. (2013) find that in Ethiopia transaction and transportation costs together add between 20% (for the least remote farmers) and more than 50% (for the most remote farmers) to the fertilizer prices charged at the input distribution center. The authors also suggest that farmers who live about 10 km from the distribution center face per unit transaction and transportation costs as large as the costs needed to bring the fertilizer from the international port to the input distribution center (about 1,000 km). These effects might partly explain the low modern input adoption rates in parts of Ethiopia.

Raballand et al. (2009) find that transport of small loads by truck in Uganda is 10 times more expensive per kilometer than movement by bicycle or motorcycle. The typical small-scale farmer in the study produces on average between 40 kg to 3 tons of agricultural goods per year and thus are able to transport their product mainly by bicycle or motorcycle. Transport by truck only becomes profitable for loads of at least 500 kg of product per trip that are transported no fewer than 50 km (DFID, 2005). At the current production levels, a consolidation center (warehouse) would be needed to collect the production of at least 600 farmers.

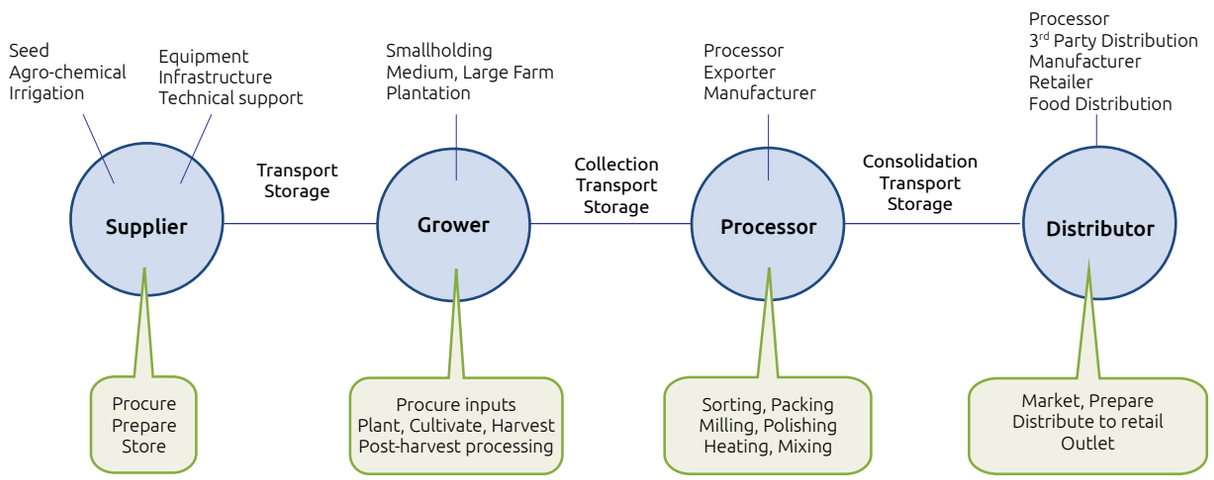
Earlier work by Kunaka (2010), Raballand et al. (2010) and Farole (2013) point to the importance of consolidating volumes to reducing unit logistics costs in lagging regions, which would extend the distances farmers are able to trade. Typically, costs are highest at the local level (first mile), as that is where volumes are smallest and costs per unit highest. As such, supply chains in thin markets tend to have a cascading pattern of consolidation and value addition to reduce the ratio of costs to volume and cost to value. Consequently, products pass through several logistics nodes, which can add to costs and transit times, as well as affect overall system reliability. Analysis of logistics services therefore should consider: (i) the location and availability of core logistics infrastructure such as transport, handling and storage facilities that influence the direction and concentration of trade flows; (ii) the availability and cost of services linking different points of production to domestic, regional and global markets; and (iii) the interactions between logistics players who intermediate the physical movement of products.

Based on the evidence, it can be argued that the performance of logistics systems in lagging regions is a function of the interaction of different systems, rooted in various types of networks: physical, social, financial, and information, among others. However, there is great coincidence in the social, financial and information networks such that they can be conveniently combined into one sub-system of supply chain organization. So, ultimately, we can view the system as comprised of two main models: one that represents the physical movement of goods through physical networks defined by physical transport and logistics infrastructure and a second one that represents the relationships between shippers, logistics actors, processors and exporters of goods. This paper aims to explore the interactions between the two and propose measures that may be taken to reduce the isolation from markets of farmers in lagging regions.

2. Organization of agricultural supply chains in thin markets

To properly account for the distribution of rents in agricultural supply chains in lagging regions, it is important to identify the main actors in the chains (Figure

Figure 1: Generalized structure of agricultural supply chains



Source: Kunaka, Saslavsky and Watanuki, 2015.

1). A distinguishing characteristic of agricultural supply chains in lagging regions is that the products are handled multiple times between point of production and the market. This poses several challenges, including lengthy time to market which leads to product losses; mixing of the produce of different farmers, which compromises quality and reduces opportunities to sell to more selective and premium markets; and inability to achieve economies of scale, which leads to high costs. Tracing the path of movement of product must start at the farm-gate and include the primary stages of marketing as well as midstream segments of the supply chains.

The main categories of actors along the agricultural supply chains in lagging regions are:

- **Growers:** They range in size from smallholders to plantations. Each has different linkages to the supply chain. The smallholders deliver their crops to collection points where the crops are aggregated prior to processing. The medium-to-large farms deliver directly to the processor, while the largest farms and plantations often process their own crops.

  The early steps in the process of selling produce, which consist of a combination of on-farm and local transport, tend to be the more costly and difficult part of the journey, often conducted on infrastructure with no clear ownership structure.[2] Rural freight transport ends for the farmer at the buying point near the road side or at rural hubs, both serving as nodes for the intermodal transfer of cargos. Rural hubs may have a special function, crucial for the development of the whole area.

- **Traders:** In areas with small volumes of production the main choice available to producers in thin markets is to sell through traders. Fafchamps and Hill (2005) find that in Uganda the likelihood of selling to the market increases with quantity sold and proximity to the market. They also find that the number of itinerant traders who tour the countryside in search of coffee rises when the price increases. Their purchase prices do not increase proportionately to their sale prices to established trader-millers, suggesting that they take advantage of farmer's ignorance about price movements.

[2] Much of the infrastructure tends to be rudimentary, consisting of pedestrian paths or tracks used by animal drawn carts.

- **Processors:** They add value to the crop supplied by the grower. There is usually a series of processes involved in converting the crop into final products for sale to the consumer. These can be categorized according to the extent of processing, as shown in Table 1.
- **Distributors and Retailers:** The structure of the food distribution chain is increasingly determined by modern food retailing in the form of supermarkets and large retail chains for food and food services. They establish a demand-driven relationship with the distributors, and often also the processors. Supermarket chains have dominated food retailing in developed countries for about 50 years but only began to appear in developing countries in the 1990s, largely as a result of foreign investment from Europe, Japan and the United States, and in Africa from South Africa. In general, their influence in Uganda is still nascent though Kenyan and South African supermarket chains have been making inroads. While supermarkets in Kenya account for about 20% of urban food sales, this percentage is estimated at approximately 1% for Uganda (Evers et al., 2014; Neven and Reardon, 2006a; Tschirley, 2010).

The level of integration between the grower and processor in the food supply chain depends on physical characteristics of the crop, the type of processing and the market for the goods produced. The two utilize different logistics service providers who may provide transport, storage and other services. If the crop has a short shelf life, then the supply chain must be tightly integrated and the harvesting of the crop must be spread out over as long a period as possible to reduce peak demand for processing capacity. On the other hand, if the crop has a relatively long shelf life and the inputs for the processor can be supplied from inventory, then there is less demand for integration between the grower and processor.

Two ways that market integration can be enhanced, with important implications for farmer outcomes, is through cooperatives and contract farming arrangements.

2.1 Cooperatives and producer associations

Cooperatives have a long history in the farming sector. They typically play an important role in how farmers are organized to pursue common interests. Generally, cooperatives have twin objectives, to minimize transaction costs and increase value for members by managing some of the downstream processes such as packaging, storage and marketing. When producers own and control the chain, they are in a better position to maximize returns for farmers and to avoid being restricted to their closest markets.

These organizations offer several benefits to smallholders, including:

- Obtaining inputs, services and/or assisting in marketing outputs by offering significant scale economies;
- Helping farmers manage post-harvest processing, by achieving scale economies in the required capital investment;
- Assisting farmers to access finance and applying peer pressure as a mechanism for enforcement of financial obligations; and

Table 1: Food processing activities

Package	Preserve	Transform
Chilled	Frozen	Freeze dried
Washed	Pressed	Distilled
Separate, Sort	Pasteurized	Sterilized/Cultured
Dried	Heated/Smoked	Roasted
Gutted, Scaled	Sliced/Ground	Cooked
Pack	Bottled	Canned, Sealed
	Hulled/Polished	

Source: Kunaka, Saslavsky and Watanuki, 2015.

- Facilitating logistics for distribution of inputs and collection of outputs.

2.2 Contract farming

Contract farming arrangements for smallholders have attracted considerable interest in the last few years throughout Africa, in part due to concerns that farmers are not capturing enough value from exports or domestic sales (Hazell et al.. 2007). Contract farming is often seen as an alternative means of tackling suboptimal investment and other market failures, since this mechanism fosters economies of scale, thus reducing transaction costs (Dorward et al., 2004). Some authors find robust evidence directly linking contract farming with increased farmer income in developing countries (Kirsten and Sartorius, 2002). Nonetheless, others doubt that contract farming schemes generate sustainable income benefits for participants or improve rural inequality (Kirsten and Sartorius, 2002; Raynolds, 2002).

Despite the seemingly positive relationship between contract farming participation and crop income, contractual problems have appeared between outgrowers[3] and large agribusiness firms, resulting in market exit of smallholders. The contractual problems are probably often magnified by inadequate quality and enforcement of legal frameworks for contracts (Wiegratz et al., 2007).

The type of contract used depends on the type or variety of crop, the method of cultivation, and the availability of appropriate inputs including seed, agrochemicals, credit and technical assistance.

Policies towards agricultural development, trade and competitiveness, infrastructure and research, and macroeconomics have a significant impact on the potential for contract farming. Government can support contract farming by encouraging direct linkages between farmers and the organized food supply chain processors. Government also can create a favorable environment for the development of food supply chains through liberalization of trade in agricultural products, restricting government involvement in this trade and

allowing foreign investment in the sector. Improvements in infrastructure are important for the efficiency and competitiveness of the agricultural sector. Agricultural research is necessary to support the introduction of new varieties and types of crops. All of these measures, combined with dissemination of information through improved communications infrastructure, would help growers to become more competitive.

These policy improvements would benefit the agricultural sector as a whole, not just contract farming. Specific areas in which government can benefit contract farming include support for outgrower schemes, similar arrangements for supporting the organization of smallholdings, and strengthening financial and legal regulations for contracts. The latter should be relatively light since the strength of contract farming lies in the use of self-enforcing agreements.

Agricultural supply chains in lagging regions therefore involve several actors. Their level of integration, either forced by market requirements, through voluntary association or contractual relationships can have significant impacts on economic outcomes for farmers. The remainder of this paper explores these issues in the specific case of Uganda and runs some experiments to test outcomes under different scenarios.

[3] In this context an outgrower is farmer who is in a contractual partnership with a larger farmer or company to produce specific products.

3. Case Study: Trade in fresh produce in Uganda

Agriculture is the most important sector of the Ugandan economy, contributing up to 26% of GDP and over 70% of exports.[4] Downstream industries are especially dependent on agriculture: food processing alone accounts for up to 40% of total manufacturing. While the economy of Uganda has been growing strongly over the past two decades, at an average of over 7% p.a., growth has been uneven. Partly driven by the uneven reduction in poverty and persistent inequality, the authorities have introduced new programs, including the "Rural Development Strategy," and "Prosperity for All"[5] with the aim of raising rural incomes and reducing the income gap.

According to Bolwig (2012), the Ugandan agricultural market structure is divided into three major groups: subsistence and small scale, medium, and large farmers. Agricultural production is dominated by small-scale farmers, consisting of approximately 2.5 million households (or 90% of the farming community), the majority of which owns less than 2 acres of land each.

Due to its tropical location, Uganda is endowed with a wide variety of fruits, which account for a large part of the country's non-traditional agricultural exports. The major fruits produced in Uganda include passion fruit, papaya, jackfruit, citrus, pineapple, mango, avocado, apple, banana, cavendish, watermelon, guava, grape, strawberry, melon and tree. There is a lot of potential to grow exports in these products and to diversify the export basket.

Between 2001 and 2011, production of fresh vegetables in Uganda almost doubled, from 585,000 tons to almost one million tons. Meanwhile, exports multiplied by a factor of 40 in volume, but only by 13 times in terms of value. On the other hand, production and exports of fresh fruits remained stable between 2001 and 2011 in both weight and value. In both cases the percentage of production exported is negligible, close to or smaller than 1%. The most notable change in trade patterns is in the geographical composition of exports: while African markets represented less than 1% of both fruits and vegetables exports in 2001, by 2011 they represented between 65 and 75% of total external sales.

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2.5M Agricultural production is dominated by small-scale farmers, consisting of approximately 2.5 million households

There is a growing volume of trade in fresh produce between Uganda and neighboring countries, especially South Sudan.

[4] From World Bank World Development Indicators.

[5] The "Prosperity for All" program started as a post-2006 election plan to implement the new government's manifesto. The program aspires to see that every household earns sustainable income to transform itself into an economically viable entity. With particular emphasis on agriculture, the plan envisages raising agricultural productivity through zoning, providing start-up capital and inputs, supporting mechanization and value addition (agro-processing). It has run parallel to the PEAP, which is GOU's PRSP.

Transport of Ugandan produce between regional and global markets differs: regional markets are reached almost exclusively by road, while overseas markets are connected by a combination of land and air transport services.

3.1 Regional markets

There is a growing volume of trade in fresh produce between Uganda and neighboring countries, especially South Sudan. The volume of traffic between the two countries has increased rapidly, particularly since South Sudan gained independence in 2011. There are no established suppliers for food (maize, pulses, sugar, oil or meals ready to eat) produced in South Sudan. Nearly all the states experience cereal deficits, which are balanced through imports, mostly from across the border with Uganda, DRC and Ethiopia, but also from overseas. The thriving trade in food products in the border region of Uganda and South Sudan is driven by the significant differences in the prevailing prices in South Sudan and northern Uganda (Table 2).

Traders purchase produce in Uganda at the farmgate or in market towns. A typical shipment starts at the farm level, is consolidated or is transported to a buying point or to local and regional markets. Consolidation is the only way to develop synergy with higher volume-lower cost transport services to the nearest export market. Though there is some empirical evidence of this (e.g., Raballand, 2010), how such consolidation takes place is often not fully explored. It cannot be assumed that cooperation to trade will necessarily take place on its own accord (Gibbon, 2001). Fafchamps and Hill (2005) find that farmers in Uganda used not to trust each other sufficiently to enable one of them to carry all neighborhood produce to the market for sale, even though doing so would reduce everyone's costs. However, fieldwork for this paper found that this has become quite common, facilitated through the use of mobile phones.

Government interventions are necessary to establish logistics infrastructure in rural areas. The core infrastructure has traditionally been roads and some storage facilities. While Uganda has a dense road network and high traffic volume compared with its East African neighbours, the district roads are often in poor condition, making for low accessibility to rural areas (Ranganathan and Foster, 2012). As a result, transport costs in Uganda at all levels are very high in relation to neighboring economies. The high transport costs impair the development of the agricultural sector in the country (Natamba et al., 2013; Gollin and Rogerson, 2010; Collinson et al., 2005). The burden of transportation costs on export prices erodes the returns to capital, reducing investment and hindering economic growth.

To reduce such costs, the government of Uganda has invested significantly in road construction and upgrading over the last decade. Nonetheless, Uganda's RAI (rural access index[6]) is still low at only 53% compared to other countries such as Bangladesh which has an index of 86% (Iimi et al., 2016). Given that Ugandan agriculture is mainly composed of low density subsistence small farming, reaching an RAI of 100% might not be sustainable considering the considerable investment that would be required (Raballand et al., 2009). Carruthers et al. (2008) estimate that the Ugandan government would need to invest 3.6% of GDP for a period of 10 years to reach an RAI level of 75%. Given the unavailability of resources for that magnitude of investment, other measures are needed to reduce overall logistics costs. The design of

Table 2: Maize and beans retail and wholesale prices, April 2010

Logistic Centers	Maize		Beans	
	Retail price	Wholesale price	Retail price	Wholesale price
Juba—South(ern) Sudan	17,12.5	1,182.5	2,700	2141
Gulu—Northern Uganda	342.5	400	1,350	1,150

Source: Ephrem Asebe, 2012.

[6] The rural access index measures the "share of the population who live within 2 km of the nearest road in good condition in rural areas" (Iimi et al (2016).

such measures should take into account how farmers actually reach domestic and regional markets.

In addition to roads, there is an important nexus between transport and storage infrastructure which is often ignored in rural projects. The location of storage facilities, which serve also as consolidation points, is critical in enabling small scale producers to connect to regional and global supply chains. As argued above, a certain level of infrastructure development is often necessary to provide the foundation for improvements in the quality of logistics services. When storage is not available, produce must be harvested a few hours before it is taken to market, which limits the distance the produce can be transported and its shelf life. Storage facilities in Uganda are typically provided by the private sector, but in a patchy manner.

Grabowksi (1999) emphasizes that without an external coordination mechanism to bring buyers and sellers together, farmers may lack the assurance required to undertake production while customers may be unable to find suppliers. In this regard, technological innovations are rapidly transforming marketing practices across East Africa, including in Uganda. Electronic intermediation through ubiquitous coverage by mobile telephony in particular has disrupted rural marketing and led to virtual integration of supply chains. One of the impacts has been though improved price discovery. Farmers and traders often have imperfect or no knowledge of prevailing market conditions, which may result in them delivering produce when conditions are not conducive to high returns. As the products are often bulky and of low value the farmers can suffer significant losses. Mobile phones enable farmers to check prices and general market conditions before deciding when to sell their produce thereby reducing their exposure to risk of losses.

However, while the use of IT in agro-markets is widespread in Uganda, the impact on logistics costs is not clear. Each farmer is put in a position where they can decide which market to access or when to take their product to the market. If this is done without coordinating with other farmers then individual costs can be high, as shipment volumes will be small resulting in high unit costs. It is in this context that the World Bank (2012) found ICT effective in reducing transport and logistics costs with just-in-time information on consolidation and market trends.

Ready access to information has three primary effects on producers:

- It reduces information asymmetry and enhances farmers' ability to negotiate higher prices, even with market intermediaries.
- Farmers can decide to delay selling their produce until market conditions improve, although storage costs can be high if the right facilities are not available.
- Farmers can switch to alternative markets, if they have the necessary transport and are able to change their destination market.

In addition to facilitating information flows, ICT has contributed to agricultural efficiency through the proliferation of payment systems based on mobile phones. There are a large number of developing and developed countries that now have such systems in place. Kunaka (2010) finds also that ICT helps manage payment processes in lagging regions by enabling all players to be prepared for market transactions. Otherwise some studies (e.g., Gong et al., 2007) find that farmers who sell directly to market without advance information can suffer payment delays unless they sell to an intermediary but at a lower price. East Africa has several successful mobile payment systems, which emulate the first successful[7] branchless banking platform, M-Pesa, introduced in Kenya in 2007.[8] These systems make it easier and faster for farmers to receive payment without having to travel long distances.

Connectivity to regional markets by small scale farmers in Uganda utilizes elements of all of the above. Farmers either sell produce to traders who take products into neighboring markets or they get together and organize a

[7] Morawczynski and Pickens (2009) says that in August 2009 M-Pesa had 7 million customers transferring 150 million KSh (US$2 million) a day in small transactions averaging about 1,500 KSh (US$20). The system had handled over 130 billion KSh (US$1.7 billion) since 2007.

[8] It was initially launched in 2003 to allow borrowers to re-pay loans with airtime using the network of Safaricom airtime resellers. Mobile phone customers put it to various other users, and it was re-launched as a branchless bank service with limits on transactions and credit holdings. The second launch was supported by DFID and Vodaphone (40% shareholder of Safaricom) and the telecom consultancy firm Sagentia.

truck to ferry fresh produce of several farmers to markets in neighboring countries. Only a few farmers travel, while the rest keep track of sales and prices through mobile telephony. The regional markets, especially South Sudan and the eastern part of the Democratic Republic of Congo, hold great potential for increased trade from Uganda. They also have the advantage, compared to markets in the Middle East or Europe, in that they do not impose strict standards on product quality and handling. As argued below, strict product standards either increase costs for farmers or can exclude small scale farmers completely from some markets should they be unable to comply with the set standards.

3.2 Overseas markets

Due to its landlocked nature and long distances to overseas markets, air transport is important for global connectivity of Uganda producers. In fact, the fresh produce sector in Uganda is concentrated within 40 km of Entebbe Airport. Proximity to the airport is quite important to defining a zone of production of perishables like flowers, fresh fruits and vegetables, which tend to have a short shelf life. In 2013, fresh produce was the third largest export by air in Uganda (22% of export tonnage), after fish (46%) and flowers (26%). However, the volume of production is generally not sufficient to support the regular supply of airlift capacity. In general, for exports, cargo is nearly equally distributed between passenger and freighter flights. Still, the belly freight is less than the worldwide average of 70%. To support the market some private cargo handlers have developed facilities at the airport for the temporary storage of the produce of many farmers and to enable the airlines to then cater to this market. The airlines provide a cut-off time of a few hours before a flight for all produce to be delivered and processed ready for export. This enables farmers to plan the ideal moments to harvest produce and deliver it while it is still fresh.

Most of the flights carrying freight out of Entebbe airport are destined for the Middle East or Europe. Nearly 75% of air exports leave on flights to these two regions. A significant proportion of the cargo on flights to the Middle East is transferred to flights to other destinations,

In 2013, fresh produce was the third largest export by air in Uganda (22% of export tonnage), after fish (46%) and flowers(26%).

Europe among them. In fact, Europe is the largest market for Uganda's exports by air. About 19% of the cargo is transported to African airports, where Southern Africa captures a larger share than does the East African Community (EAC). Within East Africa, some freight can be transported by road instead of air transport.

The distribution of Uganda produce in the overseas markets, particularly in the Middle East, is usually through supermarkets. As mentioned above, supermarkets increasingly play an oversized role in the marketing of produce in both the East Africa region and internationally. However, the supermarkets have strict requirements in terms of packaging, quality and other standards as well as the traceability of products. Compliance with these requirements often has to start at the farms in countries like Uganda, through some central processing facilities where the produce is washed, weighed, bagged and tagged. As a result, the ability of producers in Uganda to meet the pressures from supermarkets and to comply with global standards is influenced in part by, and in turn is affecting, the topology of fresh fruit and vegetable supply chains. Whereas in the past the produce of different farmers might have been mixed in the same packaging, there is increasing pressure to keep separate the produce from different farmers so that it can be easily identified. This can work contrary to the requirements to reduce unit costs of accessing some of the markets.

3.3 Typology of supply chains to regional or global markets

Consistent with the framework in Figure 1, four main types of fresh produce export supply chains have emerged in Uganda, which determine whether the exports are destined for the regional or overseas markets:

1. **Large farmer-led supply chains.** There is only a small number of large fresh produce farmers (at least 30 hectares of land and 300–350 workers) in Uganda. These farmers package and label their own brand products, control their own cool chain, and face little difficulty in meeting the standards or quantities required by Uganda-based regional supermarkets or supermarkets in neighboring countries (Kenya, Rwanda, Burundi). Only a few possess GlobalGAP certification and export to overseas markets. They can transport produce to supermarkets using their own refrigerated trucks. Some of the large farmers work with outgrowers who possess 1–2 ha each. In turn, each outgrower can have a relationship with another 100–200 smallholder farmers.

2. **Farmer associations.** Most of Uganda's fresh fruits and vegetables are produced by smallholders, mainly for self-consumption or local markets. There are 2–3 million smallholder producers of fresh fruits and vegetables, but only a few hundred supply produce to regional supermarkets through producer marketing organizations (PMOs), cooperatives or outgrower schemes. They own on average less than 2 acres of land and are spread in the Southern, Central and Eastern regions of the country. Producer associations such as Hortexa,[9] cooperatives, and marketing organizations, which have about 20–30 farmers each, consolidate volumes and export them. Typically, production relies on family and unskilled

Table 3: Summary of characteristics of supply chains

Transaction	Large farmer	Association	Trader	Contract farming	
				4a	4b
Farm gate to collection centers	Process at farm	Farmers bring to collection center	Intermediaries brings to collection centers	PMO collects from farm gate	PMO collects from farm gate
Sorting/grading	Sort and grade at own processing location	The team leader inspects and receives	Exporter sort/grade at his collection center	Done by PMO at collection center	Done by PMO at collection center
Packaging	Sort and grade at own processing location	The team leader inspects and receives	Exporter sort/grade at his collection center	Done by PMO at collection center	Done by PMO at collection center
Transport to airport/ regional market	Transport to airport	Agent accompanies goods to regional markets	Transport to airport or regional market	Done by PMO	Done by PMO
FOB/CIF	CIF/FOB	CIF	CIF	CIF	FOB
Final market	Supermarket/ Wholesaler	Wholesaler/retailer	Wholesaler/retailer	Supermarket/ Wholesaler	Supermarket/ Wholesaler
Traceability	Risks	No/Yes	No	Yes	Yes
Post harvest losses	Yes	Significant	Significant	Average	Average
Timely delivery of cargo to destination	Normal	Significant	Significant	Average	Average
Access to reliable market	Average	Subject to change regional market, politics	High risks due to lack of traceability	Subject to changes in the world market	Subject to changes in the world market
Transport price fluctuation	Low risk	Very high	High	High	High

Source: World Bank.

[9] HORTEXA is a legal entity that brings together horticultural producers and exporters. It was formed in 1990 to help exporters deal with their common problems collectively. In 1998 it was decided that farmers could also be members. Among other activities, the organization works to promote awareness of the high quality and availability of Ugandan fresh produce, with special focus on international markets. It had played a major role in helping growers upgrade their production and postharvest handling methods to meet international export requirements.

labor, with limited access to specialized advisory services. Production is also characterized by low use of pest and disease control, planting materials or soil fertility enhancement measures. Most companies or producer associations have very limited investment capacity to increase production or explore market opportunities. Only a very small number sells directly to European wholesalers (Evers et al., 2014).

3. **Traders.** It is common for small scale farmers to sell to traders who then consolidate and export product. Itinerant traders purchase product from farmers and either export it or act as local agents for regional buyers. Generally, farmers who have large quantities are more likely to take their produce to the market, often using their own transport, while those who sell small quantities are likely to sell at the farmgate, to traders or agents.

4. **Contract firms.** These are firms that may or may not grow any product but instead consolidate product from farmers, carry out quality control and packaging, and sell to domestic markets, regional markets (South Sudan, Kenya, DRC, Rwanda, and Tanzania), and international markets. Such firms source product when there is demand, consolidate and market it, typically to national or international wholesalers and supermarkets.

4. Data collection and analysis

Given these characteristics of the fresh produce sector in Uganda, we carried out experiments to assess the role of different dimensions of the logistics systems for access to market. The experiments were conducted to test four policy issues:

- What is the impact of further improving transport infrastructure?
- Where should storage facilities be provided?
- What is the impact of associations on logistics costs and farmer participation in product markets?
- What is the impact on farmers of complying with national and global product standards?

The experiments were based on intensive consultations with farmer associations, field data collection through structured surveys and modeling of supply chain actor interactions. The modeling of the relationships between supply chain actors employed a relatively new technique, called agent based modeling (ABM). ABM techniques are a class of computational models and simulations based on a large number of acting and interacting agents (Axelrod and Tesfatsion, 2005; Tesfatsion and Judd, 2006). ABM models are robust and less demanding than econometric models with regard to availability of aggregate data, making them especially attractive for policy analysis in studies of developing countries. ABM models also differ from other conventional simulation models that are grounded in mathematical programming, because they can capture explicitly the interactions between actors (farmers and intermediaries, for example), thus allowing for the study of transaction and information costs. These models can fully account for the spatial dimension in agricultural activities, and thus the role of internal transport costs and the physical features of land. Consequently, the explanatory power of the models is suited to policy questions of interest.

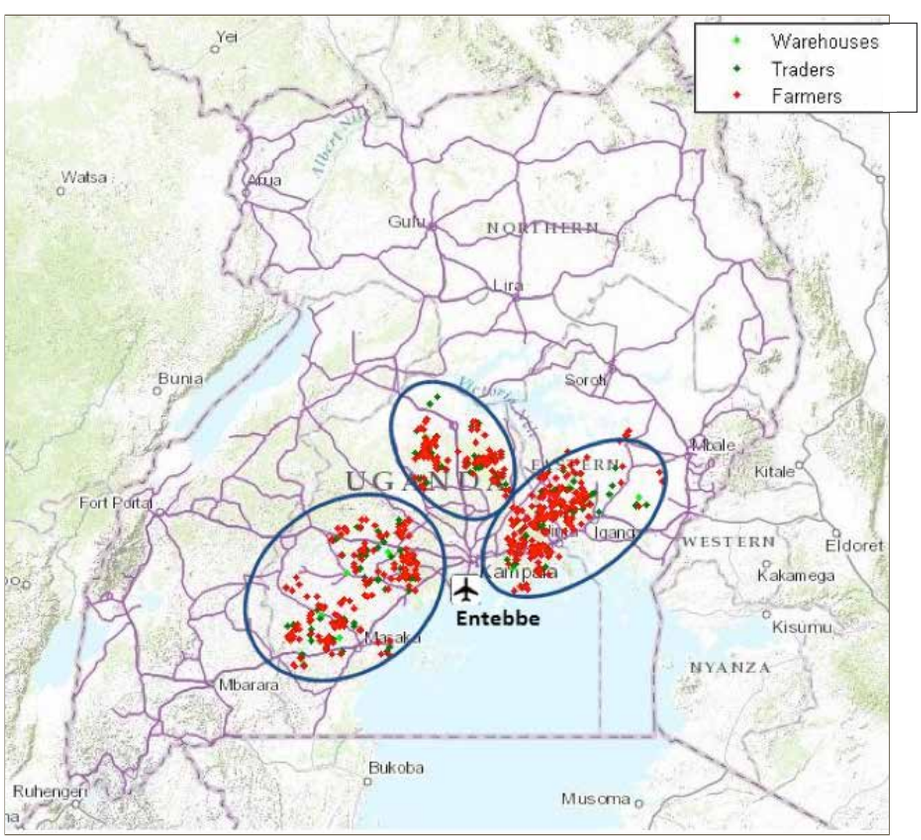
The outcome of a simulation using ABM is largely determined by the agents at the micro level, who are acting between themselves and the environment in which they are set. Hence, ABM provides a way to study the behavior of agents as a result of a set of different scenarios, and then to test the impact of policy changes. Compared to conventional modeling, ABM makes it much easier to model heterogeneous and not fully rational agents, provides more flexibility to model farmers' decision-making processes, and facilitates the inclusion of non-economic factors, which leads to a better representation of the regional-spatial variations in agriculture. ABM can capture not only individual decision making, but also negotiation processes between supply chain actors, and incorporates time and geographic information system (GIS) elements for geographical placement. The agents' interactions result in a macro equilibrium as a consequence of the model's bottom-up approach, generating better results than in top-down modeling (Axelrod and Tesfatsion, 2012). Moreover, ABM enables constructing and solving problems that are non-tractable by usual analytical models (Billari et al., 2006; Romero-Calcerrada et al., 2008). Lastly, ABM is also useful in the representation of changing behavior, starting with

individual actions and leading to of individuals sharing information, adapting, and learning.

The ABM approach is particularly suited to these questions in the Uganda context, as the supply chains have a wide range of organizational models (labor vs. capital intensive, production location in periphery vs. core, time-sensitive vs. non-time sensitive goods, fragmented vs. integrated chains) and international transport means (shipping, air) requiring a varied scope for analysis. The agricultural supply chains are characterized by a wide spectrum of agents who operate in highly fragmented networks (farmers, traders, wholesalers, and exporters). These diverse agents operate within the same context but have diverse goals, resources and available information, and operate under different constraints. The ABM approach may enable us to reveal unanticipated underlying dynamics, for instance how specific types of farmers/agents behave in terms of output and sales decisions (location of sale, contracting, etc.) when market conditions change or when pricing mechanisms are more readily available.

The modelling was implemented by the Quantitative and Applied Spatial Economic Research (QASER) laboratory at University College London. Data for the model were collected from districts in the Central and Eastern regions of Uganda, and used to define the spatial, geographical and demographic environment of the agent-based system. The spatial and geographical environment is captured using a network structure. The nodes of the network are represented by the GIS locations of villages in Uganda. The links between the village nodes correspond to the available road infrastructure, which is mostly unpaved. A field survey was conducted in districts near Kampala, including Luwero, Mayangayanga and Kikyusa (Figure 2). A standardized questionnaire was designed and administered during December 2013 to farmers, with the objective of covering different aspects of agricultural production, marketing and logistics practices, for five

Figure 2: Study areas depicting ABM-generated locations of farmers (red), warehouses (green) and traders (blue).



Source: Kunaka, Saslavsky and Watanuki, 2015.

representative products: hot pepper, chillies, matooke, okra, and sweet potatoes. Farmers were selected using a stratified sampling method. Interviews were held also with producer cooperatives and associations.

The results of the experiments are summarized below.

4.1 Impacts of road infrastructure investments

A typical intervention to try and improve logistics in rural areas is to upgrade all roads. As mentioned above, this is implied in the definition of the RAI. The experiment tested the impact of roads investment in Central and Eastern regions of Uganda, in the districts of Luwero, Mpigi, Masaka, Iganga, Mitiyana, Kamuli, and Mukono, to upgrade all roads to all-weather standards (Figure 2). Specifically, two possible intervention scenarios were explored. First, rather than assuming that all roads are upgraded to achieve 100% RAI in Uganda, road improvement was targeted to agricultural-oriented districts. On the second intervention, an improvement to 100% RAI of all roads around the airport in Entebbe within a radius of 30 km was considered.

The simulation showed that improving roads in the agricultural districts would produce a 60% decrease in travel time. Improving the infrastructure would affect the micro-economic behavior of farmers, as assumed in the ABM construct. Agents/farmers are affected by road quality upgrading through "speed to market" improvements, which reduces post-harvest losses, among other things. Moreover, the increase in market accessibility enables farmers/agents to augment their capital because of more frequent trade exchanges. Greater connectivity will mean that farmers will be able to sell their surplus production, and thus will be less likely to rely solely on their agriculture product for their subsistence.

Over the course of one simulated year, we do not observe long-lasting benefits in terms of trade growth or an increase in overall productivity and welfare as a result of these transport improvements. Nonetheless, the number of farmers participating in market exchanges is significantly increased as compared to the "existing conditions" network, which leaves road infrastructure quality unchanged. Based on this finding, a direct intervention in Entebbe Airport's hinterland roads appears to be more effective than upgrading all roads in the Central and Eastern regions of Uganda in terms of increasing participation rates. Although the ABM model is generally not well suited for identifying individual factors causing a particular outcome, it was noted that a considerable amount of smallholder agricultural production takes place around the Entebbe area. This finding is consistent with other work, especially by Raballand, et al. (2009).

Improving access to markets can lead to a shift away from a supply-based situation of the agriculture sector where farmers merely sell whatever crop surplus they have, to a demand-driven agriculture where farmers produce for the markets. However, this shift is complex, and there are numerous constraints that still prevent Ugandan farmers from taking full advantage of participation in the market. The non-traditional export agriculture goods market remains underdeveloped, and depending on the product can fluctuate significantly in terms of pricing, production volume, export volume, and export values (Ugandan Bureau of Statistics, 2013), in part due to erratic weather conditions or to changes in demand. Penetrating international markets requires concerted efforts to increase production to a sufficient level, to develop efficient supply chains, and to establish market quality and standards.

4.2 Consolidation of agricultural produce

In an effort to look into logistics markets more closely, we ran a second experiment where we assumed that the agriculture trader selects the best shipping route between an origin and a destination to minimize their transport costs while also satisfying demand. To keep transport costs low, the trader will offer to buy the farmer's crop at the farmgate (origin) and then transport it to a warehouse (destination). The trader can reduce costs by consolidating the produce of several farmers and lowering unit delivery costs. The product price to be used in these transactions varies from point to point and is determined by the trader in advance. It is assumed that the trader must determine prices at each warehouse

destination point for his offer to be acceptable to the farmer. Moreover, the trader chooses the most suitable price and tries to maximize his profit. However, the trader offers a price that also includes shipment costs, so the price offered to the farmer will depend on the location of the warehouses.

In the simulation approximately 40 control warehouse locations were preselected in accordance with the geographical location of the 7 districts of study. In the ABM simulations, a trader decides whether the farmer must pay for transport (by offering a price that reflects transport costs) in relation to his (the trader's) own budget. Our simulation suggest that the outcomes depend on the number of farmers who decide to sell to a trader and that the traders are better off selling at specific consolidation centers. In addition, the cost of transport will significantly affect the farmer's decision on whether or not to sell his crop.

Based on average probabilities of warehouse use computed in the simulations, 5 warehouses emerged as potential consolidation centers (see Figure 2). The centers, or *rural hubs*, are those that would minimize transport costs for all the market participants, be they farmers or traders. Two of the selected sites are in the Jinja area, and the others in Kabasanga (West of Kampala) and Luwero (North of Kampala, near the Kampala-Gulu Highway). In terms of characteristics the *rural hubs* are those that have high population density, and agriculture is the main economic activity. Their main attraction is that farmers can sell their products quickly and minimize losses due to produce deterioration. This result confirms the existence of a hierarchy of markets and the fact that the more central locations especially those with relatively large demand can play a role in how rural logistics are organized. As volumes increase, it would be important for rural hubs to have improved facilities for storing produce and to minimize post-harvest losses.

4.3 Farmer coordination strategies

The third experiment explored the effects of farmer coordination strategies. The ABM enabled us to model coordination initiatives/association among farmers through the spread of information that can be of any type (formal and informal). The model is used to explore the impact that associating with other farmers would have on farmers' market participation, transport cost, crop prices, and volumes sold to traders. Association between two farmers implies that they share information, produce and sell together at the same price, consolidate and transport together in the same warehouse and at the same logistics cost, and share revenues in proportion to the amount produced.

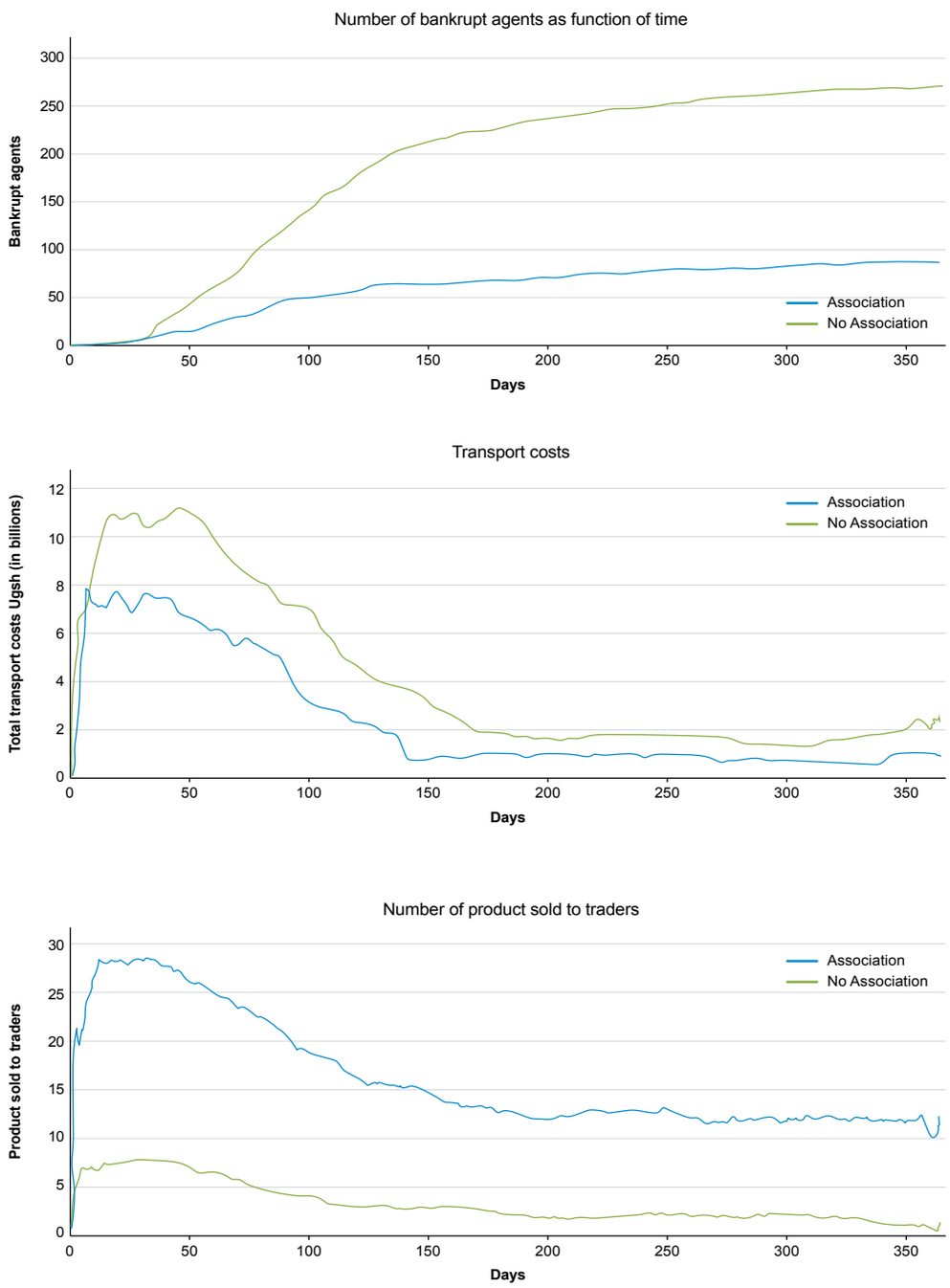
Under the base conditions scenario of the model, it is assumed that only minimal coordination is taking place. Farmers are bounded rational agents, and they make decisions as a function of the information available to them. Through association the farmers can share the resources for paying the shipping cost, pass information to one another and can gain some market power and influence prices of their products. It is assumed that association is realized between farmers no farther than 30 kilometers (half a day walking) from each other and thus benefit from some agglomeration economies within their local area. Each farmer may start with a network of farmers known to him, and this network is then shared every time a new multiplier attachment/coordination with a new farmer/outgrower is developed. The model is designed so that the sharing of the network of known farmers occurs within one calendar year, so the spread of information is thus across one year to allow for adjustment and clearing of noise. Since the association process is very time-consuming from the point of view of computing, we consider that the coordination process takes place every 3 months.

The results of the simulation are striking. In the case of no association, approximately half of the farmers (agents) cease to participate in the market (Figure 3a). However, when the farmers associate, participation rates rise sharply. This result suggests that association among farmers may be highly significant over the longer-term. Association results in lower transport costs: the curve related to the association among farmers lies conspicuously below the curve representing the case of no association (Figure 3b).

The farmgate prices under associations of the crops considered (hot peppers, chillies, matooke, okra, and sweet potatoes) are always higher than prices of crops without association. For any crop, the supply chain is

composed of many intermediaries, each taking a margin at every stage of the chain. When farmers form an association, they can coordinate their actions and avoid some of the intermediary stages by selling directly to the major wholesaler/trader. Generally, through the crop price mechanism, the formation of associations leads to a fall in the number of products sold to traders (Figure 3c). A plausible explanation for this pattern is farmers, by associating with each other and reducing their costs while also ensuring more reliable supply, can sell directly to final markets often at higher prices.

Figure 3: Effects of farmer association on market participation, transport costs, and volume of trading



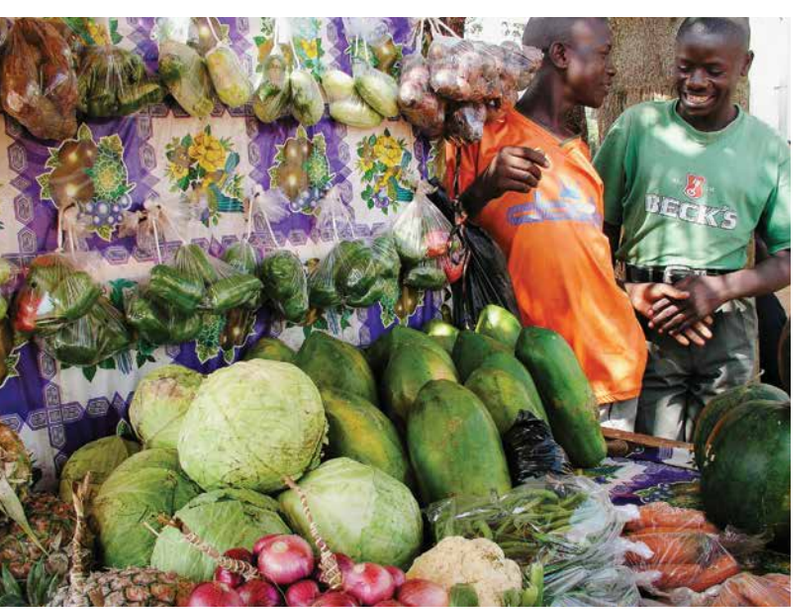
Source: Kunaka, Saslavsky and Watanuki, 2015

4.4 Adoption of food safety and quality standards

Uganda's export market has increased steadily over the past two decades; however, its non-traditional crop market is still poorly structured. Given its high transaction costs, the non-traditional crop market also has not been able to implement standards and quality control mechanisms adequately. This is a major hindrance to the development of trade, and particularly impedes sales to the major international importers such as the European Union.

Increasingly therefore, the Government of Uganda has embraced compliance with private standards such as GlobalGAP. Good Agricultural Practices (GAP) "address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products" (FAO COAG, 2003). In Uganda adopting GAP was deemed necessary to maintain the country's presence in key developed markets and as a tool for differentiation. Different interventions were geared to increase awareness of the standards and to facilitate their adoption, mainly through capacity building, technical and financial assistance—especially to cover certification costs. The assistance has predominantly been channelled through "lead firms" that are supposed to provide support to smallholder farmers to adopt GAP and otherwise be compliant with buyer and/or regulatory requirements (Diaz Rios et al., 2009). However, due to little exposure to mainstream global buyer chains – linked to their focus on ethnic and wholesale trade - Ugandan shippers have not faced much pressure from buyers to modify their practices and that of farmer suppliers (Diaz Rios et al., 2009).

The ABM was used to explore the impact of implementing good agricultural practices (GAP) at the exporter level. It is assumed that only some farmers apply GAP procedures. The results of the simulations were mixed. On the one hand, the adoption of GAP procedures would in theory ensure access to the specific markets where set standards have to be complied with. In general, the introduction of standards and controls was found to be conducive to the dissemination of information on the benefits associated with GAP. This will in turn impact how produce is handled all along the chain. However, the results also suggest that there would be increased fragmentation of volumes as not all farmers will be able to meet the standards. Fragmentation of volumes will increase unit costs of delivery of the products to markets. Specifically, products that are typically consolidated by traders, who tend to buy and mix produce from different farmers, may no longer meet the traceability requirements that are a feature of most GAP standards. Consequently, shipment sizes would reduce and unit costs would go



While there are legitimate reasons for specifying how products should be handled all along the supply chain the standards can also have the effect of locking out some of the small and more marginalized producers, typically those in lagging regions.

up. At the same time, the simulations suggested that GAP implementation would not have a dramatic impact on trader prices, although they increase at a slightly faster rate than without GAP implementation. This latter phenomenon could be because the reduced volume is comprised of higher quality produce that meets the standards and therefore fetches higher prices in the market.

5. Conclusions

A thread running through the results of the experiments run in Uganda is that small scale farmers benefit most from coordinating among themselves in accessing information, searching for markets, deciding when to go to market and when adopting new technologies.

One consolidation strategy is physical. The typical shipment originating in rural areas in developing countries starts at the farm level, is transported to a storage facility and from there to buying points or to local and regional markets. The development of road networks can have a significant influence over the direction of flow of agricultural shipments. As products move from the farmgate to market in lagging regions volumes can be increased and costs lowered by consolidating flows into larger and larger vehicles. The larger vehicles require better roads than are available at the local level and which lead to central places where markets are larger. In fact, there are discernible rural freight hubs, serving as storage and logistics transfer points. In that regard the placement of rural hubs is quite important to reduce costs in lagging regions.

A complement of rural hubs is their link with urban areas. Increasingly modern food retailing is dependent on supermarkets and large retail chains for food and food services. Supermarkets are playing a transformative role in reorganizing and upgrading supply chains for fresh produce. They require produce of specific standards, sizes, packaging, freshness, etc., which forces suppliers to also update their systems if they want access to growing urban markets. The reconfiguration of supply chains extends all the way to the farmgate. If small scale producers want to benefit from urbanization and globalization then they have to comply and meet these requirements.

However, as the results of the simulations suggest, the net effect of adopting high product handling standards are double edged. While there are legitimate reasons for specifying how products should be handled all along the supply chain the standards can also have the effect of locking out some of the small and more marginalized producers, typically those in lagging regions. Such producers are often not able to meet any high standards at least without suffering the effects of high transport and logistics costs. The farmers can therefore end up relying on only the local markets and to a limited extent regional markets. This can have significant implications on poverty eradication outcomes.

A second consolidation strategy is virtual, through the use of ICT. There are several actors in agricultural logistics flows in rural regions in low income countries. Among them are various types of intermediaries who often may retain a large share of the rents from farming compared to the farmers who do the actual production. Providing farmers with information on prices or other market conditions can influence where and when product is delivered to the market. In markets in lagging regions there is great uncertainty on how much or when product should be ready for market. In some agro-supply chains there have been attempts to minimize this uncertainty by entering into contract farming arrangements between producers and downstream processing or marketing enterprises. A more recent approach has been to exploit information technology, to facilitate price discovery and assessment of market conditions and to coordinate between farmers on when to go to market. The appeal of these features is reflected in a surge in the development of farmer applications for mobile phones, especially in Africa.

A third consolidation strategy is one that is several decades old, in the form of social organizations. Farmer organizations help individual producers overcome their immediate disadvantage of small scale production. Through collaboration farmers can combine their produce into large volumes, and gain some market power and high retained incomes. However, as social formations, many farmer associations fail to transform over time, and focus on issues that are removed from raison-d'etre and are not sustainable. Nonetheless, farmer organizations have a relevant role to play in logistics in lagging regions.

References

Asebe, E. (2012). field survey report for World Bank.

Axelrod, R. (1997). *The complexity of cooperation*. Princeton University Press (Princeton).

Axelrod, R., and L. Tesfatsion (2005). "A Guide for Newcomers to Agent-Based Modeling in the Social Sciences." In: Leigh Tesfatsion and Kenneth L. Judd (Eds.), *Handbook of Computational Economics*, Vol. 2: Agent-Based Computational Economics.

Beckmann, M. J. (1976). "Spatial equilibrium in the dispersed city: In: *Environment, regional science and interregional modeling* (pp. 132-141). Springer Berlin Heidelberg.

Billari, F. C., T. Fent, A. Prskawetz and J. Scheffran (2006). "Agent-based computational modelling: an introduction." In: *Agent-Based Computational Modelling* (pp. 1-16). Physica-Verlag HD.

Bolwig, S. (2012). Poverty and Gender Effects of Smallholder Organic Contract Farming in Uganda. USSP WORKING PAPER. IFPRI.

Carruthers, R., and R. R. Krishnamani (2008). "Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa." Background Paper 7 for the Africa Infrastructure Country Diagnostic, World Bank, Washington, DC.

Casaburi, L., R. Glennerster, and T. Suri (2013). Rural Roads and Intermediated Trade: Regression Discontinuity Evidence from Sierra Leone. Available at SSRN 2161643.

Collinson, C.D., U. Kleih, D.G. Burnett, A. Muganga, J. Jagwe, and R.S.B. Ferris (2005). Transaction cost analysis for selected crops with export potential in Uganda, prepared for the Plan for the Modernisation of Agriculture by the Natural Resources Institute, UK, and the International Institute of Tropical Agriculture, Nigeria. ASARECA/IITA Monograph 6, IITA, Ibadan, Nigeria. 168 pp.

DFID (2005). "The Value of Time in Least Developed Countries: The African Studies." Final report for contract R8307, Department for International Development, London.

Dorosh, P., H. G. Wang, L.You, and E. Schmidt (2010). Crop production and road connectivity in Sub-Saharan Africa: a spatial analysis. World Bank Policy Research Working Paper Series, Vol.

Dorward, Andrew, Shenggen Fan, Jonathan Kydd, Hans Lofgren, Jamie Morrison, Colin Poulton, Neetha Rao, Laurence Smith, Hardwick Tchale, Sukhadeo Thorat, Ian Urey and Peter Wobst (2004). "Institutions and Policies for Pro-poor Agricultural Growth," *Development Policy Review* 22, Issue 6, November 2004, pp. 611-622.

Evers, Barbara, Maggie Opondo, Stephanie Barrientos, Aarti Krishnan, Flavia Amoding, and Lindani Ndlovu (2014). Global and regional supermarkets: implications for producers and workers in Kenyan and Ugandan horticulture, Capturing the Gains: economic and social upgrading in global production networks. University of Manchester. Working Paper 39.

Fafchamps, M., and R.V. Hill (2005). "Selling at the farmgate or traveling to market." *American Journal of Agricultural Economics* 87(3), 717-734.

FAO Committee on Agriculture (2003). Development of a Framework for Good Agricultural Practices, Seventeenth Session. Rome, March 31 – April 4, 2003. Food and Agricultural Organization.

Farole, T. (ed) (2013). *The Internal Geography of Trade: Lagging Regions and Global Markets.* World Bank. Washington, DC.

Furlong, W. J., and G. A. Slotsve (1983). " Will That Be Pickup or Delivery?": An Alternative Spatial Pricing Strategy. *The Bell Journal of Economics*, 271-274.

Gibbon, P. (2001). "Upgrading primary production: A GCC approach." *World Development* 29 (2), pp. 345–363.

Gollin, D., and R. Rogerson (2010). Agriculture, roads, and economic development in Uganda (No. w15863). National Bureau of Economic Research.

Gong, W., K. Parton, R. J. Cox, and Z. Zhou (2007). "Transaction costs and cattle farmers' choice of marketing channels in China: A Tobit analysis." *Management Research News* 30(1), 47-56.

Grabowski, R. (1999). "Coordination Problems, Risk Diversification, and Chance Economic Development and the Traditional Sector." *Journal of Asian Economics* 10 (3): 475–87.

Hazell, P., C. Poulton, S. Wiggins and A. Dorwood (2006). "The Future of Small Farms: Synthesis Paper" Based on Research Workshop organised by IFPRI, ODI and Imperial College, Wye.

Iimi, A., F. Ahmed, E. C. Anderson, A. S. Diehl, L. Maiyo, T. Peralta-Quirós and K. S. Rao (2016) New Rural Access Index: Main Determinants and Correlation to Poverty. Washington, DC. World Bank. Policy Research Working Paper 7876.

Kirsten, J. and K. Sartorius (2010). Linking agribusiness and small-scale farmers in developing countries: Is there a new role for contract farming? *Development Southern Africa* 19:4, 503-529,

Kunaka, C. (2010). *Logistics in Lagging Regions: Overcoming Local Barriers to Global Connectivity.* World Bank. Washington, DC.

Kunaka, C., D. Saslavsky and M. Watanuki (2015). Small Payers in Big World, Unpublished paper, World Bank.

Minten, B. and C. Barrett (2008). "Agricultural Technology, Productivity, and Poverty in Madagascar," *World Development* 36, issue 5, p. 797-822.

Minten, B., B. Koro and D. Stifel (2013). The last mile (s) in modern input distribution: Evidence from northwestern Ethiopia. Ethiopia Strategy Support Program-2 Working Paper, 51.

Neven, D. and T. Reardon (2004). "The Rise of Kenyan Supermarkets and the Evolution of their Horticultural Product Procurement Systems," *Development Policy Review* Vol 22 (6), pp.669-699.

Raballand, G., P. Macchi and C. Petracco (2010). Increasing roads investment efficiency in rural Areas. World Bank, Washington DC.

Raballand, G., P. Macchi, D. Merotto, and C. Petracco (2009). Revising the roads investment strategy in rural areas: an application for Uganda. World Bank Policy Research Working Paper Series, No. WPS5036. World Bank.

Ranganathan, Rupa and Vivien Foster (2012). Uganda's infrastructure : a continental perspective (English). Policy Research working paper; no. WPS 5963. Washington, DC: World Bank.

Diaz Rios, L., S.Jaffee, S.Henson and J. Mugisha (2009). "Not Quite Up to Standard: The Legacy of Two Decades of Government and Donor Assistance to Uganda's Horticultural Export Sector." Agriculture and Rural Development Discussion Paper, World Bank, Washington, DC.

Romero-Calcerrada, R. and J. Millington (2008). "An Agent-Based Model of Mediterranean Agricultural Land-Use/Cover Change for Examining Wildfire Risk." *Journal of Artificial Societies and Social Simulation* 11(4): 4.

Ronner, E., and K. E. Giller (2013). Background information on agronomy, farming systems and ongoing projects on grain legumes in Uganda.

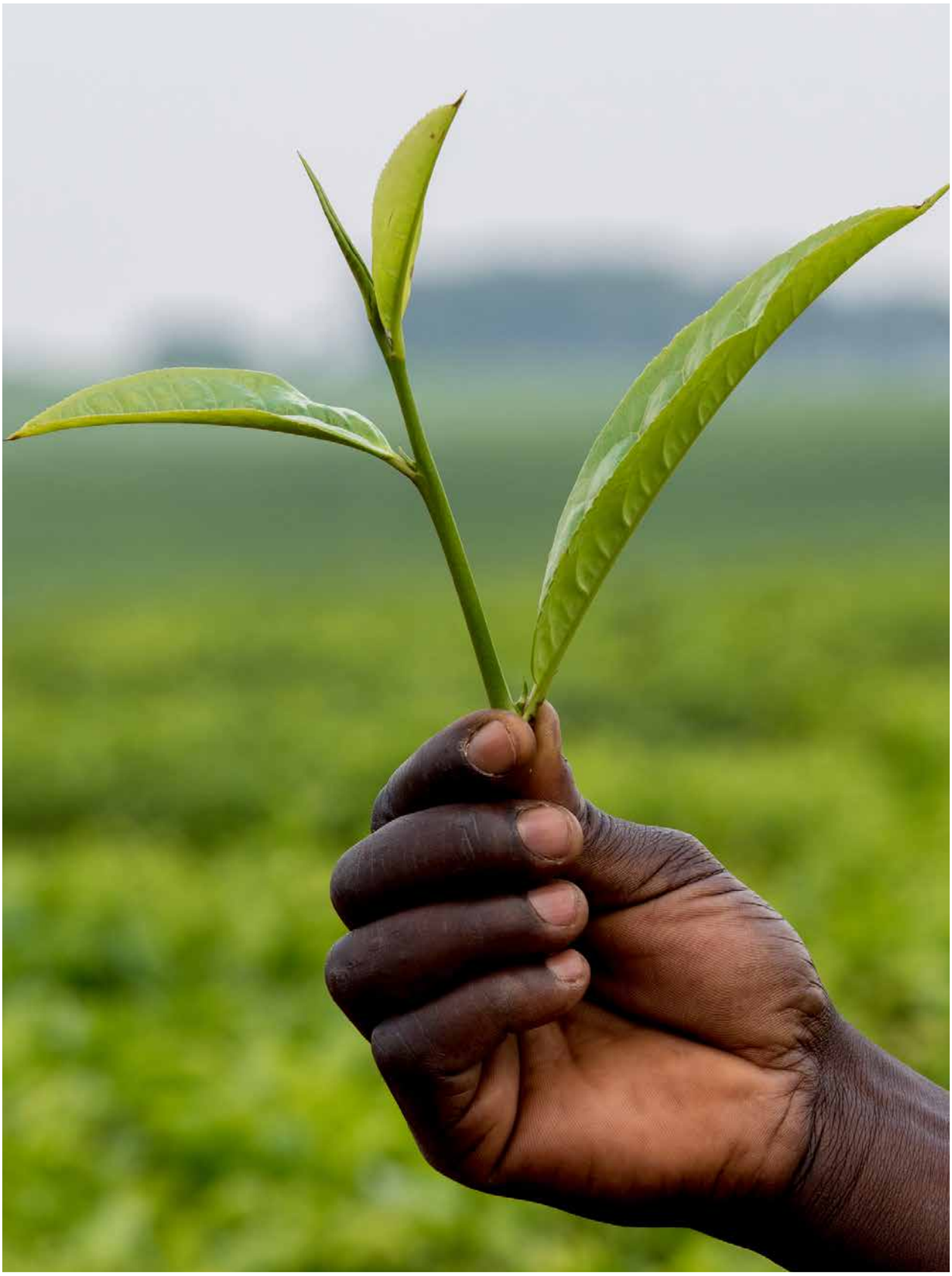
Stifel, D. and B. Minten (2008). Isolation and agricultural productivity. *Agricultural Economics* 39(1), 1-15.

Wiegratz, J., P. Nyabuntu and C. Omagor (2007). "Case Studies of Lead Firm Governance Systems in The Context of Commercialization of Smallholder Agriculture in Uganda." Uganda Programme for Trade Opportunities and Policy, Kampala, Uganda.

World Bank (2009). Not yet up to standard: the legacy of two decades of private, governmental, and donor efforts to promote Ugandan horticultural exports.

World Bank (2012). The Transformational Use of Information and Communication Technologies in Africa. Washington D.C: The World Bank. 2012.

World Bank (2014). Review of Smallholder Participation in Transforming Agri-Food Supply Chains in East, Working Paper.



Trade Openness and Vulnerability to Poverty in Viet Nam under *Doi Moi*[1]

Emiliano Magrini, Food and Agriculture Organization of the United Nations[2]
Pierluigi Montalbano, Sapienza University (IT) and University of Sussex (UK)[3]

1. Introduction

Following the so-called "Asian option" of transition, from the early 1990s Viet Nam adopted the *Doi Moi* (renovation) process, a combination of liberalization, stabilization and structural reforms. This included two main waves of trade liberalization, one in the 1990s and a second in the 2000s (Coello at al., 2010). The first wave lasted from the initial opening of the country until approximately 2001 and foresaw the total abolition of trade licences and the removal of most quantitative restrictions (Thanh and Duong, 2009). The second wave—still ongoing—includes the full involvement of the country in the global network of reciprocal trade agreements (both multilateral, WTO accession in January 2007, and bilateral, such as agreements signed with the United States in 2001 as well as FTA negotiations with the EU concluded in 2016).

Extensive empirical investigation of trade liberalization and poverty dynamics in Viet Nam has been carried out (Irvin, 1997; Fritzen, 2002; Jenkins, 2004; Nadvi et al., 2004; van de Walle and Cratty, 2004; Jensen and Tarp, 2005; Nguyen and Ezaki, 2005; Fujii and Roland-Holst, 2008; Niimi et al., 2007; Abbott et al., 2009; Heo and Doanh, 2009; Coello et al., 2010). Empirical analyses consistently highlight the increased importance of international trade in the Vietnamese economy as well as the positive correlation between trade liberalization, growth and poverty reduction.

However, these studies focus mainly on the first sub-period, when the process of liberalization was still restricted and subject to trade licences. Moreover, the studies do not examine the relationship between openness and vulnerability to poverty. This is because they generally overlook the possible impact of the opening process on households' exposure to risk as well the role of trade openness as one of the possible channels of risk.

This work aims at addressing this gap, assessing differences in households' vulnerability according to specific features such as the typology of economic activities (farm versus non-farm), gender, and trade exposure. The value added of this analysis lies in taking advantage of a full set of available rounds of household surveys in Viet Nam to give a careful interpretation of the cross-sectional evidence of risk-induced household vulnerability, its determinants, and its heterogeneity across "trade-related" industries.[4]

[1] We are very grateful to L. Alan Winters, Andy McKay, Chris Elbers and Julie Litchfield for helpful comments on earlier drafts of this work and to all the participants in the Seminars and Conferences where previous versions of this paper have been presented.
[2] Agricultural Development Economics Division, Food and Agriculture Organization of the United Nations, Rome, Italy.
[3] Department of Economics and Social Sciences, Sapienza University of Rome (IT), Department of Economics, University of Sussex (UK).
[4] Because of the lack of panel data, our analysis is not able to directly control for cross-sectional household heterogeneity or for measurement error and their evolution over time. The main problem is that the cross-sectional variation in vulnerability to poverty across the various trade-exposed sectors can actually be driven by a number of factors other than risk (e.g., differences in household characteristics across sectors due to self-selection) that are unobservable to the researcher. By providing sound empirical techniques and taking advantage of the full set of available household and community controls, we are confident to be able to minimise the relevance of unobservables and provide useful upper bound of the phenomena under analysis.

Empirical analyses consistently highlight the increased importance of international trade in the Vietnamese economy as well as the positive correlation between trade liberalization, growth and poverty reduction.

The share of the vulnerable population in the relatively more trade-exposed sectors fell more slowly than in non-traded sectors.

The contribution of this paper is twofold: using six Living Standards Measurement Surveys in Viet Nam (covering the period 1992-2008), we first assess the level and changes over time in the shares of vulnerable people across economic sectors, organized according to their relative degree of trade exposure; second, we measure how much of households' consumption variation (which is at the core of vulnerability analysis) can be explained by its stochastic *ex-ante* component, namely the variance of income within trade-exposed groups, as well as by actual income shocks, defined as the component of income variation unexplained by observables.

Our main results are the following. Vulnerability to poverty fell in Viet Nam during the *Doi Moi* period, together with an increased share of its stochastic (risk) determinant. The share of the vulnerable population in the relatively more trade-exposed sectors fell more slowly than in non-traded sectors. Even after *Doi Moi*, farming households engaged in the production of export crops and import-competing crops faced higher levels of vulnerability than those engaged in the production of non-traded crops or in non-farm activities.

Moreover, the risk of future poverty for households engaged in activities directly affected by trade liberalization was driven by high volatility, not from expected mean consumption below the poverty line. The above results are key for policymaking. They highlight a link between trade openness and risk-induced vulnerability, underlining the need to address vulnerability to poverty, even in the context of trade liberalization policies that result in a net reduction in poverty.

The paper is organized as follows: section 2 reviews the literature and presents the conceptual framework; section 3 presents the data; section 4 shows the empirical results; and section 5 concludes and provides key policy implications.

2. Trade openness and vulnerability to poverty: the conceptual framework

The literature on trade liberalization and poverty dynamics in Viet Nam has reached consensus on the following issues: price liberalization has had a great impact on agricultural households since 1986 (Niimi et al., 2007), with a substantial poverty reduction for rice net producers that exceeds that for rice net consumers (Heo and Doanh, 2009); trade liberalization has been beneficial to the poor thanks to the highly labor intensive structure of Vietnamese exports;[5] the negative effects of trade liberalization occurred mainly in coffee production after 1998 (Ha and Shively, 2008).

However, a key issue remains unanswered: has trade openness magnified households' exposure to risk and raised their vulnerability to poverty? The topic is currently debated by practitioners, whereas it is largely ignored by the trade literature (Montalbano, 2011). In principle, trade can change the level of risk faced by households in two ways: by changing the riskiness of existing activities, for instance, by altering the weight of foreign compared with domestic shocks faced by the economy, or by shifting the composition of household activities, for example switching from subsistence food crops to cash crops (McCulloch et al., 2001).

[5] Abbott et al. (2009) claim that the poverty impacts of trade reforms in Viet Nam are even larger than those anticipated by existing model predictions, because of the intrinsic limitations of the most common applied methods and because they generally overlook the fact that institutional rather than tariff reforms have been the main driving factor behind recent development in Viet Nam.

The poor face particularly severe challenges if trade reform increases risk. Their ability to insure themselves against adverse impacts tends to be limited, while their traditional coping mechanisms may be ineffective in dealing with the greater exposure to foreign shocks and changes in incentives generated by trade liberalization (Dercon, 2001; 2005). Moreover, the poor may lack information on the risks associated with the new activities induced by openness (Winters et al., 2004). Trade openness can also affect government ability to adopt price stabilization policies or contribute to the elimination of institutions or policies aimed at smoothing domestic prices (Winters, 2002; Winters et al., 2004).

In all the above cases, trade openness can have an impact on households' optimal economic activities and, eventually, lead to net welfare effects that are less positive than expected in the long run (Winters, 2002; Winters and al., 2004; Calvo and Dercon, 2007). This, together with the presence of risky assets (Elbers et al., 2007), may explain *ex-ante* their unwillingness to pursue high average returns linked to the different activities opened up by trade reforms and eventually the possibility to fall into poverty traps (Carter and Barret, 2006; Dercon and Christiaensen, 2011; Barrientos, 2013).

For instance, in the Vietnamese context, poor farmers in the midst of trade reform have two options. The first one is to rely on conservative choices (for example, subsistence farming) as their main risk management strategy, thus insulating themselves from trade-related risks. This leaves them still vulnerable to shocks that existed before liberalization (for example, natural ones), and fails to improve their income. The second option is to make changes in production in response to the new incentives generated by trade liberalization (for example, moving to an export crop such as coffee), with an expected increase in mean income as well as an increase in its volatility. With this choice they could climb out of poverty, but remain vulnerable to risks that existed before liberalization as well as the new ones relating to openness. Assuming that different risks (domestic and foreign) call for different risk management strategies (as well as different risk coping ones when shocks occur), and that households adopting the second option (changing behaviour to get benefit of trade liberalization) do not have appropriate risk sharing strategies, we would register different welfare impacts *ex-post*.

3. Data

Our empirical analysis uses the standard measure of vulnerability to expected poverty (VEP)[6] (explained in detail in Appendix B), drawing on cross-sectional data for the following years: 1992, 1998, 2002, 2004, 2006 and 2008. Data come from two different sets of Vietnamese household surveys: the Viet Nam Living Standards Survey (VLSS) and the Viet Nam Household Living Standards Survey (VHLSS).[7] The variable used for consumption is the real per capita food and non-food expenditure in the past 12 months, re-adjusted by price indexes of regions and months. Poverty lines for computing vulnerability are expressed in Vietnamese Dong as follows: 1,160,000 for 1992; 1,790,000 for 1998; 1,915,000 for 2002; 2,070,000 for 2004; 2,559,000 for 2006; 3,360,000 for 2008.

[6] For a taxonomy of the main methods applied in vulnerability analysis, see Montalbano (2011).

[7] The VLSS was undertaken in the period 1992/93 using a sample of 4,800 households, of which 4,000 were re-interviewed in 1997/98, out of a sample of 6,000 households in total. The VHLSS collected information from a new sample of 29,530 households in 2002; 9,188 in 2004; 9,189 in 2006 and 2008. Unfortunately, as reported by Pham and Reilly (2007) and Le and Booth (2010), the sampling frame for VHLSS differs substantially from that of VLSS: whereas VLSS used the 1989 Population Census, the VHLSS 2002 exploited the Population and Housing Census from 1999. As a result, while there are short panel samples from the last waves, no household was re-interviewed between the VLSS and the VHLSS and, generally speaking, a comparison between VLSS and VHLSS rounds is not possible.

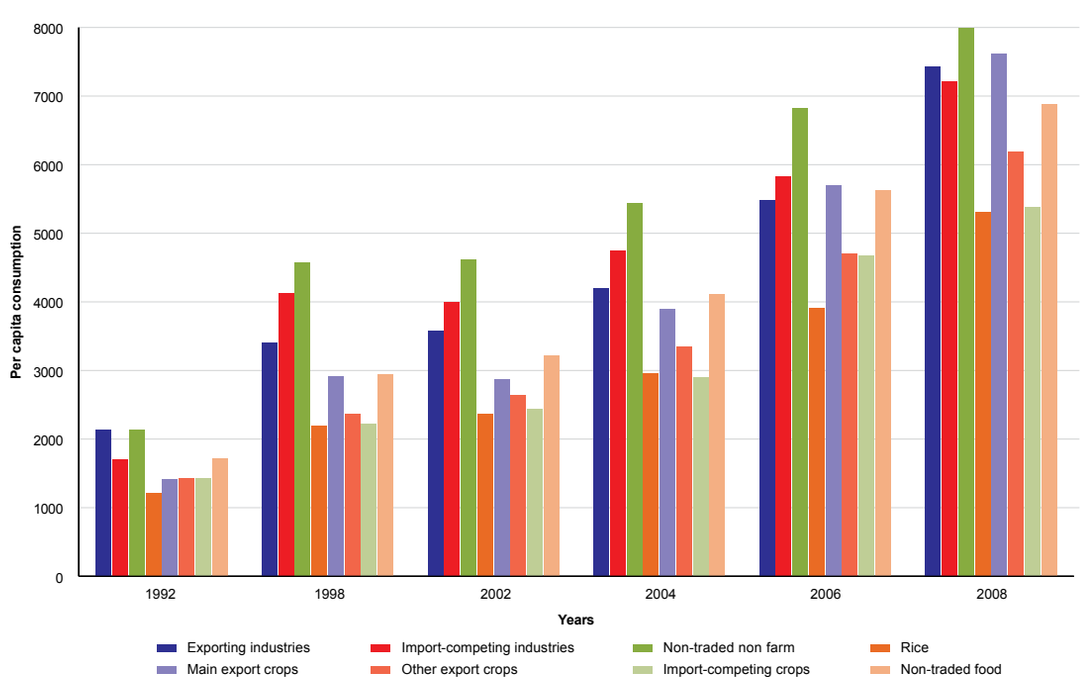
The variable used for household real per capita income has been derived by aggregating income into six major categories: income from crops, income from agricultural sidelines, household business income, wage income, gifts and remittances, and other residual sources of income. While we acknowledge possible measurement errors, when errors are random errors with a mean of zero, and the variable with errors is used as a dependent variable, as in our case, it is well known that those errors will not cause estimation bias. Furthermore, as suggested by Nakata et al. (2009), measurement errors in retrospective expenditure reports seem to be systematically related to household size. This suggests that the inclusion of household size as one of the control variables in our regressions contributes to mitigating biases arising from measurement errors in consumption.

The set of covariates used for our consumption estimates includes household characteristics (such as characteristics of the head of household, i.e., linear and quadratic age, marital status, sex, linear and quadratic terms of family size and number of children); education achievements (primary, secondary, upper secondary, technical/vocational, university) as well as village-level infrastructure characteristics (such as the presence of roads, water pipelines, public transports, urban/rural environment).

Since VLSS and VHLSS surveys do not relate production and external trade, we group households according to the trade openness of their sector of specialization, as in Coello et al. (2010). This requires matching the ISIC code of any sector with the SITC classification used in trade data and classifying sectors as follows: exported manufactures; import-competing manufactures; non-traded services; and agricultural goods. A further breakdown of the agricultural sector is also provided, as follows: rice (considered separately because of its special status for the Vietnamese economy: it acts as the main staple food as well as the main cash crop); the main agricultural export products, other agricultural export products, import-competing crops and subsistence crops. Thus, we come up with eight trade-related production sectors articulated into traded and non-traded, farm and non-farm activities (see Table A.1 for details on the surveyed industries included in each sector).

Figure 1 reports the average levels of mean real per capita consumption for each trading group across time (Table A.2 in Appendix A provides additional statistics

Figure 1: Real per capita consumption (average levels by trade categories in VN Dong)



Source: Authors' calculations

on real per capita consumption, real per capita income, the current values of assets/durables, and the number of surveyed households by each category). The figure shows that, although both farm and non-farm activities actually increased their consumption levels over time, people involved in non-farm activities are on average characterized by higher consumption levels than farmers (the highest consumption is registered by households involved in non-traded non farm), followed by export industries and import-competing manufacturing (and, more recently, by export crops). Conversely, households involved in rice production (actually the vast majority of sampled ones, see Table A.2) show, on average, the lowest level of real per capita consumption. This is consistent with the fact that incidence of poverty is lower in non-farm sectors than in farm sectors (with the exception of farm main-exports and non-traded crops) and fell sharply in households engaged in non-traded farm activities.

4. The empirical analysis

Our empirical analysis adds new pieces of information to the standard picture of poverty and trade liberalization in Viet Nam under *Doi Moi*, by computing both the overall VEP and its risk-induced sub-component for each household in the sample.[8] Table 1 reports the new statistics alongside the poverty rates for each round of household data.[9]

Both poverty and vulnerability fell during the *Doi Moi* reforms. The share of Vietnamese households under the poverty threshold fell from more than 50% at the eve of the liberalization process to about 16% in 2008, while the share of vulnerable households fell from around 56% in 1992 (68% in the case of rural households) to 8.3% in 2008 (10.2% of rural households). The decline in poverty was greatest at the start of the liberalization process (between 1992 and 1998) and more relevant for rural households than for urban households: vulnerable urban households were about 7% of the total at the beginning of the openness process, falling to about 0.5% already in 1998. The same pattern is confirmed when we disentangle farm and non-farm households' activities, although 25% of households involved in non-farm activities were vulnerable in 1992. Vulnerability was higher among male-headed households (9.4% in 2008) than in female-headed households (4%).

Table 1: Vulnerability and poverty in Viet Nam (1992-2008)

	1992	1998	2002	2004	2006	2008
Poverty Rate in the Survey	55.2	29.9	28.0	19.4	15.3	16.4
VEP Rate (%)	56.1	21.5	18.3	10.8	7.1	8.3
Non-Farm	25.1	6.5	6.7	3.4	2.0	2.0
Farm	69.0	30.9	27.9	17.5	12.0	11.7
Rural	68.2	29.8	23.6	14.0	9.3	10.2
Urban	7.1	0.5	0.5	0.1	0.2	0.2
Female	43.5	13.5	8.4	4.4	2.7	4.0
Male	60.7	24.4	21.1	12.6	8.3	9.4
Risk-induced VEP (% vulnerable)	18.7	33.7	31.0	31.2	32.6	31.1
Non-Farm	30.3	47.8	45.9	46.9	46.3	61.7
Farm	17.0	31.9	28.0	28.5	30.4	28.2
Rural	17.7	33.4	30.9	31.2	32.6	31.0
Urban	61.0	87.5	39.4	100.0	33.3	50.0
Female	22.6	40.5	39.5	50.6	46.0	53.7
Male	17.7	32.4	30.0	29.3	31.4	28.6

Source: Authors' calculations.
Note: VEP rates = shares of vulnerable households on total sampled households.

[8] As is common practice, we consider households as vulnerable if they show a probability higher than 0.50 to fall into poverty at least once in the following two years. To this end, we compute vulnerability as one minus the probability of no episodes of poverty, as follows: $V_{h,t+1}=1-[P(lnc_{ht}>lnz)]^2$, given the information set at *t*.

[9] *Ex-ante* vulnerability and *ex-post* poverty should be viewed as different statistics: while we can compare their evolution over time, we cannot draw any cross comparisons between them. For those who are interested in this, Imai et al., (2011) suggest a method of making such a comparison by means of a multinomial logit model, adding $VEP_{h,t-1}$ as one of the arguments.

A different picture comes out if we look at the share of the risk-induced component of vulnerability (i.e., the component of vulnerability associated with a high estimated variance of consumption, but expected consumption above the poverty line). In this case, after a common drop moving from VLSS to VHLSS (between 1998 and 2002), probably due to the substantial difference in the sampling frame between the two surveys, the risk-induced vulnerability never fell below the threshold of 31% of the overall VEP. Moreover, differently than in the overall measure, a higher share of female-headed households than male-headed households are vulnerable by the risk-induced VEP measure, and the former share rises, with more than 50% of vulnerable female-headed households risk-induced in 2008. Also remarkable is the higher incidence of risk-induced vulnerability among urban than rural households, as well as in households involved in non-farm than in farm activities (even if in both cases the former categories show very low percentages of vulnerable households overall). In other words, our analysis shows that the nature of vulnerability changed over time (from poverty-induced to risk-induced).

Table 2 reports the breakdown of the vulnerability statistics by trading sector between farm and non-farm activities.[10] For each trading sector and surveyed year, it shows the total percentage of vulnerable households and the percentage of vulnerable households that are considered as risk-induced. The percentage of vulnerable people decreased steadily in all trade-related sectors

Table 2: Overall and risk-induced vulnerability by farm and non-farm activities and trade-related sectors

		1992	1998	2002	2004	2006	2008
VEP rate (%)	Non-farm activities						
	Export manufactured goods	22.4	10.0	10.8	5.3	3.8	2.3
	Import manufactured goods	43.6	6.1	8.0	4.1	2.9	3.2
	Non-traded non farm	18.9	5.8	5.5	2.8	1.4	1.4
	Farm activities						
	Main export agricultural products	54.5	14.9	25.9	11.0	3.0	3.4
	Other export agricultural products	51.1	26.3	25.3	16.8	7.3	9.3
	Import-competing crops	58.3	39.5	36.8	26.8	13.2	19.3
	Non-traded crops	43.8	22.0	10.8	2.8	1.1	1.9
	Rice	71.6	32.1	27.8	17.8	13.4	12.3
	Net consumer	45.1	16.4	13.3	7.8	4.3	5.4
	Net producer	68.2	27.5	20.5	14.4	10.3	11.1
Risk-induced VEP (% vulnerable)	Non-farm activities						
	Export manufactured goods	31.8	48.5	39.4	41.9	40.9	55.6
	Import manufactured goods	26.4	43.8	45.1	45.5	37.5	60.0
	Non-traded non farm	33.3	48.3	49.0	49.4	52.4	66.7
	Farm activities						
	Main export agricultural products	23.6	56.8	32.1	52.4	55.6	50.0
	Other export agricultural products	20.9	17.1	31.8	31.3	62.5	45.7
	Import-competing crops	14.3	25.5	20.2	25.4	40.0	25.3
	Non-traded crops	42.9	62.5	50.9	75.0	60.0	50.0
	Rice	16.5	32.4	28.5	26.5	28.2	26.4
	Net consumer	20.5	27.5	30.4	34.6	37.7	35.4
	Net producer	17.5	37.9	34.0	28.8	29.9	29.3

Source: Authors' calculations.

[10] Both the F-statistics of the one-way ANOVA and the Levene's T-test reject in each round of observations the null hypotheses that the means and the variances of the estimated income residuals are the same across trade-related production groups. We are thus confronting heterogeneity in unexplained stochastic components when households are gathered by trade-related sectors.

(with the usual jumps moving from VLSS to VHLSS). As a result, in 2008 (our last year of observation), all trade-related sectors register, without exception, a lower percentage of vulnerable households than in 1992. Nevertheless, farm activities show higher percentages than non-farm ones, with the relevant exception of households producing non-traded crops.

According to our VEP estimates, the sectors with the lowest percentage of vulnerable households are non-traded non farm and non-traded crops (in both cases, the percentage of vulnerable households is below 2% in 2008). Among farm activities, the production sector with the highest percentage of vulnerable households is import-competing sectors, followed by rice. Acknowledging the peculiar nature of the rice sector which is, at the same time, the main production sector and the main source of food for Vietnamese households, the last two rows of Table 2 show the decomposition of vulnerability patterns between rice net producers and net consumer households; although the shares of the vulnerable are higher among net rice producers than among net rice consumers, the opposite pattern holds in the case of the risk-induce component of vulnerability. Notwithstanding the fact that the average income/consumption of households involved in main-export crops is similar to that of households involved in non-traded non farm activities (see Table A.2), the share of vulnerable people in the former is higher than in the latter for all years. This is noteworthy if we consider the low incidence of poor households involved in export crops and the roughly equal distribution of income across deciles within that sector.

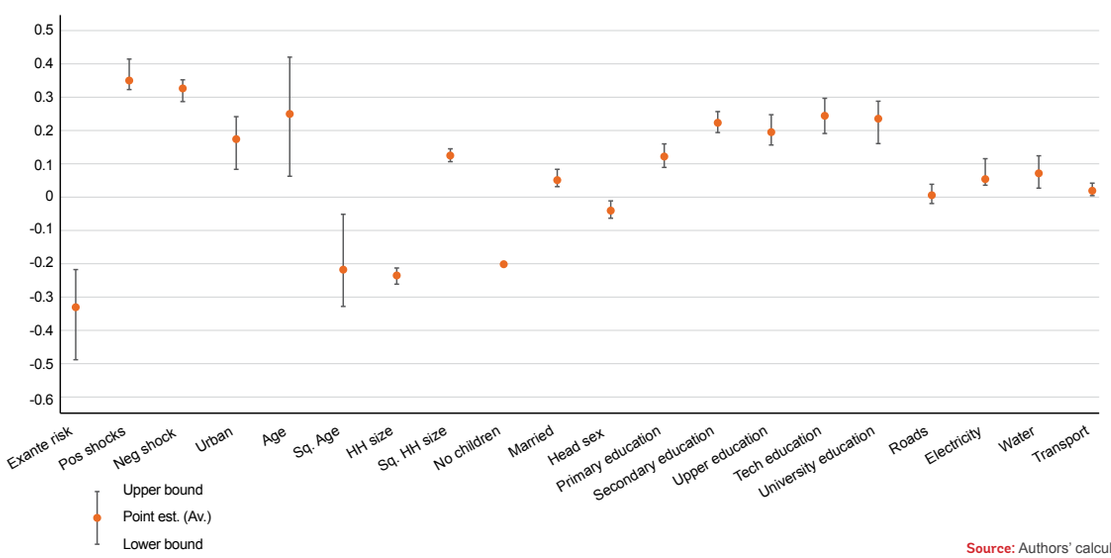
Hence, we can argue that the hypothesis of heterogeneity in vulnerability by trade sector is not rejected by the empirical data in Viet Nam. Furthermore, all non-farm activities register in 2008, generally speaking, a higher share of risk-induced vulnerability than farm ones, where import-competing crops and rice seem to be the least exposed. Although the share of risk-induced vulnerable households is computed on a smaller total number of vulnerable households, this is a relevant issue for policymaking. At the same time, we should acknowledge the inherent weaknesses of VEP of measuring risk appropriately (see Appendix B).

To shed light on the black box of the risk-induced VEP component, we further disentangle the relative weight of its various determinants by calculating the so-called dispersion importance (Achen, 1982),[11] i.e., the proportion of the variance in consumption explained by the different covariates in the vector *X*.[12] Figure 2 plots the average values over the six surveys (the estimated coefficients for each round of the observations are reported in Table A.3 in Appendix A). It shows that all the non-stochastic covariates are statistically significant and show the expected signs.[13] The striking feature of our empirical outcomes is that both our *ex-post* and *ex-ante* stochastic components of income[14] are the most important determinants of household consumption fluctuations.[15]

Figure 3 shows the evolution of the net contribution of the *ex-ante* component of income innovation in reducing households' consumption by clustering households across groups of industries classified as traded, not traded and rice. The picture highlights a higher average of the *ex-ante* stochastic component in the case of the trading sectors compared with non-traded ones, especially in the most recent rounds, net of the usual jump between VLSS and VHLSS.

Even if our exercise cannot be considered a proper test of consumption behavior under risk—because of its static nature—this last result confirms that we are confronting heterogeneity in the variance of income innovation which is correlated with the degree of trade openness

Figure 2: Dispersion importance of the determinants of household consumption (estimated beta coefficient of per capita consumption, period 1992-2008)



Source: Authors' calculations

[11] Standardized coefficients are the regression coefficients when all variables have been standardized to mean zero and variance one (z scores). For more details, see Achen (1982).

[12] See eq. B.7 in Appendix B and the estimated coefficients reported in Table A.3 in Appendix A.

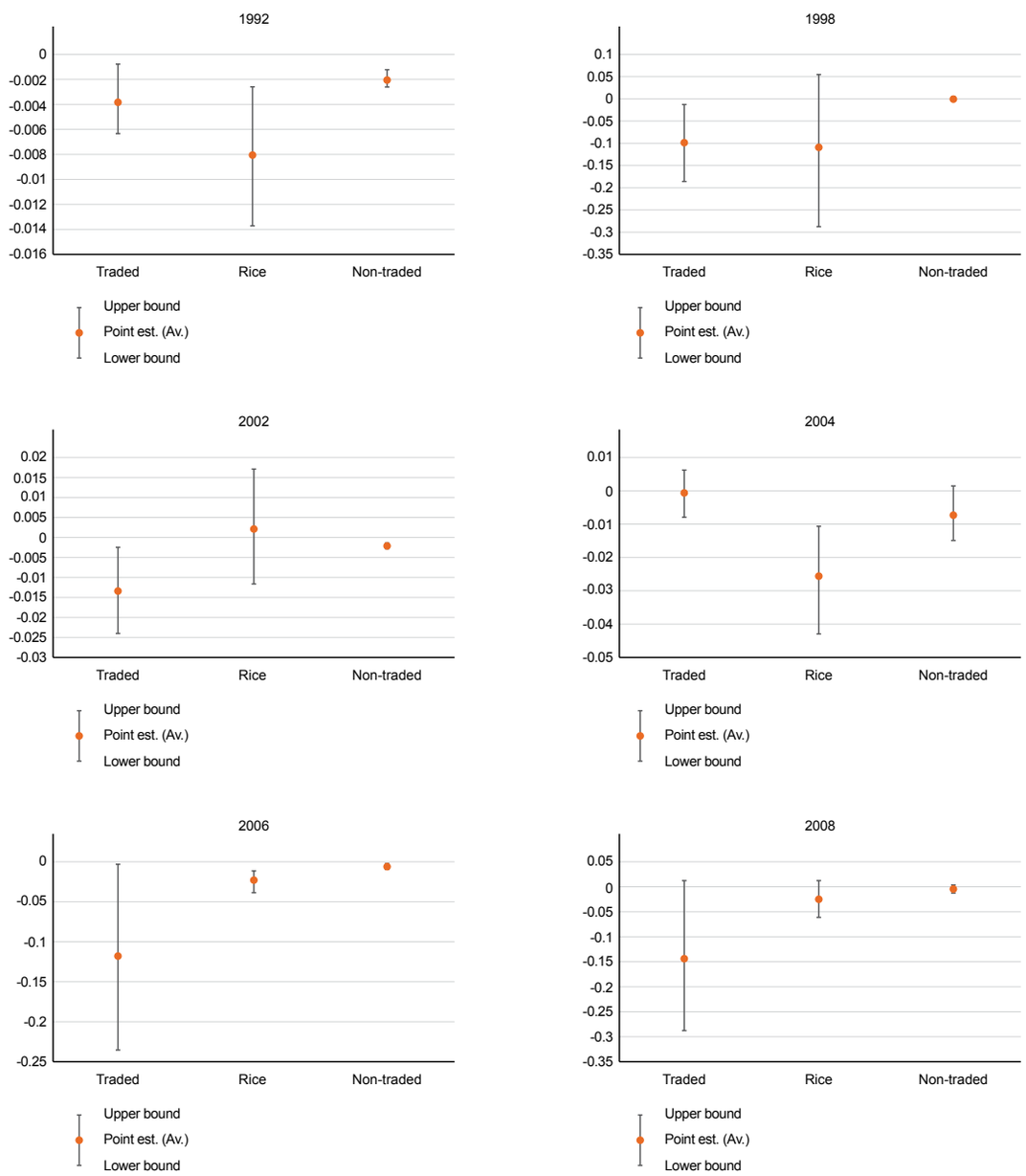
[13] The signs of age and its square coefficients confirm, in principle, the well-known concave age-consumption profile, even if the decreasing rate is in this case meaningless. Not surprisingly, having children reduces household per capita consumption while being married increases it. The significance of the parameter associated with the household dimension also mitigates possible measurement error bias. Whether the head of the household is male or female is correlated with consumption too. The education variables also behave as expected, that is, higher levels of education correspond to higher levels of consumption. Lastly, the presence of a set of village characteristics (urban status and availability of paved roads, electricity, tap water and public transport) are associated with a higher level of consumption as well.

[14] The outcomes of the income equation (eq. 1) which are used to separate the ex-ante and ex-post components of risk are reported in Table A.4 in Appendix A.

[15] For sensitivity purposes additional estimates of eq. B.7 (see Appendix B) were carried out, including dummies for trade categories. On the one hand, this helps us capture possible unobservable income effects other than those already controlled for by the observable characteristics, neutralizing differences in average income between groups (i.e., households in different trade categories show heterogeneous consumption because of heterogeneous income). On the other hand, while the risk term is supposed to capture both within and between group effects, the inclusion of trade categories acknowledges that some risks can be common to households in the same trade group and allows us to isolate the risk effect within groups (i.e., risks are identified within the groups) better than in the estimates without trade categories. While the overall fit of the model with the trade dummies slightly improves, the coefficients of the risk terms do not change significantly. The above evidence suggests that the trade dummies mainly capture differences in mean income that do not influence the risk channel depicted above.

of production sectors. Again, if we are willing to assume it is the upper bound of a proper measure of the trade-induced risk component, the plain conclusion is that, not only is risk increasing over time in Viet Nam under *Doi Moi*, but that its relevance (in terms of net contribution to the variance of household consumption) is proportionally higher the higher the trade exposure of the sector the household is involved in. It is unlikely that this could be caused only by unobserved heterogeneity other than risk, especially if we take into account that it is negatively correlated with consumption behaviour. If that were the case, it would be a very relevant issue for policymaking anyway since it would also imply a revision of the assumed trade benefits for the welfare of Vietnamese households working in the most exposed trading sectors.

Figure 3: Evolution of the net contribution of the risk component on average household consumption (1992-2008) in traded, rice and not traded sectors.



5. Conclusions

This paper presents a comprehensive analysis of vulnerability to poverty in Viet Nam during *Doi Moi*. The results show a decreasing trend in vulnerability to poverty along with a decreasing trend in poverty, confirming the well-known positive impact of the reforms—including trade liberalization—on the overall performance of the country. By these measures, the liberalization process reduced both the observed poverty as well as the risk of future poverty.

However, a more disaggregated picture on the distribution of these benefits reveals that the encouraging results shown at the aggregate level hide the presence of some subsets of the population who face increased risk and thus a high probability of falling back into poverty in the near future. Our analysis tests if this risk depends on the relative position of a household with respect to some specific features such as the typology of its economic activities (non-farm versus farm), trade exposure, and gender. Despite the fall in the vulnerability level from 56% to 8% over the sampled period, we still observe that after *Doi Moi* those employed in farm activities are, on average, five times more likely to fall into poverty compared to households engaged in non-farm activities. The same is true when we look at the distinction between rural and urban areas, making evident that farmers in rural areas still deserve special attention by policymakers interested in limiting an increase of poverty in the near future. Finally, when we look specifically at the risk-induced components of vulnerability to poverty, we detect a relatively higher incidence of vulnerable households in non-farm activities and in female-headed households.

Our estimates also show that vulnerability to poverty varies systematically according to trade exposure of surveyed households, especially for those involved in farm activities. In particular, farmers engaged in the production of export crops and import-competing crops still registered higher levels of vulnerability after *Doi Moi* than those engaged in non-traded crops or non-farm activities and, in some cases, also a new increase in recent years. More interestingly, for the categories exposed to international trade and, therefore, the liberalization process, the risk of future poverty is mainly driven by the risk-induced component. This implies that the threat of falling into poverty does not come from an expected mean consumption below the poverty line, but from its high volatility. By further investigating the determinants of consumption volatility we finally highlight the role of risk heterogeneity across households according to their degree of risk exposure.

These results provide some useful insights to policymakers. First of all, they show that "risk-induced" vulnerability is relevant and significant even in absence of *ex-post* shocks. Second, they demonstrate that the liberalization process needs to be accompanied by additional support to households engaged in those farm activities more exposed to international competition, since trade openness can magnify risk. This is because liberalization changes the riskiness of existing activities, altering the weight of foreign relative to domestic shocks faced by the economy and, as a consequence, the households' optimal economic activities. This is especially true for the smallholder because of their poor ability to take advantage of the positive opportunities created by trade reforms, their weak capabilities to insure themselves against adverse impacts and, possibly, the lack of information about the risks associated with the new activities induced by openness Interventions to address these issues should primarily target trade-induced vulnerable households. First, we need to better protect them from excessive price volatility, in the spirit of the global trade negotiations on special safeguard mechanisms. Second, we also need to help them to carry out progressive choices and take full benefit of trade reforms. This means fostering their ability to take risks consciously. This can be done by supporting self-insurance via savings (through micro-financial instruments), assisting income risk management by providing access to credit, sustaining community-based risk-sharing and pushing the public and private institutions to develop new insurance products targeted to farmers most involved in tradable cropping.

References

Abbott, P., J. Bentzen and F. Tarp (2009). Trade and Development: Lessons from Vietnam's Past Trade Agreements. *World Development* 37(2), pp. 341-353.

Achen, H. (1982). Interpreting and using regression. SAGE Publications Ltd., United Kingdom.

Amemiya, T. (1977). The maximum likelihood estimator and the nonlinear three stage least squares estimator in the general nonlinear simultaneous Equation model. *Econometrica* 45, pp. 995-968.

Banks, J., R. Blundell and A. Brugiavini (2001). Risk Pooling, Precautionary Saving and Consumption Growth. *Review of Economic Studies,* Wiley Blackwell, vol. 68(4), pages 757-79, October.

Barrientos, A. (2013). Does vulnerability create poverty traps? In *Chronic Poverty* (pp. 85-111). Palgrave Macmillan UK.

Blundell, R., and T. Stoker (1999). Consumption and the timing of in-come risk. *European Economic Review*, Elsevier, vol. 43(3), pages 475-507, March.

Calvo, C., and S. Dercon (2007). *Vulnerability to poverty*. CSAE WPS 2007-03, Oxford: University of Oxford.

Carroll, C., and A. Samwick (1997). The nature of precautionary wealth. *Journal of Monetary Economics* 40(1), pp. 41-71.

Carroll, C. and A. Samwick (1998). How Important Is Precautionary Saving? *The Review of Economics and Statistics* 80(3), pp. 410-419.

Carter, M. R. and C. B. Barrett (2006). The economics of poverty traps and persistent poverty: An asset based approach. *Journal of Development Studies* 42, 178-199.

Chaudhuri, S. (2003) *Assessing vulnerability to poverty: concepts, empirical methods and illustrative examples*. New York: Mimeo, Department of Economics, Columbia University.

Chaudhuri, S. and G. Datt (2001). *Assessing Household Vulnerability to Poverty: a Methodology and Estimates for the Philippines*. World Bank Draft.

Chaudhuri, S., J. Jalan and A. Suryahadi (2002). Assessing Household Vulnerability to Poverty from Cross-sectional Data: *A Methodology and Estimates from Indonesia*, (mimeo), Department of Economics, Columbia University: New York.

Christiaensen, L. and K. Subbarao (2005). Towards an Understanding of Household Vulnerability in Rural Kenya. *Journal of African Economies* 14(4), pages 520-558.

Coello, B., M. Fall and A. Suwa-Eisenmann (2010). *Trade liberalization and poverty dynamics in Vietnam 2002-2006*. PSE Working Papers, HAL.

Dercon, S. (2001). *Assessing Vulnerability to Poverty*. Oxford: Mimeo, Jesus College and CSAE, Department of Economics, Oxford University.

Dercon, S. (2005). *Risk, Insurance, and Poverty: A Review*. In: Dercon, S. (ed.), *Insurance against Poverty*, Oxford University Press.

Dercon, S., and L. Christiaensen (2011). Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia. *Journal of Development Economics* 96 (2), 159-173.

Elbers, C., J. W. Gunning and B. Kinsey (2007). Growth and Risk: Methodology and Micro Evidence, World Bank Economic Review, Oxford University Press, 21(1), pp. 1-20.

Foster, J., J. Greer and E. Thorbecke (1984). A class of decomposable poverty measures. *Econometrica* 52(3), 761-766.

Fritzen, S. (2002). Growth, inequality and the future of poverty reduction in Vietnam. *Journal of Asian Economics* 13, pp. 653-657.

Fujii, T., and D. Roland-Holst (2008). *How Does Vietnam's Accession to the World Trade Organization Change the Spatial Incidence of Poverty?* In: Globalization and the Poor in Asia (pp. 47-89). Palgrave Macmillan UK.

Giles, J. and K. Yoo (2007). Precautionary Behavior, Migrant Networks, and Household Consumption Decisions: An Empirical Analysis Using Household Panel Data from Rural China. *The Review of Economics and Statistics* 89 (3), pp. 534-551.

Gourinchas, P. and J. Parker (2002). Consumption Over the Life Cycle. *Econometrica* 70(1), pp. 47-89.

Guiso, L., T. Jappelli and D. Terlizzese (1992). Earnings uncertainty and precautionary saving. *Journal of Monetary Economics* 30, 307-337.

Gunther, I., and K. Harttgen (2009). Estimating Households Vulnerability to Idiosyncratic and Covariate Shocks: A Novel Method Applied in Madagascar. *World Development* 37(7), pp. 1222-1234.

Ha, D., and G. Shively (2008). Coffee Boom, Coffee Bust and Smallholder Response in Vietnam's Central Highlands. *Review of Development Economics* 12(2), pages 312-326.

Heo, Y. and N.K. Doanh (2009). Trade Liberalisation and Poverty Reduction in Vietnam. *The World Economy* 32(6), pp. 934-964.

Hubbard, R., J. Skinner and S. P. Zeldes (1994) Expanding the Life-Cycle Model: Precautionary Saving and Public Policy, American Eco¬nomic Review, 84(2), pp. 174-79.

Imai K., R. Gaiha and W. Kang (2011). Vulnerability and poverty dynamics in Vietnam. *Applied Economics* 43(25), pp. 3603-3618.

Irvin, G. (1997). Vietnam: Adjustment, Growth and Poverty. *Journal of International Development* 9 (September), pp. 783-801.

Jalan, J., and M. Ravallion (2001). Behavioral responses to risk in rural China. Journal of Development Economics, 66(1), pp. 23-49.

Jenkins, R. (2004). Vietnam in the Global Economy: Trade, Employment and Poverty. *Journal of International Development*, 1613-28.

Jensen H.T. and F. Tarp (2005). Trade Liberalization and Spatial Inequality: a Methodological Innovation in a Vietnamese Perspective. *Review of Development Economics* 9(1), pp. 69-86.

Kamanou, G. and J. Morduch (2004). *Measuring Vulnerability to Poverty*. In Dercon, S. (ed.), *Insurance against Poverty*, Oxford University Press.

Le, H. and A. Booth (2010). *Urban-Rural Living Standard Inequality in Vietnam*, *1993-2006*. Mimeo.

McCulloch, N., L. A. Winters and X. Cirera (2001). *Trade liberalization and poverty: a handbook*. London, Centre of Economic Policy Research

Meghir, C. and L. Pistaferri (2004). Income Variance Dynamics and Heterogeneity. *Econometrica*, Econometric Society, 72(1), pages 1-32.

Montalbano, P. (2011). Trade Openness and Developing Countries' Vulnerability: Concepts, Misconceptions, and Directions for Research. *World Development* 39(9), pp. 1489-1502.

Nakata, H., Y. Sawada and M. Tanaka (2009). Asking retrospective questions in household surveys: evidence from Vietnam. Discussion Paper Series 10-E-008. Tokyo: RIETI.

Nadvi, K., J.T. Thoburn, B.T. Thang, N. Ha, N. Hoa, D. Le and E. De Armas (2004). Vietnam in the global garment and textile value chain: impacts on firms and workers. *Journal of International Development* 16(1), pages 111-123.

Nguyen, T.D. and M. Ezaki (2005). Regional Economic Integration and its impacts on growth, poverty and income distribution: the case of Vietnam. *Review of Urban & Regional Development Studies* 17: 197-215.

Niimi, Y, P.V. Dutta and L. A. Winters (2007). Trade liberalisation and poverty dynamics in Vietnam. *Journal of Economic Integration* 22(4), 819-851.

Pham, T. H., and B. Reilly (2007). The gender pay gap in Vietnam, 1993–2002: A quantile regression approach. *Journal of Asian Economics* 18(5), 775-808.

Pritchett, L., S. Sumarto and A. Suryahadi (2000). Quantifying Vulnerability to Poverty: A Proposed Measure with Application to Indonesia, World Bank Policy Research Department Working Paper No.2437, World Bank: Washington DC.

Skinner, J. (1988). Risky income, life-cycle consumption and precautionary saving. *Journal of Monetary Economics* 22, 237-255.

Storesletten, K., C. Telmer and Y. Amir (2004). Consumption and risk sharing over the life cycle. *Journal of Monetary Economics* Elsevier, vol. 51(3), pages 609-633, April.

Thanh, V. T., and N. A. Duong (2009). Vietnam after two years of WTO accession: What lessons can be learnt?. *ASEAN Economic Bulletin* 26(1), 115-135.

van de Walle, D. and D. Cratty (2004). *Is the emerging non-farm market economy the route out of poverty in Vietnam?* The Economics of Transition, The European Bank for Reconstruction and Development, 12(2), pp. 237-274.

Winters, L. A. (2002). Trade liberalisation and poverty: what are the links?. *The World Economy* 25(9), 1339-1367.

Winters, L. A. (2004). Trade liberalisation and economic performance: an overview. *The Economic Journal* 114, F4-F21.

Winters, L. A., N. McCulloch and A. McKay (2004). Trade liberalization and poverty: the evidence so far. *Journal of Economic Literature* 42(1), 72-115.

Appendix

Appendix A: Methods

Table A.1: Industries classification by trade-related sectors

Exports Non-Farm
Fishing, aquaculture
Mining of coal and lignite: extraction of peat
Extraction of crude petroleum and natural gas
Wearing apparel: dressing and dyeing of fur
Footwear
Wood and of products of wood and cork
Office, accounting and computing machinery

Import-Competing Non-Farm
Forestry, logging and related service activities
Mining of uranium and thorium ores
Food products and beverages
Tobacco products
Textiles
Tanning and dressing of leather: luggage
Paper and paper products
Coke, refined petroleum products and nuclear fuel
Chemicals and chemical products
Rubber and plastic products
Other non-metallic mineral products
Basic metals
Fabricated metal products
Machinery and equipment
Electrical machinery and apparatus
Radio, television and communication equipment
Medical, precision and optical instruments
Motor vehicles, trailers
Furniture; manufacturing n.e.c.

Main Export Farm
Black pepper
Exports Cashew, coffee
Rubber, tea

Other Export Farm
Bananas
Cassava manioc
Coconut
Cotton
Cabbage, cauliflower
Mango, Papaya
Peanuts
Pineapple
Sesame seeds
Soy beans
Specialty rice
Sweet potatoes

Rice

Source: Coello et al., (2010).

Non-Traded Non-Farm
Recycling
Electricity, gas, steam and hot water supply
Collection, purification and distribution of water
Construction
Sale, maintenance and repair of motor vehicles
Wholesale trade and commission trade
Retail trade, repair
Hotels and restaurants
Land transport; transport via pipelines
Water transport
Air transport
Supporting and auxiliary transport activities
Post and telecommunications
Financial intermediation
Insurance and pension funding
Activities auxiliary to financial intermediation
Real estate activities
Renting of machinery and equipment
Computer and related activities
Research and development
Other business activities
Public administration and defense
Education
Health and social work
Sewage and refuse disposal, sanitation
Activities of membership organizations n.e.c.
Recreational, cultural and sporting activities
Other service activities
Private households as employers
Extraterritorial organizations and bodies

Import-Competing Farm
Apples, grapes
Fresh vegetables
Indian Corn
Jackfruit, durian
Jute, ramie
Mulberry
Oranges, limes
Other leafy greens
Plums, potatoes
Sugar cane
Tobacco
Tomatoes

Non-Traded Farm
Custard apple (subsistence)
Litchi, logan, rambutan
Sapodilla
Water morning glory

Table A.2: Main descriptive statistics of sampled households by farm and non-farm activities and trade-related sectors (all monetary values are in VN Dong)

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		1992		
Non-farm activities				
Exporting industries	Mean	2192.451	4411.844	50768.46
	Std Dev.	1561.628	4115.385	60503.03
	Min	659.5261	702.151	770
	Max	9416.787	28112.09	254030
	Obs.	90	90	90
Import-competing industries	Mean	1703.968	4010.86	40157.48
	Std Dev.	1096.584	4141.78	69949.56
	Min	644.5936	685.3751	420
	Max	6964.31	32100.77	557640.00
	Obs.	248	248	248
Non-traded non farm	Mean	2141.634	4513.755	54588.53
	Std Dev.	1344.579	4356.647	110483.2
	Min	632.6236	588.8931	325
	Max	13302.89	31179.41	1856910
	Obs.	764	764	764
Farm activities				
Rice	Mean	1205.835	2228.961	11760.01
	Std Dev.	588.1142	2181.356	14503.86
	Min	632.6989	581.9226	250
	Max	9823.781	32836.96	200165
	Obs.	1984	1984	1984
Main export crops	Mean	1415.444	3392.292	14058.95
	Std Dev.	763.8515	3268.074	13966.92
	Min	655.5554	595.1584	700
	Max	5502.093	20253.97	65835
	Obs.	79	79	79
Other export crops	Mean	1422.605	2839.797	12518.11
	Std Dev.	685.3914	3739.296	16657.67
	Min	641.1921	601.6185	145
	Max	4300.459	25073.38	125210
	Obs.	115	115	115
Import-competing crops	Mean	1434.692	2303.38	16439.59
	Std Dev.	785.5209	1808.142	52780.9
	Min	638.0425	583.5345	310
	Max	4542.778	11332.75	429000
	Obs.	68	68	68
Non-traded food	Mean	1713.105	3394.557	9093.655
	Std Dev.	821.2369	2458.819	8167.273
	Min	766.6361	707.5646	1240
	Max	3904.79	9992.304	38770
	Obs.	29	29	29

(continued)

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		1992		
Total	Mean	1501.673	2994.423	24725.37
	Std Dev.	985.8579	3260.65	61269.39
	Min	632.6236	581.9226	145
	Max	13302.89	32836.96	1856910
	Obs.	3377	3377	3377
		1998		
Non-farm activities				
Exporting industries	Mean	3412.447	5272.34	36800.08
	Std Dev.	2260.809	4494.307	40726.13
	Min	781.2977	580.001	2891
	Max	13071.95	31198.08	320369
	Obs.	313	313	313
Import-competing industries	Mean	4128.725	6742.565	37319.39
	Std Dev.	2521.305	4987.061	41747.78
	Min	1000.463	725.8027	1789
	Max	15113.75	28302.5	339667
	Obs.	246	246	246
Non-traded non-farm	Mean	4575.739	7008.84	39891.78
	Std Dev.	2869.457	5516.867	44393.46
	Min	672.0535	607.9286	1606
	Max	18447.21	33397.65	569448
	Obs.	1444	1444	1444
Farm activities				
Rice	Mean	2188.854	3272.888	29498.69
	Std Dev.	1134.081	2615.77	15094.29
	Min	641.6957	580.1642	4395
	Max	17954.53	32352.02	187352
	Obs.	2233	2233	2233
Main export crops	Mean	2913.869	6095.626	50035.58
	Std Dev.	1396.513	5332.938	22506.29
	Min	668.3075	641.0767	13251
	Max	7743.051	31930.03	161200
	Obs.	243	243	243
Other export crops	Mean	2371.039	3299.853	30405.18
	Std Dev.	1352.125	2531.955	16198.06
	Min	642.0324	616.2089	6555
	Max	12183.87	16451.14	162416
	Obs.	257	257	257
Import-competing crops	Mean	2223.277	4110.429	30030.66
	Std Dev.	1124.119	3511.499	14803.79
	Min	763.335	687.3796	5162
	Max	7330.38	23243.84	101753
	Obs.	369	369	369

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
1998				
Non-traded food	Mean	2944.834	5428.627	36216.86
	Std Dev.	1560.53	4595.308	18145.84
	Min	1133.982	650.2026	4147
	Max	12939.04	27087.97	119059
	Obs.	107	107	107
Total	Mean	3075.931	4828.271	34363.51
	Std Dev.	2202.777	4409.839	30268.27
	Min	641.6957	580.001	1606
	Max	18447.21	33397.65	569448
	Obs.	5212	5212	5212
2002				
Non-farm activities				
Exporting industries	Mean	3581.795	6192.238	90606.57
	Std Dev.	2319.123	4590.791	135475.1
	Min	666.2547	908.5842	780
	Max	18474.96	32929.32	1612400
	Obs.	1882	1882	1882
Import-competing industries	Mean	3993.802	6906.522	99507.89
	Std Dev.	2495.643	4745.421	139213.7
	Min	774.4517	877.4553	800
	Max	17656.49	32483.17	1128750
	Obs.	1715	1715	1715
Non-traded non farm	Mean	4610.45	7149.777	122618.8
	Std Dev.	2846.255	4654.243	182739.7
	Min	776.3353	600.4697	330
	Max	18206.18	32900.31	2690650
	Obs.	8192	8192	8192
Farm activities				
Rice	Mean	2370.043	3881.12	37594.71
	Std Dev.	1262.312	2637.034	50991.64
	Min	636.3497	592.4973	400
	Max	16062.52	32126.7	1653200
	Obs.	9992	9992	9992
Main export crops	Mean	2865.149	4745.447	87781.05
	Std Dev.	1681.762	3278.303	108277.1
	Min	661.9562	697.8714	1100
	Max	15316.62	32263.17	936000
	Obs.	1181	1181	1181

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		2002		
Other export crops	Mean	2641.501	4309.072	42263.15
	Std Dev.	1633.2	3023.609	58158.55
	Min	678.9702	683.3324	810
	Max	16090.9	30092.4	1260690
	Obs.	1129	1129	1129
Import-competing crops	Mean	2438.909	4152.161	41147.29
	Std Dev.	1495.762	3064.595	68697.35
	Min	632.3506	766.8577	500
	Max	12432.19	30170.09	1301850
	Obs.	1712	1712	1712
Non-traded food	Mean	3212.053	5584.73	80363.81
	Std Dev.	1635.302	3774.486	88996.52
	Min	781.5004	1139.245	1250
	Max	10509.04	33041.25	759300
	Obs.	501	501	501
Total	Mean	3314.752	5368.969	75403.3
	Std Dev.	2309.087	4038.796	128504.5
	Min	632.3506	592.4973	330
	Max	18474.96	33041.25	2690650
	Obs.	26304	26304	26304
		2004		
Non-farm activities				
Exporting industries	Mean	4194.41	7098.479	166570.5
	Std Dev.	2373.103	4872.359	243364.5
	Min	659.4932	1068.277	1300
	Max	18009.55	31422.96	1600000
	Obs.	567	567	567
Import-competing industries	Mean	4751.13	7275.56	209212.8
	Std Dev.	2883.759	4727.285	289705.9
	Min	804.9464	1373.189	2000
	Max	17426.08	31739.94	2048380
	Obs.	506	506	506
Non-traded non farm	Mean	5442.173	7799.166	240375
	Std Dev.	3058.865	4758.865	309790.3
	Min	762.8577	742.0001	600
	Max	18538.53	32610.54	3400000
	Obs.	2548	2548	2548
Farm activities				
Rice	Mean	2963.063	4482.403	67849.33
	Std Dev.	1632.501	3113.673	114108
	Min	636.2792	662.9399	500
	Max	15168.72	32610.57	2250000
	Obs.	2891	2891	2891

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		2004		
Main export crops	Mean	3897.313	6512.622	152681.3
	Std Dev.	2201.884	4347.045	174252
	Min	660.0689	723.0797	10000
	Max	15519.49	30273.98	1980700
	Obs.	379	379	379
Other export crops	Mean	3343.519	5054.932	90692.55
	Std Dev.	2152.001	3978.047	143519
	Min	649.9424	618.9159	1500
	Max	15193.62	29642.49	1262000
	Obs.	372	372	372
Import-competing crops	Mean	2900.893	4627.119	69519.02
	Std Dev.	1667.725	3135.846	108253.4
	Min	671.829	993.0854	2000
	Max	10585.72	21311.11	1020000
	Obs.	417	417	417
Non-traded food	Mean	4114.86	5867.191	162244.5
	Std Dev.	2018.181	4038.008	180554
	Min	1184.327	878.6608	2000
	Max	12254.45	26558.29	1039000
	Obs.	140	140	140
Total	Mean	4056.495	6091.663	147345.6
	Std Dev.	2617.109	4341.264	235251
	Min	636.2792	618.9159	500
	Max	18538.53	32610.57	3400000
	Obs.	7820	7820	7820
		2006		
Non-farm activities				
Exporting industries	Mean	5484.575	8104.154	178169.8
	Std Dev.	2910.144	4973.715	243101.4
	Min	1267.986	1358.74	1800
	Max	17637.29	31921.04	2014000
	Obs.	561	561	561
Import-competing industries	Mean	5830.48	8496.445	225846
	Std Dev.	2881.169	4785.573	280211.4
	Min	1176.05	1406.036	2800
	Max	17756.82	32552.32	1643450
	Obs.	519	519	519
Non-traded non farm	Mean	6827.813	8997.766	264558
	Std Dev.	3450.417	4902.625	319453.3
	Min	930.5538	1295.668	417
	Max	18586.1	33385.17	2400000
	Obs.	2664	2664	2664

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		2006		
Farm activities				
Rice	Mean	3909.159	7039.552	83972.15
	Std Dev.	2107.268	4862.857	116821.2
	Min	672.7744	1287.076	1500
	Max	18482.16	33404.89	2400000
	Obs.	3242	3242	3242
Main export crops	Mean	5693.544	8731.128	257178.7
	Std Dev.	2959.028	5593.56	283022.7
	Min	1234.334	1582.989	8000
	Max	17913.47	31283.97	2090000
	Obs.	290	290	290
Other export crops	Mean	4698.161	6307.187	131835.8
	Std Dev.	2419.178	3901.14	155912.8
	Min	779.4249	1259.98	2500
	Max	13095.32	25989.33	1230200
	Obs.	215	215	215
Import-competing crops	Mean	4671.11	6601.615	118328.4
	Std Dev.	2424.836	4061.37	206149.1
	Min	1258.001	1334.528	5000
	Max	17009.25	24843.68	2000000
	Obs.	220	220	220
Non-traded food	Mean	5629.526	7690.066	180524.9
	Std Dev.	3147.224	5826.151	170270.9
	Min	1548.176	1482.076	4400
	Max	17925.98	31339.33	916500
	Obs.	90	90	90
Total	Mean	5276.399	7919.612	171695.1
	Std Dev.	3079.31	4964.403	248729.6
	Min	672.7744	1259.98	417
	Max	18586.1	33404.89	2400000
	Obs.	7801	7801	7801
		2008		
Non-farm activities				
Exporting industries	Mean	7431.721	8807.368	305554.5
	Std Dev.	3326.838	5019.76	392335.1
	Min	1890.487	1399.764	3000
	Max	18603.3	32504.56	3200000
	Obs.	357	357	357

Table A.2: *continued*

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
		2008		
Import-competing industries	Mean	7213.916	8786.651	306531.6
	Std Dev.	3409.095	5256.447	362044.7
	Min	1202.683	831.3502	6000
	Max	18455.94	32561.08	3006300
	Obs.	584	584	584
Non-traded non farm	Mean	7998.437	9280.396	362571.2
	Std Dev.	3773.926	5262.812	449682.1
	Min	1290.584	909.3856	2400
	Max	18620.55	33084.13	3023950
	Obs.	1151	1151	1151
Farm activities				
Rice	Mean	5315.16	7805.027	125349.8
	Std Dev.	2800.208	5300.841	161537.2
	Min	682.2064	857.7307	1199
	Max	18584.97	33315.67	2065000
	Obs.	3032	3032	3032
Main export crops	Mean	7612.386	8280.179	389977.8
	Std Dev.	3490.674	5379.078	376865.4
	Min	1485.559	1027.04	3000
	Max	18552.71	28746.93	2118500
	Obs.	328	328	328
Other export crops	Mean	6193.856	6795.463	162927.4
	Std Dev.	3323.963	4636.765	190772.5
	Min	1199.062	954.6352	3388
	Max	17675.93	31684.09	1530000
	Obs.	369	369	369
Import-competing crops	Mean	5374.714	5834.104	152408.7
	Std Dev.	3098.08	3888.351	223396.5
	Min	1300.961	1141.184	2200
	Max	18198.8	29505.73	1803800
	Obs.	384	384	384
Non-traded food	Mean	6875.863	7992.48	283518.5
	Std Dev.	3200.153	5353.364	343254.9
	Min	1828.302	1525.087	4000
	Max	16404.09	32152.04	1724500
	Obs.	102	102	102
Total	Mean	6300.213	8070.583	215784.7
	Std Dev.	3373.366	5239.045	309481.4
	Min	682.2064	831.3502	1199
	Max	18620.55	33315.67	3200000
	Obs.	6307	6307	6307

Note: All monetary values are in VN dongs.

Table A.3: Consumption estimates (1992-2008)

	1992		1998		2002		2004		2006		2008	
	beta	se	beta	se	beta	se	beta	se	beta	se	beta	s.e.
Exante risk	-0.601	0.022	-1.302	0.027	-0.900	0.011	-0.970	0.022	-1.586	0.028	-1.627	0.030
Pos shocks	3.078	0.103	4.710	0.094	5.715	0.058	5.480	0.102	6.113	0.108	5.869	0.121
Neg shock	2.382	0.097	4.039	0.104	5.881	0.052	5.574	0.109	6.175	0.108	5.776	0.116
Urban	0.377	0.042	0.358	0.021	0.309	0.005	0.278	0.013	0.182	0.017	0.111	0.015
Age	0.016	0.003	0.012	0.002	0.010	0.001	0.003	0.002	0.010	0.002	0.015	0.002
Sq. age	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HH size	-0.057	0.008	-0.080	0.008	-0.088	0.003	-0.079	0.007	-0.087	0.007	-0.095	0.008
Sq. HH size	0.003	0.001	0.004	0.001	0.005	0.000	0.004	0.001	0.004	0.001	0.005	0.001
No children	-0.078	0.005	-0.099	0.005	-0.105	0.002	-0.113	0.004	-0.111	0.004	-0.115	0.005
Married	0.072	0.018	0.118	0.014	0.094	0.006	0.094	0.012	0.078	0.012	0.043	0.014
Head sex	-0.057	0.016	-0.041	0.012	-0.070	0.005	-0.105	0.010	-0.052	0.010	-0.014	0.011
Primary education	0.152	0.014	0.118	0.016	0.157	0.004	0.180	0.009	0.172	0.009	0.205	0.010
Secondary education	0.263	0.016	0.297	0.018	0.281	0.005	0.329	0.010	0.300	0.010	0.339	0.011
Upper education	0.364	0.025	0.458	0.020	0.449	0.007	0.473	0.014	0.451	0.014	0.453	0.016
Tech education	0.339	0.021	0.473	0.025	0.576	0.008	0.596	0.013	0.588	0.013	0.564	0.015
Univsity education	0.591	0.047	0.763	0.028	0.792	0.009	0.865	0.016	0.806	0.015	0.854	0.018
Roads	-0.013	0.023	0.092	0.018	-0.024	0.006	0.081	0.011	0.023	0.012	0.022	0.013
Electricity	0.029	0.028	0.229	0.021	0.143	0.006	0.133	0.020	0.323	0.021	0.185	0.030
Water	0.126	0.039	0.171	0.022	0.134	0.005	0.048	0.012	0.069	0.016	0.041	0.014
Transport	-0.017	0.014	0.032	0.011	0.051	0.004	0.055	0.008	0.057	0.008	0.052	0.008
Constant	6.199	0.086	6.082	0.075	6.847	0.028	7.176	0.059	6.254	0.066	6.670	0.073
No Obs.	4222		5446		27140		8117		8162		6702	
Province Dummies	yes		yes		yes		yes		yes		yes	
F	29376.991		53429.174		334587.8804		87373.78528		94107.34282		77907.02981	
Prob > F	0.000		0.000		0.000		0.000		0.000		0.000	
R-squared	0.998		0.999		0.999		0.999		0.999		0.999	
Adj R-squared	0.998		0.999		0.999		0.999		0.999		0.999	
Root MSE	1.898		1.917		1.915		1.879		1.914		1.893	

Note: Feasible Generalized Least Squares (FGLS) coefficients.

Table A.4: Income regressions (1992–2008)

dep.variable: log of real per capita income	1992	1998	2002	2004	2006	2008
Demographic characteristics						
Age of the household head	0.000682 (0.908)	0.0173[a] (0.001)	0.0103[a] (0.000)	0.00204 (0.574)	0.0128[a] (0.000)	0.0176[a] (0.000)
Age^2 of the household head	0.0000117 (0.841)	-0.000136[a] (0.006)	-0.0000836[a] (0.000)	-0.0000341 (0.325)	-0.000114[a] (0.000)	-0.000167[a] (0.000)
Household Size	-0.0147 (0.496)	-0.0373[b] (0.048)	-0.0747[a] (0.000)	-0.0256[b] (0.037)	-0.0619[a] (0.000)	-0.0668[a] (0.000)
Household Size^2	0.000731 (0.637)	0.00204 (0.181)	0.00422[a] (0.000)	0.000954 (0.344)	0.00336[a] (0.003)	0.00380[b] (0.029)
No. of Children	-0.0872[a] (0.000)	-0.113[a] (0.000)	-0.118[a] (0.000)	-0.118[a] (0.000)	-0.110[a] (0.000)	-0.117[a] (0.000)
Married Head	0.0347 (0.326)	0.134[a] (0.000)	0.100[a] (0.000)	0.0782[a] (0.001)	0.113[a] (0.000)	0.117[a] (0.000)
Head sex	0.00275 (0.937)	-0.00864 (0.757)	-0.0396[a] (0.000)	-0.0598[a] (0.004)	-0.0459[b] (0.013)	-0.0401+ (0.106)
Education						
Primary education	0.119[a] (0.002)	0.103[a] (0.005)	0.131[a] (0.005)	0.125[a] (0.000)	0.141[a] (0.000)	0.161[a] (0.000)
Lower secondary education	0.206[a] (0.000)	0.280[a] (0.000)	0.228[a] (0.000)	0.238[a] (0.000)	0.244[a] (0.000)	0.287[a] (0.000)
Upper secondary education	0.282[a] (0.000)	0.424[a] (0.000)	0.355[a] (0.000)	0.288[a] (0.000)	0.310[a] (0.000)	0.384[a] (0.000)
Tech/voc education	0.213[a] (0.000)	0.349[a] (0.000)	0.437[a] (0.000)	0.381[a] (0.000)	0.423[a] (0.000)	0.450[a] (0.000)
University	0.305[a] (0.001)	0.559[a] (0.000)	0.569[a] (0.000)	0.550[a] (0.000)	0.517[a] (0.000)	0.640[a] (0.000)
Occupation						
White-collar	0.0898 (0.156)	0.223[a] (0.000)	0.0914[a] (0.000)	0.103[a] (0.001)	0.112[a] (0.000)	0.133[a] (0.000)
Personal services	0.267[a] (0.000)	0.182[a] (0.000)	0.110[a] (0.000)	0.0343 (0.228)	0.0618[b] (0.016)	0.00921 (0.757)
Production	0.106[c] (0.052)	0.0286 (0.436)	0.0286[b] (0.024)	-0.0165 (0.478)	-0.0240 (0.269)	-0.00320 (0.930)
None	-0.00468 (0.913)	-0.0462 (0.193)	-0.0173 (0.230)	-0.0830[a] (0.003)	-0.0604[b] (0.035)	-0.0179 (0.587)
Village characteristics						
Urban	-0.0574 (0.655)	-0.0840 (0.240)	0.0785[a] (0.000)	0.0114 (0.695)	-0.0538[c] (0.083)	-0.0987[a] (0.007)
Roads	-0.0853 (0.258)	-0.0326 (0.613)	-0.0452[b] (0.038)	0.0606[b] (0.014)	-0.0611[b] (0.026)	0.00751 (0.804)
Electricity	0.0533 (0.445)	0.315[a] (0.000)	0.110[a] (0.000)	0.0843 (0.150)	0.302[a] (0.000)	0.201[a] (0.006)
Water	0.117 (0.314)	0.105 (0.185)	0.0719[a] (0.000)	0.0162 (0.518)	0.0341 (0.231)	0.0616[c] (0.051)
Transport	0.00384	0.0308	0.0408[a]	0.0269[c]	0.0373[b]	0.0416[b]
Constant	7.627[a] (0.000)	6.959[a] (0.000)	8.114[a] (0.000)	8.743[a] (0.000)	8.121[a] (0.000)	8.420[a] (0.000)

Table A.4: Income regressions (1992–2008) *continued*

dep.variable: log of real per capita income	1992	1998	2002	2004	2006	2008
Dummies for trade categories	(0.933)	(0.437)	(0.003)	(0.094)	(0.016)	(0.015)
Exporting industries	0.0144 (0.857)	-0.0550 (0.380)	-0.0337[c] (0.081)	0.0231 (0.435)	-0.00539 (0.845)	-0.00468 (0.887)
Import-competing industries	0.0457 (0.463)	0.101[c] (0.054)	0.0471[b] (0.011)	0.0361 (0.197)	0.0661[b] (0.013)	0.0506[c] (0.072)
Rice	-0.265[a] (0.000)	-0.293[a] (0.000)	-0.260[a] (0.000)	-0.273[a] (0.000)	-0.0573[b] (0.013)	-0.0000530 (0.998)
Main export crops	0.182 (0.264)	0.136 (0.243)	-0.103[a] (0.000)	-0.0208 (0.636)	0.0811[c] (0.086)	-0.0187 (0.706)
Other export crops	-0.162[c] (0.070)	-0.275[a] (0.000)	-0.198[a] (0.000)	-0.214[a] (0.000)	-0.231[a] (0.000)	-0.202[a] (0.000)
Import-competing crops	-0.223[b] (0.016)	-0.0979 (0.016)	-0.186[a] (0.000)	-0.227[a] (0.000)	-0.125[a] (0.005)	-0.204[a] (0.000)
Non-traded food	0.0609 (0.660)	0.0715 (0.536)	-0.0839[b] (0.019)	-0.193[a] (0.001)	-0.188[a] (0.009)	-0.134[b] (0.041)
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.263	0.357	0.427	0.353	0.296	0.305
Obs	3377	5212	26304	7820	7801	6307

a p<0.1
b p<.05
c p<0.1

Appendix B: Methodology for empirical analysis

In this paper, we rely on the most common measure of vulnerability, i.e. the "Vulnerability to Expected Poverty" (VEP). It adapts the standard Foster-Greer-Thorbecke (FGT) index (Foster et al., 1984) to a stochastic environment and looks at vulnerability as the probability that a household will fall into poverty, as follows:[a]

$$V_{ht} = \Pr(lnc_{ht} < lnz | X_{ht}) = \Phi\left(\frac{lnz - ln\hat{c}_{ht}}{\sqrt{\hat{\sigma}^2_{ht}}}\right) \qquad [B.1]$$

where c_{ht} is the per-capita consumption expenditure of household h at time t, z is the monetary equivalent of the poverty line, X_{ht} is a vector of household's characteristics, $\hat{\sigma}^2_{ht}$ is the estimated consumption variance, and Φ is the cumulative function of the standard normal distribution.

The choice to apply the VEP method is driven by two main reasons: (i) it helps us to derive a vulnerability measure for each survey despite the cross-sectional nature of our dataset; (ii) it is consistent with existing poverty analyses since it provides results in terms of expected values of the common *FGT* class of decomposable poverty measures. On top of that, the VEP method provides a decomposition between "poverty-induced" vulnerable households and "risk-induced" vulnerable households (Gunther and Harttgen, 2008). While the first component refers to vulnerable households with estimated expected mean consumption below the poverty line (i.e., permanent low consumption prospects), the second refers to vulnerable households with estimated expected mean consumption above the poverty line, but high estimated variance of consumption (i.e., high consumption volatility). In other words, although characterized by sufficient consumption prospects for the future, risk-induced vulnerable households face the threat of poverty because of risk exposure.

The VEP method uses an ordinary least squares (OLS) procedure to estimate a standard reduced form of the consumption function based on the following simple linear econometric specification:

$$lnc_{ht} = \boldsymbol{\gamma}_0 + \boldsymbol{\gamma}_1 X_{ht} + \boldsymbol{\gamma}_2 V_t + \varepsilon_{ht} \qquad [B.2]$$

where V_t is an additional vector of exogenous variables controlling for the village's characteristics and ε_{ht} is the error term. The VEP method does not model risk explicitly, but assumes that the observed inter-household distribution of consumption at a point in time represents the future distribution of consumption across states of nature for each household.[b] It also overlooks the key role of the behavioral response to risk. Moreover, it does not provide any clue to distinguishing whether vulnerability is properly generated ex-ante (mainly linked to a lack of strategies to reduce

[a] Further details on the computation of this measure for different time horizons will be provided later on. For additional details see Pritchett et al. (2000); Christiaensen and Subbarao (2005); Chaudhuri and Datt (2001); Chaudhuri et al. (2002) and Chaudhuri (2003); Kamanou and Morduch (2004); Gunther and Harttgen (2009).

[b] In practice, the stochastic nature of consumption is acknowledged by assuming that there is heterogeneity in consumption volatility around the mean. Thus, it addresses the issue of heteroskedasticity by using a 3-steps Feasible Generalized Least Squares (FGLS) econometric procedure suggested by Amemiya (1977).

whether vulnerability is properly generated ex-ante (mainly linked to a lack of strategies to reduce risk) or ex-post (mainly associated with a lack of coping mechanisms). To avoid these shortcomings, in section 4 we provided additional insights into the risk-induced sub-component of the VEP to infer the relative importance of the various components of vulnerability (non-stochastic, risk induced and shocks).

The most commonly applied method of extracting parsimonious information on risk from data is to calculate the variance of innovations to income. This is usually performed by calculating the variance of the residuals of an income equation such as the following (e.g., Carroll and Samwick 1997, 1998; Hubbard et al., 1994; Gourinchas and Parker, 2002; Jalan and Ravallion, 2001; Meghir and Pistaferri, 2004; Storesletten et al., 2004):[c]

$$y_{ht} = \boldsymbol{\alpha}_0 + \boldsymbol{\alpha}_1 Z_{ht} + \boldsymbol{\alpha}_2 V_t + \upsilon_{ht} \qquad [B.3]$$

where y_{ht} is the log of per capita income and Z is a vector of exogenous household characteristics.[d] In estimating equation B.3 we insert also a series of provincial dummies which allow us to "clean" the residual of its covariate component. Furthermore, since our aim is to assess households' vulnerability according to the relative trade exposure by trade categories (i.e., households' main sector of employment) in estimating equation B.3 we also insert dummies for trade categories. This assumes that households know which group they are in and hence they do not consider inter-group differences in income as risk, which would be implicitly assumed if we did not control for trade group dummies in the income regression. For each round of observations, we compute the variance of the income innovations by "trade-related" groups as follows:

$$\sigma_{gt}^2 = \frac{\sum_{h=1}^{n} (\upsilon_{hgt} - \bar{\upsilon}_{hgt})^2}{n} \qquad [B.4]$$

where υ_{hgt} indicates income innovation of household h in trading group g at time t. Following Skinner (1988), Guiso et al. (1992), Blundell and Stoker (1999), Banks et al. (2001), and Giles and Yoo (2007), we further rescale it by a factor (π_{ht}) based on household expected wealth. In particular, consistent with the adoption of the constant relative risk aversion utility function, we assume that poorer individuals are more responsive to changes in risk, scaling up the variance of income innovations by the square of the ratio between current household's income and expected lifetime wealth.[e] Our final proxy for income innovation is thus the following:

$$\sigma_{ht}^2 = \pi_{ht} \sigma_{gt}^2 \qquad [B.5]$$

[c] Note that the lack of panel data prevents us from exploiting the time dimension. Hence, we are assuming the unexplained component of income in cross-section data in Eq. B.3 to proximate stochastic innovation. This is not unreasonable: while it is true that the unexplained component also contains non-stochastic unobservables as well as measurement error, it is not necessarily true for the variances of income innovations within sub-samples of households grouped according to their trade openness position.

[d] For identification purposes, the occupation characteristics are assumed to influence consumption behavior only through income.

[e] According to Skinner (1988) and Guiso et al (1992), the exponent of the scaling factor measures the sensitivity to the level of expected wealth exhibited by the reaction to uncertainty. If the exponent is more than zero, the effect of risk on consumption declines with the household's resources and the decline is faster the higher the value. Usually, the adopted value is two and this is why we use the square of that ratio.

[f] The current value in thousand dong of the households' fixed assets and durable goods has been used as a proxy for wealth in the denominator of the scaling factor. Robustness checks using alternative proxies for wealth such as the linear combination of the principal component factors or observed consumption have been implemented. They show the same pattern, suggesting that the negative relationship between ex-ante risk and consumption volatility seems to be robust to alternative empirical proxies for wealth.

where $\pi_{ht} = \frac{y_{ht}}{\hat{w}_{ht}}$ and $\hat{w}_{ht}$ is a measure of the expected wealth.[f] As well as its theoretical foundation, the scaling term has the additional advantage of allowing us to obtain a risk measure that is specific to each household in the sample in each period, further differentiating risk exposure across the households belonging to the same trading group.

To provide a separate measure of the impact of idiosyncratic shocks on consumption, in addition to the ex-ante impact of risk (the former influenced by the available coping mechanisms of the households, the latter by their mitigating strategies), we avoid using self-reported measures of idiosyncratic shocks and instead rely on objective measures based on income realizations, such as the ratio between the household residual from equation B.3 and the predicted level of log income, as follows:

$$\zeta_{ht} = \frac{\vartheta_{ht}}{\hat{y}_{ht}} \qquad [B.6]$$

We also disentangle the positive (ζ_{ht}^{+}) from the negative (ζ_{ht}^{-}) shocks in order to consider the possibility that the households are credit constrained and thus unable to fully smooth their consumption in the event of negative shocks. We exploit these proxies for risk and shock, amending eq. B.2 and estimating the following reduced form:

$$lnc_{ht} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 X_{ht} + \boldsymbol{\beta}_2 V_t + \boldsymbol{\beta}_3 \sigma_{ht}^2 + \boldsymbol{\beta}_4 \zeta_{ht}^{+} + \boldsymbol{\beta}_5 \zeta_{ht}^{-} + \varepsilon_{ht} \qquad [B.7]$$

where ζ_{yht}^{+} and ζ_{yht}^{-} measure, respectively, positive and negative idiosyncratic shocks to differentiate their asymmetric impact on consumption.

Glass Barriers: Constraints to Women's Small-Scale, Cross-Border Trade in Cambodia and Lao PDR[1]

Marlon Seror, Richard Record and Julian Clarke, World Bank Group

1. Introduction

Border checkpoints in developing countries often teem with traders transporting small quantities on foot or pushing carts alongside trucks that sport the insignia of formal companies. Those small-scale, cross-border traders may eventually be superseded by larger import-export firms. But during the process of development, their trade may be a valuable avenue for poverty alleviation and women's empowerment. This chapter focuses on the latter in the context of small-scale, cross-border trade in Cambodia and Lao People's Democratic Republic (Lao PDR). It analyzes recent survey research undertaken by the World Bank and draws conclusions about the key policy implications for facilitating the poverty-reducing impact of women's participation in small-scale, cross-border trade.

Small-scale, cross-border trade (SSCBT) is thought to provide several benefits to developing countries. First, the literature emphasizes its importance as a source of employment and financial resources for poor smallholders and landless households, particularly on a country's geographical (and often socioeconomic) fringes. Second, SSCBT plays an important role in reducing price differences and volatility, thus having a positive welfare impact on poor households beyond those directly involved in this activity (World Bank, 2011). Third, trade offers a way for women to earn money outside the household, which may foster empowerment.

In this context, trade facilitation projects are traditionally built on the expectation that the automation, streamlining and simplification of procedures[2] will foster economic activity and eventually reduce poverty. Small-scale cross-border traders, including informal, female and other categories of potentially vulnerable traders, may benefit at the margins of such projects, e.g., from improvements in transparency. However, they carry small quantities and may fall under customs declaration thresholds. They are poorly educated and thus cannot cope with the administrative tasks demanded of formal firms, and their profit margins may be so thin that compliance with the same customs duties and other border procedures facing firms would prevent them from trading at all (Lesser and Moisé-Leeman, 2009). Trade policy in developing countries thus tends to focus on large, formal firms and firms that might consider going formal, even though many traders are unlikely to formalize in the medium run.

In Cambodia and Lao PDR, the two countries on which this chapter focuses, women tend to be overrepresented in unpaid family labor, while wage-earning jobs are mostly

[1] The research undertaken for this chapter was supported by the Trade Development Support Program in Cambodia, the Second Trade Development Facility Multi Donor Trust Fund in Lao PDR, and the Umbrella Facility for Gender Equality.
[2] See World Bank (2012a) for Cambodia, and EMC (2012) and World Bank (2014a) for Lao PDR.

Women face specific challenges in SSCBT. Besides the "crushing weight of family responsibilities," women are more likely to face capital constraints, market smaller quantities and have difficulties accessing information on market opportunities.

Our findings highlight that although they do not interpret it as gender-based discrimination, women are found to suffer from a higher tax rate and a tax schedule that deters them from upgrading to more profitable cross-border trade activities.

taken up by men (UNIFEM, WB, ADB, UNDP and DFID/UK 2004, World Bank 2012b). Since women's employment opportunities are often limited by cultural norms, restrictions on mobility for safety reasons and household responsibilities, the fact that trade is considered an acceptable occupation for women in the Mekong sub-region (ibid.) makes cross-border trade a valuable avenue for women's empowerment. Lao female traders, for instance, were found in an early study to often earn more than their husbands (Walker 1999), which may allow them to gain financial independence. Prior to this study, women were known to dominate some subcategories of traders in the Mekong sub-region, e.g., fish traders across the Cambodian-Thai border (Kusakabe et al. 2008) and long-distance traders between Lao PDR and Thailand (Walker 1999). In Africa, small-scale, cross-border trade is largely carried out by women (World Bank 2011).

Yet women face specific challenges in SSCBT. Besides the "crushing weight of family responsibilities" (UN Women 2012), women are more likely to face capital constraints, market smaller quantities and have difficulties accessing information on market opportunities (World Bank 2012c). Women are also more likely to be illiterate, which restricts their access to, and knowledge of, trade policies and procedures (USAID 2012) and thus further limits business development. Women often have to hire brokers, which eats into their profit margins, or seek assistance from officials, who are predominantly male and not trained to work in gender-sensitive environments (World Bank 2012b). This may fuel extortion and even harassment, as shown in East Africa (World Bank 2011, UN Women 2012).

Whereas this study does not find women reporting the dramatic level of abuse highlighted in the East African context, women may face binding constraints in their activity as small-scale, cross-border traders. These challenges may be "visible" and acknowledged by (at least some of) the actors in the border economy, e.g., discriminatory tariffs or gender-based violence. The barriers to SSCBT that women face may also be "invisible," i.e., not recognized by those actors as related to gender, or indirectly—through regulations, norms, infrastructure, etc., that adversely affect women—constraining women's participation in cross-border trade.

The contribution of this study is thus to shed light on the obstacles, both visible and invisible ("glass barriers" to trade), that prevent women from making the most of SSCBT for income generation and empowerment. To this end, we rely on an innovative mix of original qualitative and quantitative data to both voice the concerns of the actors in the border economy and econometrically detect constraints that they fail to perceive or would not express. Our combination of qualitative and quantitative data further allows us to infer the constraints faced by women who *selected out* of SSCBT. Following the metaphor of Hausmann, Klinger and Wagner (2008), we shall strive to voice the concerns of both "camels" (women actually

participating in cross-border trade—or the "Sahara desert") and "hippopotami" (who would, but cannot, engage in this activity—are absent from the "Sahara"—and thus do not appear in our quantitative data).

Our study first documents that in contrast to other parts of the world female traders in the Mekong sub-region seldom report abuse and gender-based violence or discrimination; yet women are underrepresented in small-scale, cross-border trade despite a potential for expansion and their dominance in trade and services away from border checkpoints. We next establish that poor infrastructure is a key challenge for traders and acts as an "invisible" source of discrimination, women being more time constrained and thus disproportionately affected. Our findings further highlight that although they do not interpret it as gender-based discrimination, women are found to suffer from a higher tax rate and a tax schedule that deters them from upgrading to more profitable cross-border trade activities. Along with capital constraints, this may explain the lower share of women in small-scale, cross-border trade than among own-account workers and the self-employed.

The structure of this chapter is as follows. In the next section, we present the study design and methodology for data collection. In Section 3, we provide an overview of the border economy in Cambodia and Lao PDR. Section 4 then investigates gender-related constraints to women's small-scale, cross-border trade. Section 5 discusses the results and delineates policy implications.

2. Study Design and Methodology

The profiles of and challenges faced by the women and men who deal with border authorities for a living

cannot be easily described, given the dearth of data on the topic in Cambodia and Lao PDR. Neither country holds a register of small-scale, cross-border traders, as they usually operate only with the documents necessary to enter the neighboring country. This may entail registration with a local government agency, but these traders are seldom registered as foreign traders with a central ministry. Besides, informality often carries stigma, which means that they may be reluctant to acknowledge their line of business.

Given the lack of a list of small-scale, cross-border traders and brokers, an innovative mix of survey strategies was implemented. Three major challenges were involved in collecting data on the population of interest: (i) making sure that interviewees are indeed involved in small-scale, cross-border trade; (ii) establishing a list of border crossers to get an accurate picture of trade patterns and the population; and (iii) drawing a sample of border crossers from that list to gather representative data.

The following approaches were implemented for data collection:

- Preliminary observations were made at various checkpoints in Cambodia and Lao PDR, on the borders with Thailand and Viet Nam—see Table 1. Preliminary observations were meant to: (i) select economically important, diverse and typical border checkpoints to include in the study; (ii) identify research questions for further investigation; and (iii) define the survey methodology and inform survey instruments.
- In all checkpoints visited for preliminary observations, stakeholder interviews were carried out with border agency (customs, immigration, Camcontrol, etc.) staff and management; both small- and large-scale, formal and informal traders and brokers; transporters who do not act as brokers; and various border users and local dwellers. Based on the preliminary observations and stakeholder interviews, three checkpoints were selected for further study: **Bavet** (Svay Rieng province, Cambodia), **Poipet** (Banteay Meanchey province, Cambodia) and **Vangtao** (Champasak province, Lao PDR), on the Cambodian-Vietnamese, Cambodian-Thai and Lao-Thai borders, respectively (Map 1).

In each of the selected checkpoints—Bavet, Poipet and Vangtao—more detailed qualitative data were gathered through focus group discussions (FGDs). They consisted of open questions about small-scale, cross-border trade patterns and the people involved in them. FGDs are helpful to understand the overall picture of small-scale, cross-border trade through traders' and brokers' experiences, as well as through the eyes of those discouraged from engaging in SSCBT. Focus groups separated women and men to build trust and elicit truthful information about gender-specific issues. Representativeness was an essential aspect of each group. The information obtained was used to determine the data collection strategy and refine the questionnaire for the quantitative part of the study.

Table 1: Checkpoints visited for preliminary observations and stakeholder interviews

	Cambodia	Lao PDR
Border with Thailand	Poipet international checkpoint[a]	Vangtao International checkpoint[a]
	Small, bilateral checkpoints in Poipet	Paktaphan
	Malai	
	Daung International Port	
Border with Viet Nam	Bavet International checkpoint[a]	Dansavanh International checkpoint[b]
	Small, bilateral checkpoints in Bavet	Small bilateral checkpoint near Dansavanh
	Srmo checkpoint	

a Checkpoints selected for IDIs and FGDs.

b The study was piloted in Dansavanh, but this checkpoint was not retained because all small-scale cross-border traders and brokers there are Vietnamese and reside in Vietnam. This raised difficulties in terms of logistics and legitimacy since the counterparts for this study are the Cambodian and Lao governments. Moreover, Vietnamese crossers were reluctant to cooperate with the survey team, presumably because many of them are brokers although brokers should be Lao nationals or permanent residents (Financial ministry of the Lao PDR 2005).

Map 1: Checkpoints selected for focus group discussions and in-depth interviews

Source: Map data © 2015 Google. Text and lines in red added by the authors.

- A two-stage quantitative data collection approach was adopted. First, a sampling frame was established—at the border gate proper[3]—to get a clear and accurate picture of SSCBT patterns. Randomly sampling households in villages near the checkpoints was ruled out based on qualitative information, as some traders travel long distances. Moreover, as highlighted in the literature, self-reports may be biased, as involvement in SSCBT can be sensitive. Therefore, we decided to implement a census of all border crossings corresponding to our definition of SSCBT—see Section 3—for 2–3 days. Basic information about the crosser, her role in the crossing and the shipment were recorded in a sampling frame used to randomly sample respondents for in-depth interviews. Based on our qualitative data, we define our population of interest as follows: brokers or traders who *deal with authorities themselves* and are involved in *small-scale* trade, i.e., in the trade of goods that cross the border in human-powered vehicles or vehicles with fewer than four wheels. The rationale for this definition is made explicit in Section 3.

- The second stage consisted of in-depth interviews (IDIs), which were first piloted at all shortlisted checkpoints. The IDIs provided detailed information on both border crossers (demographics, education, past experiences as a trader/broker, perception of challenges, etc.) and crossings (goods transported, purchase value, selling price, etc.).[4] Sample sizes were 55 for Bavet, 55 for Poipet and 48 for Vangtao. Respondents for IDIs were selected from the sampling frame through stratified random sampling to ensure sufficient sample sizes for cross-group comparison, in particular across gender.[5] Since the sampling frame is an exhaustive list of shipment crossings, the sample was representative of crossings and populations (as defined in Section 3) at the selected checkpoints.[6]

[3] Border checkpoints are the natural place to conduct surveys of small-scale traders: all goods traded across the border, wherever they are produced, bought or sold, must cross the border at some point. Qualitative data indeed made it clear that a negligible share of small-scale cross-border trade is carried out outside checkpoints, as goods must then be carried on foot, which inflates transportation costs. There are however informal routes within checkpoint zones, small by-roads that are less thoroughly monitored by border officials. Our sampling design captures those routes.

[4] For the sake of comparability, some of the IDI questions were inspired by the surveys carried out by World Bank (2011) and UN Women (2012). Our survey instruments are available upon request.

[5] The variables used for stratification, carried out at the checkpoint level, include the role of the crosser in the shipment (i.e., trader and broker), gender and nationality. Sampling weights were computed based on the stratum-specific probability of being sampled. The results presented in the chapter are weighted to restore representativeness.

[6] One important caveat is seasonality. First, we are confident that the days on which the census was carried out were typical, i.e., did not coincide with or fall near any holiday. Since virtually all traders and brokers work at the border every day, they are not seasonally selected. It is however possible that seasonal traders work during holidays, and our conclusions do not apply to them. Second, it is possible that some goods are seasonal, e.g., agricultural produce. Traders however specialize in one type of goods and trade in those goods all year. Traders who sell vegetables will thus sell different vegetables (e.g., cabbage vs. carrots) around the year but not different types of goods.

3. Overview of the border economy

3.1 Definition of the population of interest

Small-scale cross-border trade is an elusive concept. Different definitions have been used in the literature, different rules apply depending on the country, the value and quantity of goods traded per crossing may vary from one checkpoint to the next, and SSCBT includes a variety of actors. Thus, we need to develop an alternative, unified definition of SSCBT.

The literature proposes a variety of definitions that revolve around shipment value or the degree of formality of trade activities. UN Women (2012) considers that "all revenue-generating cross-border commercial activities with a daily transaction value of less than 100 U.S. dollars (USD) per trader" qualify as "small-scale" and that traders are "informal" if they are not registered and pay no income taxes, although they might pay export or import taxes, and pass through official border crossings with appropriate travel documentation. World Bank (2011) defines informal trade as "unorganized small-scale trade which does not appear in the customs record." It may however be "official" in the sense that "traders go through official border posts, pay a crossing fee to the immigration office, and if processed appropriately pay a duty on imports" (ibid.).

Such definitions are impracticable in our context for two reasons: (i) small-scale cross-border trade is not "informal" in the case of Cambodia and Lao PDR by any of the usual definitions; and (ii) we had to create a sampling frame by implementing a census of crossings, and the constant flow of crossers prevented us from asking detailed questions (about the value of the shipment and formality of the transactions) to determine eligibility.

All traders and brokers in Cambodia and Lao PDR indeed fill customs forms and are subject to duties. Small-scale traders and brokers, legally defined in terms of registration with the relevant ministries or shipment value (typically, below USD 100) are exempted from a full customs declaration using the ASEAN Customs Declaration Document (ACDD). They instead fill out a simplified customs form, called "Customs Declaration Form for Retailed Declarants" (or "Customs Regime Form 44") in Lao PDR.[7] "Informality" thus rather comes from the way duties are applied by officials: For "small" shipments, duties are more likely to be negotiated or estimated by rules of thumb than dutifully calculated, as is usually the case for "large" shipments. Field observations and stakeholder interviews revealed that officials determine to which category a shipment belongs ("large" or "small") based on the means of transportation. The rationale behind this is probably that means of transportation is readily observable and a good predictor of shipment size and value.

Based on field observations and stakeholder interviews, the population of interest is thus defined by two criteria:

- **People who deal with authorities.** These comprise: (i) traders who do not hire brokers and thus pay taxes and fees and interact with border authorities in general themselves; and (ii) brokers who do that on behalf of traders.[8] Transporters who do not act as brokers and traders who do not interact with authorities are not included in the population of interest. This criterion is meant to capture those who are effectively involved in cross-border trade and thus the most directly affected by border conditions. It is grounded in the qualitative interviews and observations carried out in the first phase of the study, which revealed a clear divide between absentee traders and people present at the border, while there is some overlap between own-account traders and brokers—see Figure 1 in the next section; and
- **People involved in "small-scale" goods trade**[9] (as determined by the first criterion) and who cross the border in human-powered vehicles or vehicles with fewer than four wheels. All the checkpoints selected for this study indeed have clear (informal) rules to distinguish between "small" and "large" trade based on the type of vehicle used. Trucks are always

[7] The use of a Customs declaration shows that small-scale trade is not synonymous with an evasion of duties or legal requirements.
[8] Brokers and traders who are exempted from taxes and fees but would interact with authorities if controlled are part of our study population.
[9] Preliminary observations and stakeholder interviews revealed that the trade of services (hairdressers, housekeeping, etc.) constitutes a very marginal activity at the studied checkpoints. We therefore exclude such traders from the population of interest.

considered as large, carts or motorbikes as small.[10] Whereas this criterion might not be relevant outside Cambodia and Lao PDR, it is suitable for our setting as it (i) facilitated the establishment of a sampling frame, (ii) is in line with officials' rules of thumbs and (iii) is predictive of the "informality" of taxes.

In what follows, the population of interest is referred to as "traders and brokers" or "SSCBTers."

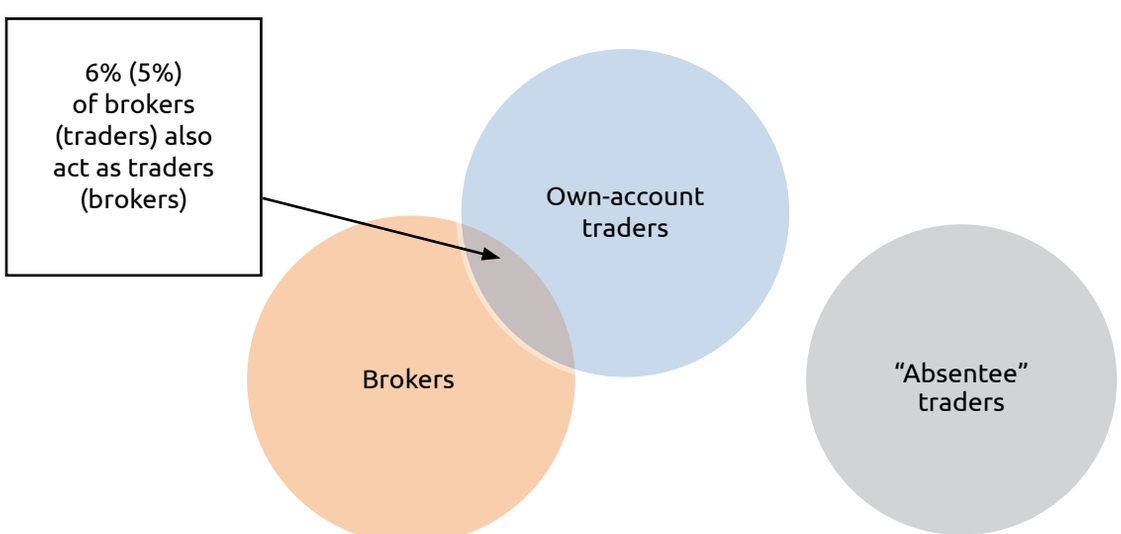
3.2 Structure of the small-scale, cross-border trade population

This definition reflects a striking feature of border economies in the Mekong sub-region: the structural divide between "absentee" traders (who are not considered *cross-border* traders),[11] own-account traders and transporters-brokers, and the differences in this structure across checkpoints. An arrangement between a trader and broker can also assume one of several contractual forms.[12] Qualitative evidence highlights a watershed in the SSCBT population between traders and transporters-brokers on the one hand and "absentee" traders on the other.

Traders rarely engage in brokering, i.e., dealing with authorities on behalf of other traders, and never work only as transporters, while brokers rarely trade on their own accounts but are often hired as transporters, i.e., carrying goods across the border but not dealing with authorities. There is no overlap between "absentee" traders and either cross-border traders or brokers. Figure 1 illustrates this with a simple Venn diagram. In 6% of cases brokers also trade on their own accounts. No trader who deals with authorities and was thus eligible for sampling was found to hire brokers. This implies that the traders who hire own-account traders as occasional brokers are "absentee" traders who never cross the border.

Qualitative evidence hints at the importance of overall

Figure 1: SSCBT Is divided in three distinct activities despite some overlap between brokers and traders



[10] Private cars, tractors, pick-up trucks or minivans are in a "grey zone": They cannot transport goods across the border without going through specific procedures or with a fee that SSCBTers would seldom accept to pay, preferring other (smaller) means of transportation..

[11] Whereas eliciting information from "absentee" traders would yield interesting information about trade patterns, the determinants of informality and the choice of hiring a broker, qualitative information and pilot experience made it clear that they could not be contacted through their brokers. Brokers themselves often deal with intermediaries, typically cart owners in Poipet, who do not deal with authorities and do not handle the goods at any time but rent carts to several brokers and are contacted by traders.

[12] Transporters-brokers are mostly (93% of crossings) remunerated based on how much they have to transport, which is determined either in kilograms or by the number of items; the rest are paid a lump sum. Different contractual arrangements are available and were observed in the field: (i) brokers may keep whatever they can save on taxes and fees (brokers are remunerated in this manner for 91% of crossings) or give back all savings to the trader (8%); and (ii) they may be responsible for the goods in case of confiscation (76%) or not (15%), or share the responsibility (10%) according to idiosyncratic agreements, e.g., depending on whether forbidden goods are concealed in the shipment.

traffic as an explanatory factor for a predominance of brokers at a checkpoint. Busier checkpoints can indeed lead to delays, and traders therefore incur significant losses. This fuels demand for specialized transporters-brokers who know how to get heavy carts across the border faster, where to stop for dealing with authorities and how to minimize taxes and fees. The volume of trade, both by large and small firms, is much larger in Poipet than in the other two checkpoints. Therefore, intermediaries specialized in getting relatively large quantities of goods through a congested checkpoint are much needed in Poipet, and most SSCBTers there are brokers (Figure 2). Conversely, brokers are almost absent in Bavet and completely absent in Vangtao.

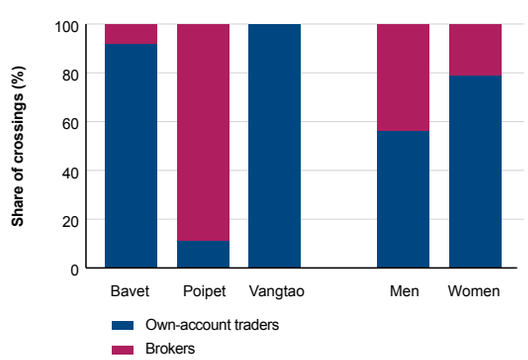
Being a broker is less desirable than being a trader. Besides being more physically demanding, brokering implies interacting with border authorities, negotiating taxes and sometimes smuggling illegal or high-tax goods (illegal or undeclared goods may constitute part of the shipment). Depending on the contractual arrangement, brokers may be responsible for confiscated goods. As shown by our qualitative data, brokers would become traders, had they better access to capital and knowledge of local demand and supply. The quantitative survey indeed confirms that brokers are more likely to take care of shipments that are sold to wholesalers and retailers, whereas own-account traders typically sell their goods directly to final consumers, which implies thicker margins.[13]

Brokers' lack of knowledge of the local market is partly explained by their higher probability of being migrant workers from other provinces, which also means that they are more vulnerable to changes in the local legal environment.[14] In the checkpoints visited, SSCBTers were always Cambodian and Lao on the border with Thailand whereas at least a significant minority of SSCBTers was Vietnamese at checkpoints on the border with Vietnam, preponderantly from border regions. Only 5% of Vangtao traders were born and live in different places, and none of them was born in a different province. About one-fifth (19%) of SSCBTers in Bavet and a majority (86%) in Poipet were born in a different province than the one they currently live in.

3.3 Gender composition of the small-scale, cross-border trade population

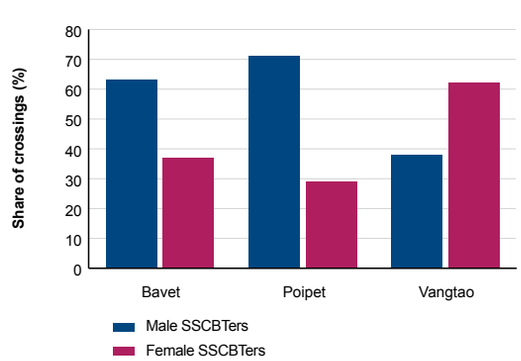
Checkpoints differ widely in their shares of female SSCBTers. Overall, 41% of crossings are performed by female SSCBTers. Figure 3 shows that this share varies by checkpoint. It is higher in Vangtao, where 60% of

Figure 2: The composition of SSCBT by activity differs significantly across checkpoints and gender



Source: Authors' calculations.

Figure 3: Share of crossings by gender



Source: Authors' calculations.

[13] There are also stark differences across checkpoints. Goods are mostly sold to final consumers in Bavet (74% of crossings) and Vangtao (71%), followed by retailers, 25% and 22%, respectively. In Poipet, goods are sold to wholesalers in 38% of crossings, to retailers in 35% and to final consumers in 22% of crossings.

[14] In Poipet, fees for the necessary "immigration card" increased dramatically for non-local residents of Banteay Meanchey province six months prior to the study. The process had also become stricter, as birth and registration certificates were required. The regulatory change was too recent to assess whether it was generating informal arrangements or whether transporters-brokers just accepted the hike. We expect little room for negotiation, as the card is issued by the Thai police and the relationship between Cambodian border users and Thai officials is notoriously poor. Moreover, the interviewees never mentioned this as an issue unless we specifically asked about travel documents.

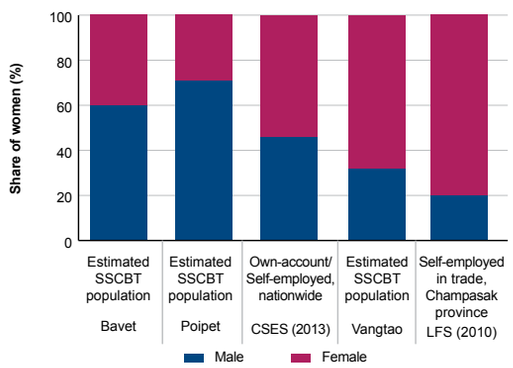
crossings are done by women, and lower in Bavet (37%) and Poipet (29%). Reasonable assumptions[15] about sampling suggest that 68% of the SSCBT population is female in Vangtao, 41% in Bavet and 32% in Poipet. The discrepancy between the shares of women in crossings and in the population of border crossers is an indication of a lower crossing frequency among female SSCBTers.

Those differences partly reflect the structure of the SSCBT population. Women are indeed underrepresented among brokers. Figure 3 shows that 79% of female SSCBTers are own-account traders, as against only 56% of their male counterparts.[16] Only 25% of brokers' crossings are carried out by women, as against 50% of own-account traders' crossings. Female traders however resemble brokers more than male traders in one important respect: They are much more likely to sell goods to wholesalers and retailers than to final consumers, which hints at thinner profit margins and may signal fewer trade opportunities.

The share of women among small-scale, cross-border traders and brokers is lower than among own-account workers and the self-employed in the country. The nationally representative 2013 Cambodia Socio-Economic Survey (CSES) shows that in Cambodia 54% of the own-account or self-employed workers are women (National Institute of Statistics, Ministry of Planning, Kingdom of Cambodia, 2014). This rough comparison suggests that the proportion of women in SSCBT is lower than we would expect from looking at jobs in the same broad category. Similarly, Lao PDR's 2010 Labor Force Survey (LFS) can be used to compare the gender composition in SSCBT with that among the self-employed in wholesale and retail (but not necessarily small-scale, cross-border) trade in the same province. We find as well that the share of women is lower among Vangtao traders—see Figure 4.[17]

Contrary to previous studies, e.g., World Bank (2011) and UN Women (2011) in East Africa, there are no reports

Figure 4: The share of women in SSCBT is lower than in comparable job categories



Source: Authors' calculations.

of physical sexual harassment in the Cambodian and Lao checkpoints surveyed. Great care was taken to elicit truthful answers about such a sensitive topic as gender-based verbal and physical abuse. Female interviewers were recruited to carry out IDIs and moderate FGDs. All interviewers were trained to ask gender-sensitive survey questions in a non-judgmental manner, minimize report bias and write down comments for field supervisors when they suspected reticence. We find no report of physical sexual harassment in the IDIs, which is consistent with FGDs and stakeholder interviews. SSCBTers however mention verbal harassment targeting women, in particular authorities' insistent questions "for the purpose of flirting" and gender-specific insults, either discriminatory or with sexual innuendos.[18] The relatively safe situation of female SSCBTers at Cambodian and Lao checkpoints is reassuring. Nevertheless, the lower share of women in SSCBT than in other trade-related self-employment remains a puzzle and may hint at constraints preventing women from entering SSCBT. The object of Section 4 is to shed light on the constraints that women face in this activity.

[15] These assumptions include: (i) Crossers who cannot be uniquely identified (e.g., because of a missing phone number) are different crossers. This is reasonable given that qualitative and quantitative evidence suggest most SSCBTers cross daily. (ii) The SSCBTers active during the survey period are similar to the general SSCBT population. Qualitative information and pilots suggest that most SSCBTers are active all year round. Seasonal crossers are not captured by the study design. Sampling was carried out and IDIs fielded in early September 2014 in Cambodia and early November 2014 in Lao PDR. (iii) No trade occurs outside sampling hours, which were set to avoid missing any crosser. We found that little or no trade occurs outside official opening times. (iv) No trade occurs outside the official checkpoint (i.e., "round the gate"), which is supported by qualitative evidence.

[16] The IDI sample was designed to ensure that at least half the respondents were women. The purpose was to maximize our ability to detect statistically differences between women and men despite a small sample size. Sampling weights are thus used systematically in the results presented in this chapter.

[17] The LFS and IDIs were fielded four years apart. But, if anything, we would expect female participation in expanding activities, such as own-account trading, to have increased in recent years.

[18] The frequency of such reports is not statistically significantly different between female and male interviewers.

3.4 Self-selection and economic potential

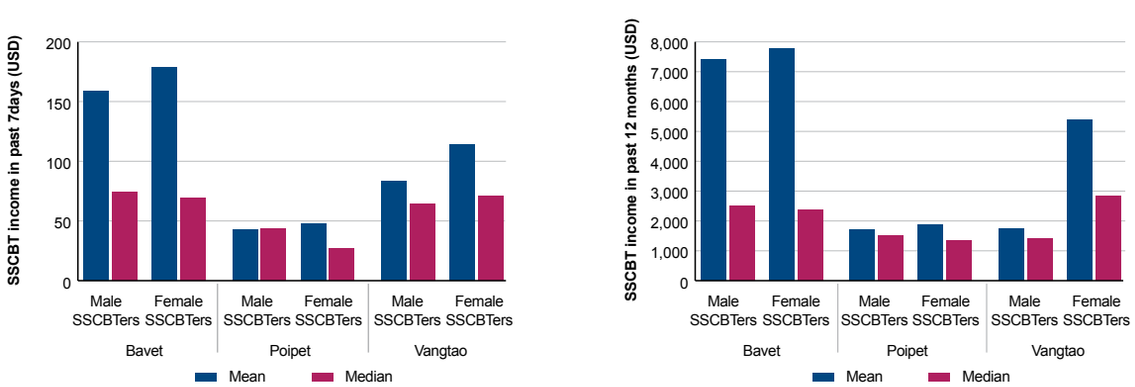
Stark differences can be noticed within the population of interest in terms of income from SSCBT. As can be seen from Figure 5, SSCBT income is much higher in Bavet; it is lowest in Poipet.[19] Mean income from SSCBT is always higher for women, but median income is often lower than for men.[20] The difference between mean SSCBT incomes by gender is statistically significant only in Vangtao. The Lao checkpoint is also the only one where median SSCBT income is larger for women than for men. The absence of significance and reversal of patterns between mean and median incomes in the Cambodian case come from the higher dispersion of female SSCBT incomes. Income is more unequal for women than for men in Vangtao as well.

The higher dispersion of female SSCBT income may hint at untapped economic opportunities. To the extent that moderate income inequality signals a potential for upward mobility, SSCBT may be a worthwhile avenue for income generation, in particular for women. The coefficient of variation of SSCBT income is highest for women in Bavet, where it is twice as large as for men.

Data on household-level socioeconomic status provide further suggestive evidence of a higher earnings potential for women in SSCBT. It is also consistent with positive selection of women into this activity. We proxy for socioeconomic status by asset ownership. Detailed information about 20 assets was gathered in the IDIs and a wealth score computed using principal component analysis (results not reported). We find that traders' households are significantly wealthier than brokers', and female SSCBTers are significantly wealthier than male SSCBTers. This may be the upshot of positive selection of women into SSCBT based on unobserved characteristics, e.g., knowledge of the market, entrepreneurial qualities, etc., which in turn may be evidence of specific challenges that women have to cope with, leading to the exclusion of more vulnerable "hippos" from the "Sahara." The analysis also suggests that being a trader is a preferable or more sought-after activity and confirms that SSCBT can be a valuable source of revenue for women. Male and female SSCBTers also differ in the role that SSCBT income plays in their households. Although noisy estimates often result in a lack of statistical significance, household income is always more reliant on SSCBT earnings in female than in male SSCBTers' households—see Figure 6. This highlights the importance of SSCBT for female-headed households, which are typically more financially vulnerable, and the fact that female traders are often the primary breadwinners in their households, so that trade may be instrumental in empowering women.

Participation in SSCBT is further associated with a higher household socioeconomic status for women but not

Figure 5: SSCBT income varies widely by checkpoint and gender

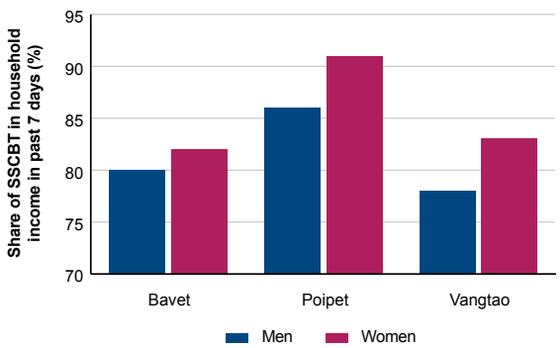


Source: Authors' calculations.

[19] This holds true whether we look at SSCBT income in the past 7 days, which is arguably a more accurate but perhaps dispersed measure, and or in the past 12 months, which is potentially more subject to measurement error.

[20] Conversely, we find that gross profit as a share of the total purchase value of the shipment is at the same level for male and female traders. Differences in total income are thus not due to a higher profit rate for male traders.

Figure 6: Female SSCBTers' households rely more heavily on SSCBT income than male SSCBTers'



Source: Authors' calculations.

for men. Non-wage income data are missing from some of the nationally representative data that we would otherwise use for this comparison. We can however rely on a subset of the IDI assets that are also present in the 2002–03 and 2007–08 Lao Expenditure and Consumption Surveys (LECS). Figure 7 compares asset ownership in Champasak-province households for respondents in the same age group as the IDI respondents in Vangtao. The comparison suggests that the level of asset ownership that we would expect for men in Champasak in 2014 is slightly lower than observed for male traders in the IDI data. However, asset ownership is much higher among female traders in Vangtao. This may be evidence either of positive selection on household wealth of women into SSCBT or of a higher earnings potential, which translates into asset ownership, for women as small-scale, cross-border traders. Data limitations make it impossible to distinguish between these two explanations, and endogeneity precludes a causal interpretation. However, under both interpretations, the comparison suggests that SSCBT is a valuable avenue for income generation for women.

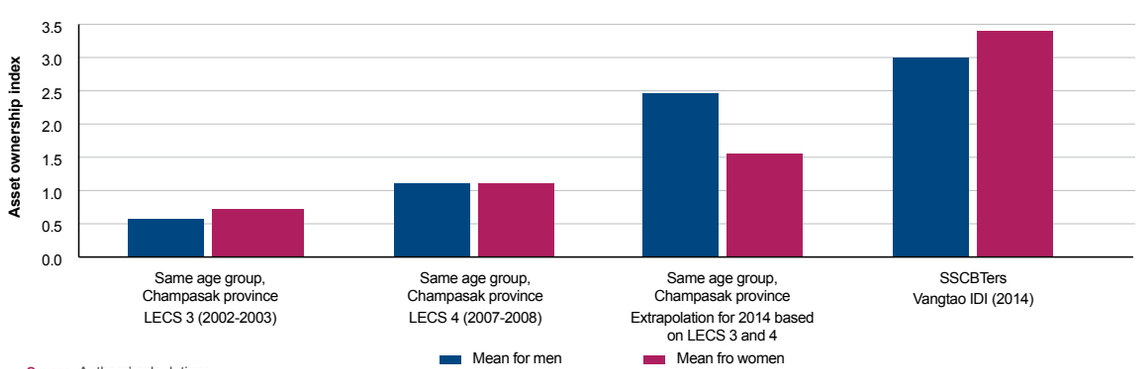
4. Gender-related constraints to women's small-scale, cross-border trade

Both the literature and our data suggest that small-scale, cross-border trade offers a potential for income generation and the empowerment of women. Selection is however likely, which combined with the lower share of women in SSCBT than in comparable activities in Cambodia and Lao PDR hints at binding constraints affecting women more than men. This section investigates such gender-related constraints to women's small-scale, cross-border trade.

4.1 Capital constraints

One of the constraints on women's entrepreneurship and female entrepreneurs' revenues most often singled out in the literature is women's limited access to capital. We find no significant difference in startup capital between male and female traders in our data.[21] Figure 8 however

Figure 7: Wealth comparison using nationally representative data



Source: Authors' calculations.

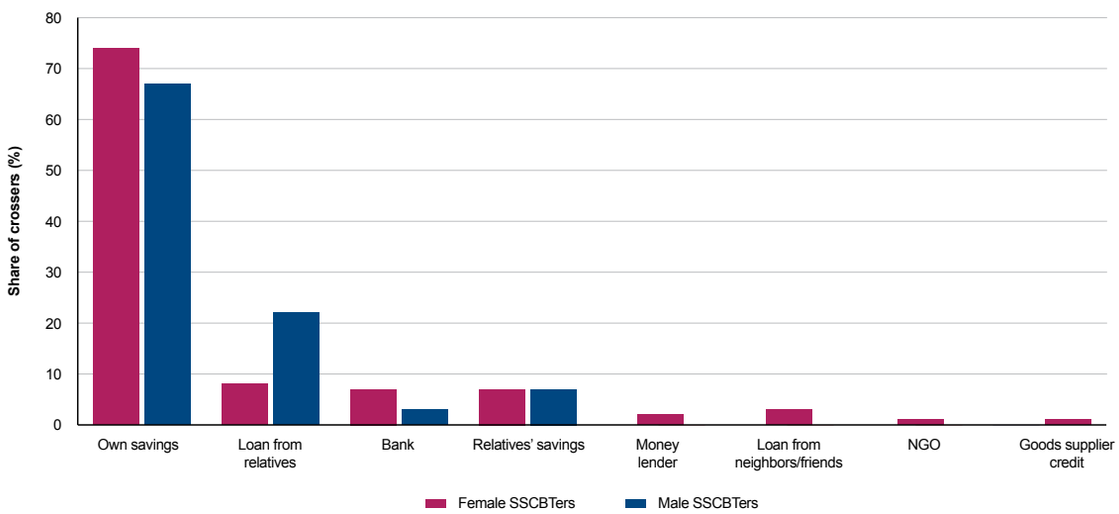
[21] Controlling for age and the year the trader started their activity does not alter the picture.

shows that startup capital comes from a wider variety of sources for female than male traders, and Figure 9 presents a similar picture for how traders finance their daily activities. Since men and women have similar levels of startup capital, this diversification of finance sources by women may hint at capital constraints: It may be possible but more difficult for women to take a loan from relatives, hence a need to look for alternative lenders.

4.2 Time constraints

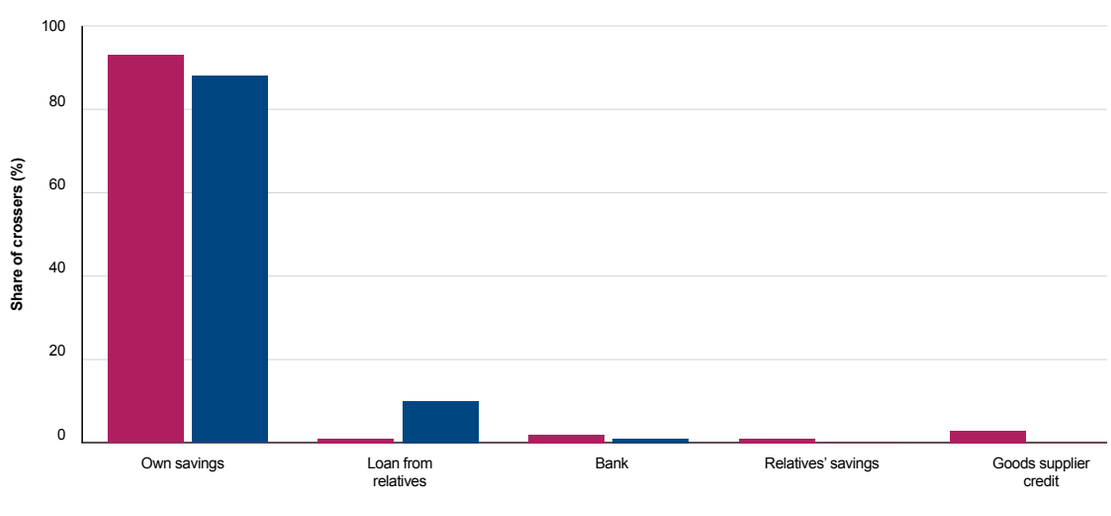
Both SSCBTers and other stakeholders, and both female and male interviewees, primarily attributed the prevalence of men among brokers to physical strength. Time endowment may however be a crucial determinant of women's selection into own-account trading rather than brokering. Since women are usually expected

Figure 8: Women have to knock on more doors than men to mobilize a similar level of startup capital



Source: Authors' calculations.

Figure 9: Female traders' day-to-day financing capital comes from a wider variety of sources

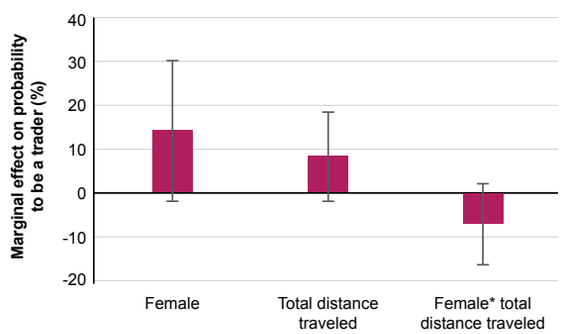


Source: Authors' calculations.

to take care of the household and accomplish more chores than men, women are often found to be more time-constrained, which may in turn affect their activity choices.

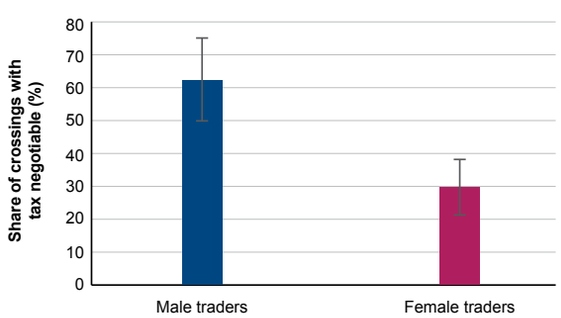
In Figure 10, time endowment is proxied by the total distance traveled by the SSCBTer in her activity, i.e., the distance between the place where the goods are purchased or received and that where the trader sells them (usually, her place of residence) or where the broker stops taking care of them. We see that being a trader is positively correlated with the total distance traveled. The intuition behind this is that brokers usually take care of the goods just for dealing with border authorities.[22] Interestingly, distance enters the regression *negatively* when interacted with the female indicator variable. Although the coefficients on total distance and the interaction just miss the 10% significance cutoff, this is consistent with the idea that time endowment—and thus distance and transportation—are more of a concern for women.

Figure 10: Time constraints as proxied by distance partly explain SSCBT activity choice



Source: Authors' calculations.
Note: The figure displays coefficients from an OLS regression. Country and checkpoints are controlled for. Whiskers represent 95% confidence intervals. "Total distance traveled" refers to the distance between where the goods were purchased (received from the trader) and where they were sold (delivered) by the trader (broker).

Figure 11: Female traders are less likely to report negotiable taxes and fees



Source: Authors' calculations.
Note: Whiskers represent 95% confidence intervals.

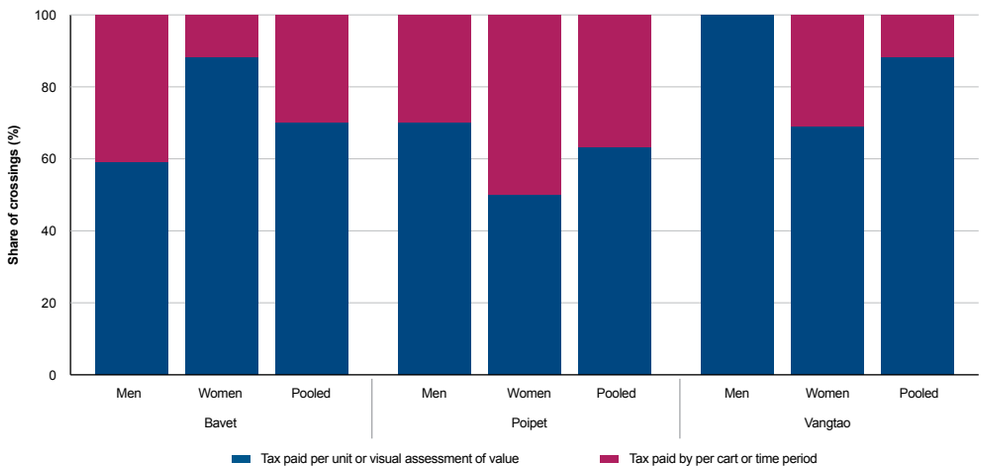
Further evidence of more severe time constraints for women can be gathered from the data. First, stakeholder interviews provide some qualitative evidence that women are overrepresented among the few small-scale "absentee" traders. A common story put forward by interviewees is that mothers cannot afford to leave their homes for extended periods of time, especially as controls and negotiations with border officials make the length of a trip across the border difficult to predict. Second, female SSCBTers are less likely to negotiate taxes and fees at the border—see Figure 11—which is consistent with women's incentive to minimize the time they spend at the border. Third, there are important differences between the way female and male traders are taxed at border and in the transport costs that they incur, which we now discuss.

Goods may be taxed per unit (e.g., by the number of packs or boxes), by "visual assessment" of the quantity and value of the goods, through a "fixed" fee per vehicle whatever the quantity transported, or through a lump sum paid on a daily, weekly or monthly basis. As can be seen from Figure 12, most crossings are reported to give rise to a per-unit or "visual assessment" tax. The data however show that women are significantly more likely to be charged a lump sum per period or a fixed amount per vehicle. One rationale for this gender gap could be that they are more time-constrained.[23] The number of different goods that one carries across the border indeed

[22] A second rationale is that own-account traders make the most of a comparative advantage in connecting sellers and buyers in remote villages, where they often sell goods directly to final consumers.

[23] Women are also found to be more risk-averse than men in our data.

Figure 12: Most shipments are taxed based on unit of value

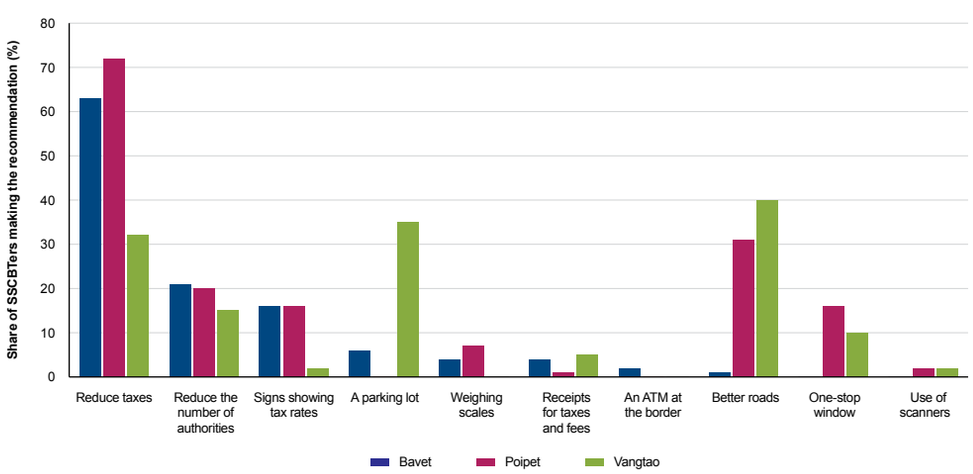


Source: Authors' calculations.

prolongs customs clearance, as officers are supposed to browse through and count the goods to calculate duties. Another interpretation may be that women have weaker bargaining power and cannot make customs officers go through all goods—as they should—to calculate the correct taxes. The difference is significant for Poipet and Vangtao; interestingly, the difference goes in the opposite direction in Bavet, although it is not statistically significant. Distances are shorter in Bavet and SSCBTers can cross the Vietnamese border by motorbike, which is forbidden on the Thai side. This may reduce the importance of time constraints for women in Bavet.

SSCBTers complain about the high level of taxes and fees[24] more than about anything else, and next about the uncertainty in taxes and fees, interactions with border officials and transportation or the length of the crossing process. Unsurprisingly, reducing taxes is SSCBTers' main recommendation to improve border crossings, followed by suggestions to improve roads and transportation

Figure 13: SSCBTers' recommendations to improve small-scale cross-border trade conditions



Source: Authors' calculations.

[24] This pattern is common in surveys about business constraints.

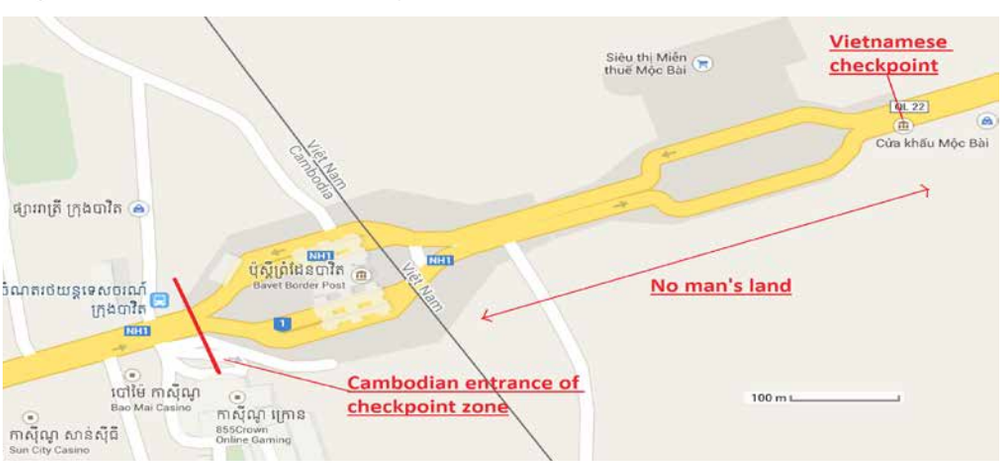
infrastructures—see Figure 13.[25] Only in Vangtao does "reduce taxes" come third, after "better roads" and "a parking lot."[26] The recommendations are supported by qualitative evidence. There is a visible rift in Vangtao between traders who have a pick-up truck and can load goods onto it immediately after the physical border—see Map 4—and the others who share minivans and tuk-tuks, parked downhill at the entrance of the checkpoint zone. Road quality is also a major concern in Poipet and Vangtao, but field observations suggest that the recommendation pertains primarily to breadth (to avoid traffic jams).

Calling for a "reduction in the number of authorities" and "one-stop windows" reflects both transportation issues and informal taxation that is not justified as duties. Checkpoint zones often cover a large crowded area (see Maps 2 through 4), that SSCBTers must cross in several directions to pay taxes and obtain the necessary documents, e.g., a day ticket to cross the border. This is particularly strenuous, as SSCBTers often lack a motor vehicle because of the cost (gas and/or additional fees) or because of regulations. Motorbikes are forbidden to cross the Thai border with goods, and on the Vietnamese border one must dismount and walk across the wide no-man's land—see Map 2.

> "A number of recommendations relate to the enhancement of SSCBTers' knowledge of the laws and regulations applicable and of their bargaining power, which in turn would help reduce the time wasted in negotiations."

A number of recommendations relate to the enhancement of SSCBTers' knowledge of the laws and regulations applicable and of their bargaining power, which in turn would help reduce the time wasted in negotiations. Such recommendations include signs showing tax rates (which were not displayed in any of the checkpoints visited), weighing scales and receipts for taxes and fees. Female traders and brokers are expected

Map 2: Spatial organization of Bavet international checkpoint



Source: Map data © 2015 Google.
Note: Text and lines in red added by the authors.

[25] It is important to note that many recommendations are put forward by a relatively small percentage of SSCBTers. The upshot is that there might be no easy fixes to improve small-scale, cross-border activities, and efforts in several directions should be combined.

[26] This finding jars with the much higher taxes found in Vangtao (Figure 15). We see this as a further illustration of the discrepancy between actual and perceived challenges. People often lack a point of comparison, which makes barriers—discrimination, poor institutions, corruption, etc.—"invisible."

to benefit the most from a faster, simpler and more predictable border clearance.

Female SSCBTers' aversion to long border crossings is also obvious from transaction-level data on transportation costs. Greater needs for transportation services, e.g., hiring help to pull carts or a motorbike to transport a shipment faster, are the main challenge specific to women that SSCBTers put forward. Figure 14 shows that on average female traders spend more than twice as much as men per crossing on transportation costs, which eats into their business margins.[27] Another option for time-constrained women is to transport smaller quantities. Despite these costly fixes, delays are apparently more frequent for women and customers are reported to avoid entrusting female brokers with their goods.

Map 3: Spatial organization of Poipet international checkpoint

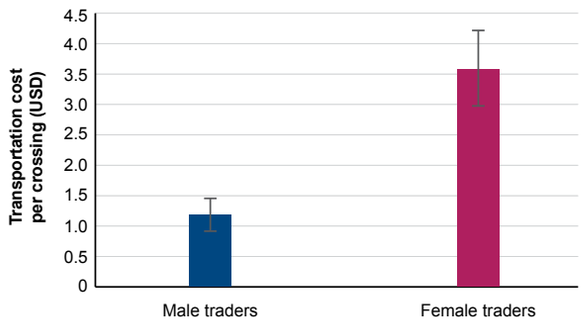
Source: Map data © 2015 Google.
Note: Text and lines in red added by the authors.

Map 4: Spatial organization of Vangtao International checkpoint

Source: Map data © 2015 Google.
Note: Text and lines in red added by the authors.

[27] It is important to note that the crossing-specific cost data collected in the IDIs were extremely detailed. Transportation costs are thus distinct from fees imposed on vehicles, duties determined based on the number of carts, or bribes related to transportation.

Figure 14: Female SSCBTers spend more per crossing on transportation costs



Source: Authors' calculations.
Note: Traders only. Whiskers represent 95% confidence intervals.

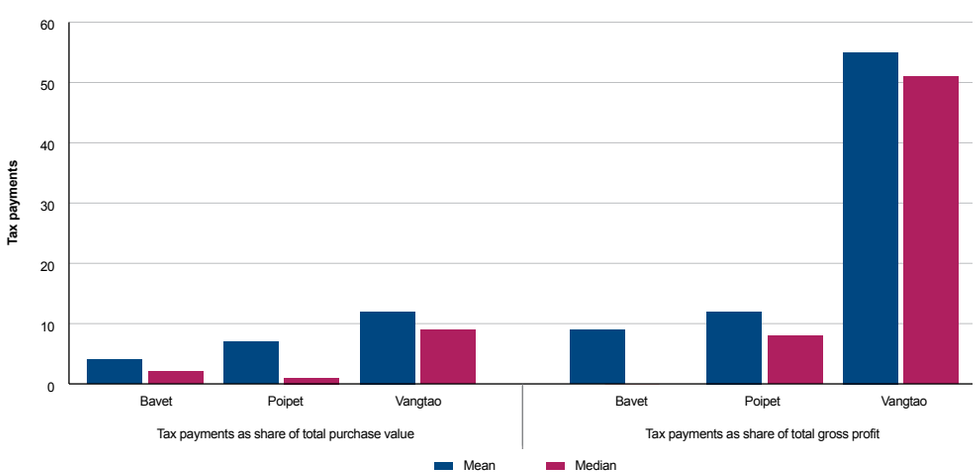
4.3 Discriminatory treatment

The constraints identified in the first two parts of this section may affect women disproportionately but cannot be directly blamed on interactions between border crossers and officials. The actors in the border economy seldom acknowledge taxation practices as harming particularly female SSCBTers. Econometric analysis however reveals that women pay higher taxes and are more likely to be controlled although they do not bend the rules more often than men.

First, while contrary to complaints voiced by traders and brokers the tax burden on SSCBT is relatively light except in Vangtao (Figure 15), tax rates are higher for female than male traders.[28] This holds true whether we look at tax payments as a share of total purchase price or total profit—see Figure 16. It also holds true whether we consider averages, medians or—as in Figure 17—the whole distribution. Higher tax rates on female traders cannot be explained by goods quality or scale economies captured by male traders, as male and female traders enjoy similar gross profit rates.

Second, female traders are significantly more likely to be controlled by quarantine officers, which hints at deliberate targeting. The difference, driven by the Vangtao sample, remains significant when one controls for perishable food products, which make up almost half of the crossings in SSCBT and are more often traded by women. The regression results displayed in Figure 18 strongly hint at discrimination or at least deliberate targeting of women. Quite strikingly, men are not statistically significantly

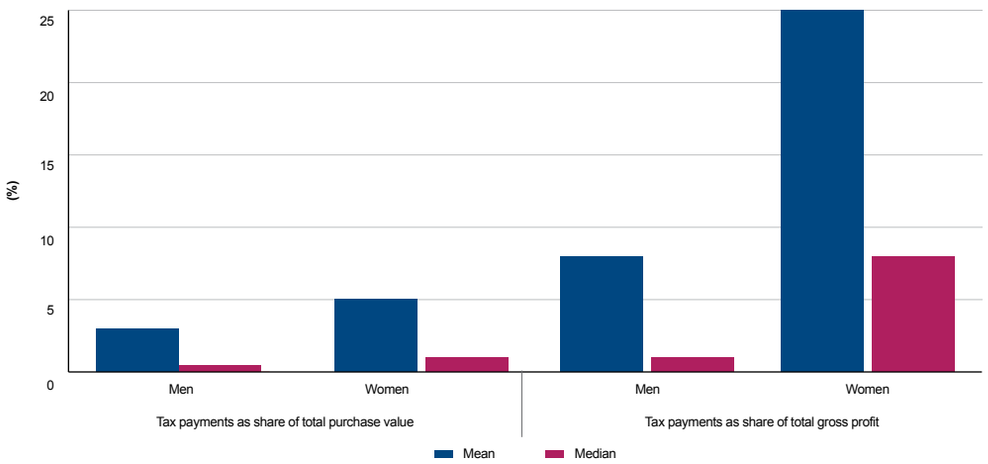
Figure 15: Tax payments as a share of gross profits are high in Vangtao



Source: Authors' calculations.

[28] The IDI data contain unique information on shipment values, taxes and fees that enable us to shed light on the tax burden faced by female SSCBTers relative to men. Tax rates remain moderate when compared with the value of the goods, but most of Lao traders' profits vanish in taxes and fees levied by border officials when looking at tax payments as a proportion of total gross profits (total sale minus purchase price)—see Figure 15. The marked difference in Lao PDR between the two tax rate definitions shows that profit margins are very thin in Vangtao. Since brokers are not always able to put a figure on the value of the shipments they are taking care of, results about the tax burden are based on traders' answers.

Figure 16: Female traders face higher tax rates than their male counterparts

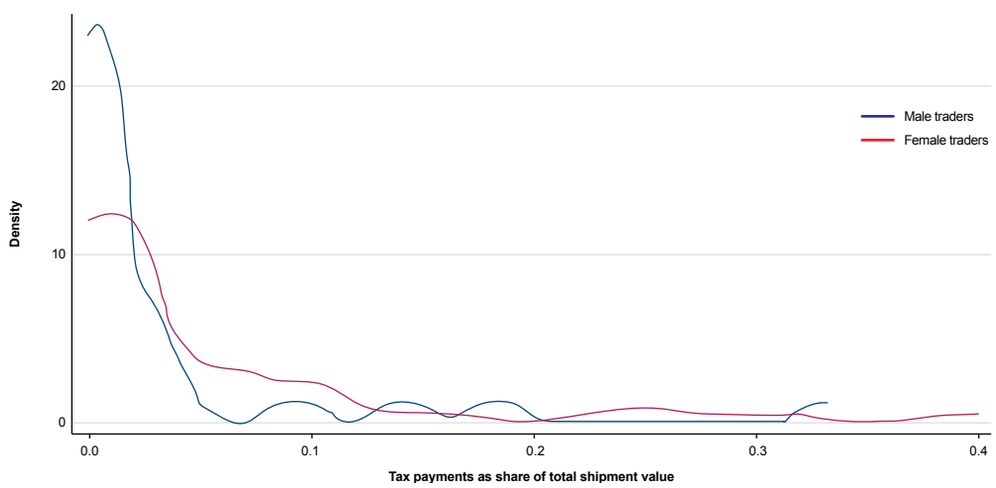


Source: Authors' calculations.

more likely to go through quarantine when they deal in perishable foods (as shown by the small and insignificant coefficient on the "perishable food" indicator variable). It must be noted that given the small sample size and endogeneity in the regression, we cannot be positive that Figure 18 provides evidence of discrimination. It is possible that quarantine officers "target" female traders for tax payments and controls because women are 29% more likely (keeping activity and checkpoint constant) to deal in perishable foods. This practice nevertheless hurts female traders, as they are more concentrated in terms of types of goods traded. Traders dealing in perishable goods are also more vulnerable to delays and confiscation—a common practice at Cambodian and Lao checkpoints—as market days are often fixed and the goods must be sold fresh.

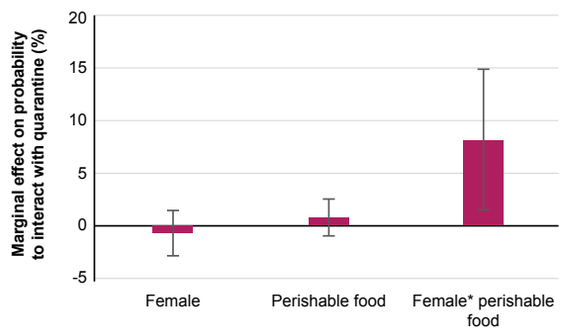
Female SSCBTers' higher tax burden and greater interaction with quarantine cannot be directly linked with female traders and brokers indulging in illegal practices

Figure 17: Tax rates faced by female traders are higher at almost every level



Source: Authors' calculations.
Note: The figure displays univariate kernel density estimations of tax rates for male and female traders. The Epanechnikov kernel is used.

Figure 18: Women dealing in perishable foods are more likely to interact with quarantine

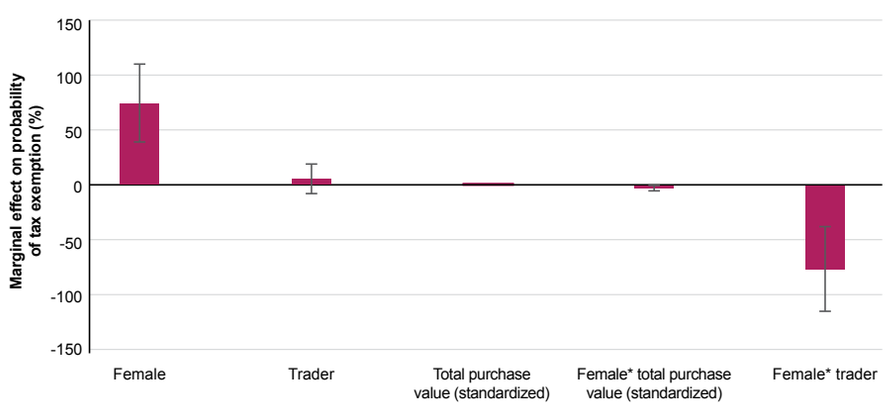


Source: Authors' calculations.
Note: The figure displays coefficients from an OLS regression using data from all three checkpoints. Country and checkpoints are controlled for. Whiskers represent 95% confidence intervals.

more than men, for example due to a low-trust equilibrium between border authorities and female crossers. The IDI data contain information on whether in the 12 months preceding the survey the respondent had "omitted to declare goods or underreported their quantity or value on purpose in order to avoid taxes."[29] We find that about one tenth of SSCBTers admit to deliberate tax evasion in the past year, but stakeholder interviews revealed that SSCBTers are reluctant to confess tax evasion. Their answers on this topic are therefore likely to be biased downwards. We decided to include in the IDI survey additional questions to take into account SSCBTers' reticence and adjust estimates of the incidence of tax evasion accordingly. The methodology implemented relies on Kraay & Murrell (2013). SSCBTers' direct answers to the binary question about tax evasion in the past 12 months are contrasted with the reticence-adjusted estimates. We leave the presentation of the relevant survey items to Appendix A and of the methodology and results to Appendix B. The main finding is that although rates of tax evasion are higher when taking reticence into account, they are neither significantly nor qualitatively different between men and women.

Third, women are charged higher taxes on larger shipments, whereas male traders face no disincentive to expanding their activity. As can be seen from the regression coefficients displayed in Figure 19, female SSCBTers face progressive taxation, while their male counterparts do not. Tax exemption[30] is indeed less likely, the higher the value of a female SSCBTer's shipment (as shown by the significantly negative interaction of the "female" indicator variable with "total purchase value"). Conversely, no such effect is found on male SSCBTers ("total purchase value" on its own is insignificant).

Figure 19: Female brokers are more likely to benefit from tax exemption, not female traders



Source: Authors' calculations.
Note: The figure displays coefficients from an OLS regression. Country and checkpoints are controlled for. Whiskers represent 95% confidence intervals. "Total purchase value" is standardized by checkpoint. The reference category is male brokers.

[29] Some goods, e.g., alcohol, are subject to declaration in some checkpoints and simply forbidden to cross the border in others. A common practice for traders who want to minimize taxes is to hide high-duty goods under low-duty ones. This is particularly effective under the "visual assessment" method, which remains usually superficial.

[30] Tax exemption is a widespread tool to introduce progressive taxation in the three checkpoints. Since brokers are not always able to put a figure on the value of the shipments they are taking care of, results about the tax burden are based on traders' answers.

Fourth, female SSCBTers are discouraged from upgrading to own-account trading, while male brokers face no such disincentive. Figure 19 indeed further shows that the probability of tax exemption is significantly lower for female traders than for female brokers. This can be seen from the large negative coefficient on the interaction of the "female" and "trader" binary variables. Male traders do not differ from male brokers in their probability to benefit from tax exemption (see the insignificant "trader" variable, male brokers being the reference category in this regression).[31] This generates a tax wedge that may discourage women from upgrading to own-account trading, which we saw is a more profitable cross-border activity.

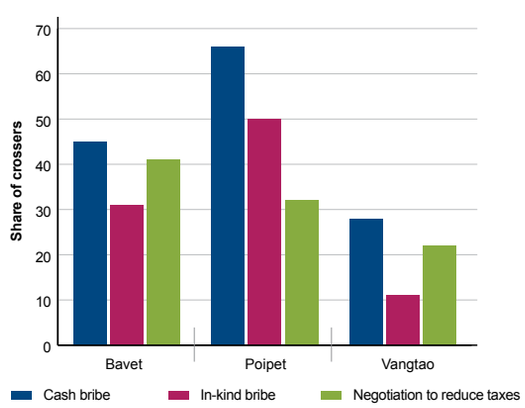
5. Discussion and policy implications

Based on a mix of qualitative and quantitative data, we have highlighted major constraints that compress female SSCBTers' profits and that are likely to deter other women from engaging in small-scale, cross-border trade. Some are visible to the actors in the border economy, while others, invisible, work as "glass barriers" to female cross-border trade and entrepreneurship. The main barriers are: (i) capital constraints, (ii) time constraints, and (iii) a higher tax burden. We consider that (ii) and (iii) are—at least partly—due to border checkpoint infrastructures and interactions with border officials, and thus ought to be tackled by border authorities.

SSCBTers' most frequent complaints pertain to the high number and volatility of taxes and fees. Traders and brokers are usually unaware of the legality, tariff rate and purpose of levied taxes and a high proportion reports paying bribes—see Figure 20.[32] We also realized during field observations that virtually all border agencies tax traders and brokers, sometimes in blatant violation of their mandates, and SSCBTers must travel back and forth within checkpoint zones to make payments. Women are likely to be particularly harmed by informal taxation, as negotiations and multiple payments take time. An obvious implication is to streamline taxation at border checkpoints and ensure that only legal taxes are levied. Signs displaying tax levy rules and the tariffs applicable should be posted at each checkpoint and kept up to date.[33] The display of tariffs could be complemented by the equipment of checkpoints with weighing scales, a recommendation some SSCBTers put forward. They would indeed avoid time-consuming negotiations and help reinforce SSCBTers' bargaining power. Finally, one-stop windows should help reduce border clearance time.

Women's time constraints also resonate with another major hurdle in trading goods across the border: transportation. SSCBTers' top concerns include narrow roads that cause traffic jams and delays, the lack of public transportation and parking lots, and restrictions on the types of vehicles allowed across the border with goods. The first way to tackle the issue of transportation consists of investing in transportation infrastructure. The most crowded of the checkpoints visited is undoubtedly Poipet, where large trucks, private cars, SSCBTers' carts and tourists on foot all go through the same gate. Infrastructure improvements could also include parking lots that would enable better-off SSCBTers to invest in

Figure 20: Bribe payments are widespread at Cambodian and Lao checkpoints and take a variety of forms



Source: Authors' calculations.

[31] The gender gap in tax exemption is not due to differences in shipment values, since Figure 19 controls for that.

[32] Note that the reported incidence of bribe payments does not significantly differ between women and men.

[33] Whereas SSCBTers in FGDs complained about the level of taxes, they were seldom inclined to reject negotiability, probably out of fear that the application of tariffs set in stone would be detrimental to them. But if the average tax rate were to remain unchanged, predictable tariffs would improve SSCBTers' welfare, especially for brokers, who are found in the data to be more risk-averse. Moreover, we saw that women are less attached to negotiations since they do not have time for them.

larger vehicles, or a bus service to the border proper. Women's time constraints and high transportation costs may also be effectively tackled by relieving them of some of their household duties, for instance through a better provision of child care—the cost of which could be shared through a female traders' association.[34]

Border-crossing rules need to be altered to facilitate SSCBT. In Vangtao, SSCBTers refrain from using pick-up trucks because of the fees attached to crossing the border with goods in four-wheeled vehicles. Reducing those fees might be an alternative to enlarging the existing parking lot. On the border with Thailand, motorbikes are not allowed to cross with goods, which prevents SSCBTers from using a cost-effective transportation option and means that only human-powered carts are available. On the border with Vietnam riding a motorbike with goods is forbidden in the checkpoint zone, which forces traders and brokers to push the heavy shipment for long distances.

Our findings that women are subject to higher tax rates, are more often controlled by quarantine and incur much larger transportation costs are suggestive of "glass barriers" to female cross-border trade—either hidden yet real discrimination or challenges that affect women disproportionately. This is part of the explanation for the lower share of women in SSCBT compared with similar jobs in Cambodia and Lao PDR. Such practices are not justified by a higher propensity to evade taxes, since women appear no different from men in that respect, even after adjusting reports for differential reticence. Training of officials and traders on gender-based challenges at the border, backed up by monitoring of the performance of officials could be established to address these issues together with the establishment of a complaints and dispute settlement mechanism to allow women who feel they have been unfairly targeted to seek redress.

A Charter for Cross-Border Traders and Brokers reminding all parties in small-scale, cross-border trade—authorities on both sides of the border, transporters, and small-scale, cross-border traders and brokers—of their rights and obligations could be instrumental in improving border-crossing conditions. The Charter, the exact contents of which should be discussed with stakeholders, would list the authorities allowed to operate at border checkpoints, and which authorities can collect taxes and fees and which can not. The Charter would also state rules of conduct, including no discrimination in tax rates by gender and no verbal or physical violence. Its main benefits would be to enhance the bargaining power of the most vulnerable categories of border users and raise the low level of knowledge of cross-border trade rules and regulations that characterizes SSCBTers. The design of the Charter could benefit from experience from the World Bank's initiative piloted at the Mwami/Mchinji crossing between Malawi and Zambia (World Bank 2014b). As in southern Africa, the Charter would be displayed at strategic locations, translated into local languages and disseminated to stakeholder groups.

Our findings that women are subject to higher tax rates, are more often controlled by quarantine and incur much larger transportation costs are suggestive of "glass barriers" to female cross-border trade—either hidden yet real discrimination or challenges that affect women disproportionately.

[34] No small-scale traders' associations exist in Cambodian and Lao checkpoints, but in open discussions about ways to foster small-scale cross-border trade during FGDs, SSCBTers agreed associations might have a positive impact on their activities. They would however not list them among their recommendations, as they were reluctant to suggest solutions they had never tried out. Associations have been proven effective in defending female traders' rights, improving information about prices, providing training and ensuring smooth relationships with border officials in East Africa.

References

Cambodia Development Resource Institute. 2005. "Cambodia's Cross Border Economy: An Exploratory Study." Working Paper 32 by K.A.S. Murshid and Tuot Sokphally, Phnom Penh.

Cambodia Ministry of Agriculture, Fisheries and Forestry. n.d. Agricultural Market Information: Gender Roles in Agricultural Marketing. Accessed June 6, 2014. http://www.agriculturalmarketinformation.org.kh/en/information-resources/gender.

EMC. 2012. Time Release Study 2012 Lao PDR. Vientiane: Emerging Markets Consulting, Ltd.

Financial Ministry of the Lao PDR. 2005. "Financial ministerial instruction on the implementation of the law and enforcing decree to implement the Custom Law No. 05/NA." Vientiane, May 25.

Hausmann, Ricardo, Bailey Klinger, and Rodrigo Wagner. 2008. "Doing Growth Diagnostics in Practice: A 'Mindbook'." CID Working Paper No. 177, September.

Kraay, Aart, and Peter Murrell. 2013. "Misunderestimating Corruption." World Bank Policy Research Working Paper 6488.

Kusakabe, Kyoko, Prak Sereyvath, Ubolratana Suntornratana, and Napaporn Sriputinibondh. 2008. "Gendering Border Spaces: Impact of Open Border Policy Between Cambodia-Thailand on Small-scale Women Fish Traders." African *and Asian Studies* 7: 1-17.

Lesser, Caroline, and Evdokia Moisé-Leeman. 2009. "Informal Cross-Border Trade and Trade Facilitation Reforms in Sub-Saharan Africa." OECD Trade Policy Working Paper No. 86.

Ministry of Economy and Finance of the Kingdom of Cambodia. 2005. "Circular on Management of Imported Non-Commercial Goods No. 009 SHV." Phnom Penh, December 1.

——. 2010. "Prakas on Procedures of Payment of Duties, Taxes and Other Levies on Imported and Exported Goods No. 571 MEF.BK." Phnom Penh, August 19.

National Institute of Statistics, Ministry of Planning, Kingdom of Cambodia. 2014. "Cambodia Socio-Economic Survey 2013." Phnom Penh, July.

Prud'homme, R. 1992. "Informal Local Taxation in Developing Countries." *Environment and Planning C: Government and Policy* 10 (1): 1-17.

UN Women. 2012. Walking in the Dark: Informal Cross-Border Trade in the Great Lakes Region. New York City: UN Women.

UNIFEM, WB, ADB, UNDP and DFID/UK. 2004. "A Fair Share for Women: Cambodia Gender Assessment." Phnom Penh.

USAID. 2012. "Women in Cross-Border Agricultural Trade." Enabling Agricultural Trade Project Policy Brief. no. 4. October.

Walker, Andrew. 1999. The Legend of the Golden Boat: Regulation, Trade and Traders in the Borderlands of Laos, Thailand, China and Burma.

Warner, S. 1965. "Randomized-response: A survey technique for eliminating evasive answer bias." *Journal of the American Statistical Association* 60: 63-69.

World Bank. 2014a. *Lao PDR Trade and Transport Facilitation Assessment*. Vientiane: World Bank.

World Bank. 2014b. *The Republic of Zambia Diagnostic Trade Integration Study (DTIS)*. Washington, D.C.: World Bank.

World Bank. 2012a. *Cambodia Lao PDR Trade and Transport Facilitation Assessment*. Phnom Penh: World Bank.

World Bank. 2012b. *Lao PDR - Mapping the gender dimensions of trade: A preliminary exposition*. Vientiane: World Bank.

World Bank. 2012c. *Toward Gender Equality in East Asia and the Pacific: A Companion to the World Development Report*. Washington, D.C.: World Bank.

World Bank. 2011. *Facilitating Cross-Border Trade between the DRC and Neighbors in the Great Lakes Region of Africa: Improving Conditions for Poor Traders*. Washington, D.C.: World Bank.

——. 2005 and 2009. World Development Indicators. Accessed June 6, 2014. http://databank.worldbank.org/.

Appendix

The RRQs included in the IDI questionnaire are presented in the Appendix A. Some of the questions come from Kraay & Murrell's battery, which was used in Cambodia among other developing countries to estimate the share of the population who had been in a situation where a bribe was expected in the past year. The others were developed based on preliminary observations and qualitative interviews of SSCBTers. They were then fielded along with the other sections of the survey during pilots in all three checkpoints.

Appendix A. Random-response Procedure included in the IDI Survey

5.8	In the last 12 months, have you ever omitted to declare goods or underreported their quantity or value on purpose in order to avoid taxes? ☐ 1 Yes ☐ 0 No ☐ 997 Doesn't know ☐ 998 Refuses to answer

Please read out the following script,[a] making sure the interviewee understands the procedure:
Enumerator: Please make sure the card deck is well shuffled (do it a minimum of 5 times before the interview).

I am going to read out a set of questions that describes acts or behaviors that people have expressed. Unlike other questions where you would just respond with a "yes" or "no," this set has a slight variation to it. Before you answer each question, you will pick a card from this deck. There are 50% of black (spades/clubs) and 50% of red (hearts/diamonds) cards, randomly mixed. Based on which color you pick, I will give you an instruction to provide the appropriate response. Are you ready? I will now read the first question. Please pick a card from the deck, and if it's a red card, just say YES regardless of whether you have done this or not. If it's black, please just answer the question. Please do not let me see the card and do not put it back into the deck. This is very important.

		1 Yes	0 No
5.9	Have you ever lied to protect yourself?	☐	☐
5.10	Have you ever deliberately spoken ill of a member of your family or a friend?	☐	☐
5.11	Have you ever deliberately tried to cheat another person?	☐	☐
5.12	Have you ever broken a promise?	☐	☐
5.13	Have you ever taken something that is not yours without permission and kept it?	☐	☐
5.14	Have you ever bought, sold, bartered or been given something that you knew was stolen?	☐	☐
5.15	Have you ever mistreated someone because they did not share your opinions or values?	☐	☐
5.16	Have you ever been nice to a person only because you thought it would bring you some benefit?[b]	☐	☐
5.17	If you received some extra money that your family did not know about, would you ever hide it from them and spend it on your own enjoyment?	☐	☐
5.18	Have you ever insulted your parents, relatives or other elders?	☐	☐
5.19	Have you ever bribed a policeman because you did something wrong on the road?	☐	☐
5.20	Have you ever damaged somebody's property to hurt them?	☐	☐
5.21	Have you ever stolen money from a member of your household?	☐	☐

Please mix in front of the respondent the cards s/he has picked with the rest of the deck. Do not look at the cards.

a Adapted from Kraay and Murrell (2013).
b This question was not exploited in the reticence adjustment procedure because pilot interviews revealed a very high proportion of "Yes," suggesting a different rate of guilt.

Appendix B. Adjusting Answers to Sensitive Questions

Answers to survey questions about sensitive topics, e.g., corruption or illegal activities, are notoriously unreliable because respondents put little faith in guarantees of survey data anonymity or want to avoid negative judgments from enumerators.

Kraay & Murrell (2013) have designed a new methodology that uses randomization but does not assume that reticence decreases—contrary to Warner (1965), for instance. Besides the "conventional question" (CQ), i.e., a sensitive question (set in binary terms) that the respondent is asked to answer directly, their approach includes a set of "random-response questions" (RRQs), for each of which the respondent privately tosses a coin (we used playing cards instead). She is instructed to answer "Yes" whatever the true answer to the sensitive question if the coin comes up heads and to answer the question otherwise. The RRQs are also sensitive—a crucial assumption is that the proportion of respondents who have done the sensitive action, which Kraay and Murrel call the "rate of guilt," is the same across the CQ and RRQs,—and far from assuming that randomization elicits more truthful answers, the known probability of a "Yes" is used to estimate the incidence of reticence in the sample thanks to the generalized method of moments (GMM). Reticence-adjusted rates of tax evasion are presented in Table B.1.

Table B.1: Reticence estimation and adjustment of answers to sensitive questions following Kraay & Murrell's (2013) methodology

	Pooled	Bavet	Poipet	Vangtao	Men	Women	Brokers	Traders
Guilt	0.189[a]	0.121[c]	0.183[c]	0.270[b]	0.165[b]	0.221[a]	0.202[C]	0.109[b]
Reticence	.796[a]	0.712[a]	0.779[a]	1.02[a]	0.749[a]	0.871[a]	0.708[a]	0.756[a]
Probability reticent person answers question reticently	0.476[a]	0.596[a]	0.439[a]	0.361[a]	0.508[a]	0.432[a]	0.540[a]	0.508[a]
Effective reticent	0.379[a]	0.424[a]	0.342[a]	0.369[a]	0.381[a]	0.376[a]	0.382[a]	0.384[a]
Number of observations	157	55	54	48	65	91	45	63
Naïve guilt rate estimated directly from survey responses	0.117[a]	0.070[b]	0.120[c]	0.170[a]	0.102[b]	0.138[a]	0.125[c]	0.113[a]

Source: Authors' calculations. The Stata code for estimating these parameters was graciously shared with us by Peter Murrell.

a p<.01

b p<.05

c p<.1

Are the "Poor" Getting Globalised?

Adelina Mendoza, World Trade Organization
Gaurav Nayyar, World Bank
Roberta Piermartini, World Trade Organization

1. Introduction

Globalization is under fire. Public perceptions and recent policy debates increasingly appear to indicate that trade liberalization has been accompanied by rising income inequality in developed and developing economies. The fact that trade liberalization creates both winners and losers has never been in question. While international trade enhances economic growth in the aggregate, the distribution of its benefits may vary by income group, location, gender, and the formal-informal divide.

The literature on the subject discusses why poor households may have only marginally benefitted from trade opening, both as producers and consumers. On the production side, skilled-biased technological change associated with trade and FDI is likely to have dampened the increase in the demand for unskilled labor in developing economies expected after trade liberalization. Further, high reallocation costs across sectors, firms and geographical locations that are particularly burdensome for poor households affects their ability to move from contracting to expanding areas of economic opportunity. On the consumption side, the pass through of lower prices (resulting from trade liberalization) from the border to consumers has been affected by high domestic transport costs and a range of market frictions.[1]

In analysing the effect of trade opening on greater economic inclusion, this literature has focused on the tariff structure in the domestic economy. But the conditions of access to foreign markets, as determined by tariff policies of trading partners, are also key to capturing export opportunities and generating employment and/or wage gains for poor households. There are, in fact, a few studies which show that improving conditions of market access reduce poverty rates.[2]

What then are the market access conditions for the poor? Are there ample opportunities for them to reap benefits from exporting? This is a particularly relevant question given evidence suggesting that individual countries often protect their own "poor" (or declining sectors) by raising tariffs and/or non-tariff barriers on the goods these households/individuals (or declining sectors) produce. But, when all countries protect the sectors where the poor work and if the poor are employed in similar kind of sectors in different countries, a "coordination problem" arises: the goods (and services) produced by the poor will face higher barriers to trade than those provided by the non-poor, and the resulting decline in the global demand will lower the price of goods and services that the poor produce.

Tariff and non-tariff barriers faced by the poor, if relatively higher, may therefore impair income distribution by keeping poor workers disconnected from global markets.

[1] For the impact of high domestic transport costs see Nicita (2009), Emran and Hou (2013), and Atkin and Donaldson (2012). For the impact of market frictions see Campa and Goldberg (2002), Atkin and Donaldson (2012), Ural Marchnad (2012) and Han et al. (2016).
[2] See, for example, Porto (2010) and McCaig (2011).

While international trade enhances economic growth in the aggregate, the distribution of its benefits may vary by income group, location, gender and the formal-informal divide.

The potential problem is then not too much globalization, but too little "inclusive" globalization. This view is in stark contrast to the rhetoric that is usually seen and heard.

In light of the above, the objective of the paper is to assess the obstacles that "poor" households in a given country face when trying to export goods to the rest of the world. In doing so, it investigates the overall tariff profile on exports from India. Tariff data is matched with consumption/income data by the industrial classification of each household member's sector of employment. "Poor" households are not identified by a pre-defined cut-off in their level of income or consumption, but are instead analysed along a continuum of decile groups that form the entire distribution. The scope of "poverty" in the paper also extends beyond the income dimension to focus on groups that are often excluded from the growth process and perhaps are more disconnected from global trade. These include women, those working in the informal sector, or those working in rural areas.

The structure of the paper is the following: Section 2 provides a review of the literature. Section 3 outlines the dataset and methodology. Section 4 describes the results and Section 5 presents conclusions.

2. Review of the literature

2.1 Trade opening and distributional effects

Trade liberalization, through its impact on prices in both product and factor markets, affects members of a household as both producers and consumers (Winters et al., 2004). In most developing countries, a majority of poor households rely on labor markets for the bulk of their income. Standard trade theory predicts that trade opening increases the demand for the relatively abundant factor, which suggests that unskilled labor in developing countries would benefit most from globalization through a resulting increase in wages or employment or both. As producers, farm households for example can gain by selling their output in hitherto unavailable overseas markets, which may also yield a better return. As consumers, trade liberalization can be beneficial to the extent that it reduces the price for imported goods. At times, these effects can go in opposite directions. For example, higher prices of agricultural exports would make the food basket more expensive, which works towards increases in poverty, but would boost labor demand and wages, which works towards poverty alleviation. Therefore, if the household is a net seller—whether of labor, goods or services—price increases will raise its real income and vice-versa.

The literature has focused on explaining why the distributional effects of trade opening, as described by the theory, depend on a range of other factors in practice. On the production side, the transfer of skill-biased technologies associated with trade could reduce the wages of unskilled labor even in a labor-abundant country, thereby widening the gap between the rich and the poor. Similarly, despite shifting low-skilled activities from rich to poor countries, foreign direct investment may increase the demand for skilled workers because jobs which were low skill-intensive in the former may be relatively skill-intensive in the latter (Wood, 1997). Further, as trade liberalization reallocates economic activity across sectors, industries and firms, the short-run adjustment costs can be high with the burden falling disproportionately on poor households (Banerjee and Newman, 2004).

Given the high reallocation costs across geographical regions within countries, the poor may also only marginally benefit from greater openness due to sectoral variation in patterns of trade liberalization combined with spatial variation in the industrial composition of the labor force. Take, for instance, evidence from India which suggests that rural areas with a high concentration of industries that were disproportionately affected by tariff reductions experienced slower progress in poverty reduction (Topalova, 2010). With perfect factor mobility across regions, labor would migrate in response to wage and price shocks, equalizing the incidence of poverty across regions, but the low incidence of internal migration in India is striking (Kone et al., 2016). Similarly, local labor markets in Brazil where workers were concentrated in industries facing the largest tariff cuts were generally affected more negatively (Kovak, 2013).

The extent to which households benefit from trade liberalization on the consumption side depends on a range of factors that influence the pass-through of

price changes from the border to consumers. Owing to transport and other costs of distribution, the geographic characteristics of localities, such as the distance to the border matter. Nicita (2009), for example, finds that tariff pass-through was significantly higher in the Mexican states closest to the United States border, and thus, households living in these states benefited relatively more from the reductions in tariffs. Similarly, Atkin and Donaldson (2015) find that the costs of intra-national trade are approximately 4 to 5 times larger in Ethiopia and Nigeria compared to the United States. This reduces the amount of potential surplus consumers in remote locations—far from a country's major port, for example—can derive from falling international trade barriers. Other spatial characteristics, such as the relative isolation of households from functioning product markets, may also matter for price transmission. Pass-through estimates for India suggest that reductions in tariffs increased domestic consumer welfare more in urban areas than in rural areas (Ural Marchand, 2012).

Market frictions are another relevant factor. If domestic industries are imperfectly competitive, changes in tariffs may be absorbed by profit margins or mark-ups (Campa and Goldberg, 2002). Atkin and Donaldson (2012) have further shown how the market power of intermediaries in domestic industries affects the mark-ups, which results in different rates of tariff pass-through within sub-Saharan Africa. Similarly, a heavily regulated domestic industry that is dominated by state-owned enterprises would have limited flexibility to adjust to the changing cost conditions (Szamosszegi and Kyle, 2011). Evidence from China suggests that a 10 percentage point increase in the size of the private sector across cities is associated with 2 percentage points higher tariff pass-through, with the share of the private sector among intermediaries being particularly important (Han et al., 2012).[3]

2.2 Market access, "pro-poor" trade policy and coordination failures

In analysing potential explanations for why poor households have benefited less from trade opening than trade theory would predict, the literature referred to above has focused on domestic factors, such as domestic tariffs and market frictions. But the conditions of access to foreign markets, as determined by tariff structures and non-tariff measures of trading partners, are also key to capturing export opportunities and generating employment and/or wage gains for poor households.

While geography is hard to change, access to foreign markets is also likely to be influenced by a set of international trade policies—such as tariffs, non-tariff measures and services trade restrictions—employed by a country's trading partners.

The literature is somewhat scant in this regard, but it does point at the importance of market access conditions for the distribution of the gains from trade. Market access is naturally influenced by geography and distance. For example, evidence from China suggests that reduced distance to (domestic and) international markets confers substantial benefits on per capita consumption of rural households (Emran and Hou, 2013). While geography is hard to change, access to foreign markets is also likely to be influenced by a set of international trade policies—such as tariffs, non-tariff measures and services trade restrictions—employed by a country's trading partners. For example, Porto (2010) predicts that the elimination of trade barriers on exports of agro-manufactures to industrialized countries would cause poverty to decline in Argentina. Similarly, McCaig (2011) analyzes the United States-Vietnam free trade agreement to show that provinces in Vietnam that were more exposed to U.S. tariff cuts experienced greater declines in poverty rates.

[3] The average pass-through rate is found to be 22% in a city where all enterprises are state-owned, while a city with an average size of the private sector has an approximate tariff pass-through rate of 31%.

One aspect that the existing literature has neglected is how domestic trade policies of individual countries, when considered together, affect access of "poor" and "rich" households to foreign markets differentially. This is particularly important in light of evidence of countries implementing trade (and trade-related) policies that favor poor households. For example, relying on data for six Sub-Saharan African (SSA) countries, Nicita et al. (2014) finds that SSA's trade policies have a systematic "pro-poor" bias,[4] that is, trade policies redistribute income from rich to poor households. This is mostly explained by protection granted to agricultural products that are sold by poor households—the positive labor income effect dominates the impact of higher consumption prices and other forces that benefit skilled over unskilled workers. The question is what if all countries apply "pro-poor" trade policies and if the poor are employed in similar kinds of sectors in different countries?

Strategies that use trade protection to assist poor households are unlikely to be effective if one also considers general equilibrium effects.[5] There is the possibility of a "coordination problem" whereby poor households are less able to benefit from globalization because they are excluded from the process. Consider the following. In order to protect producers from low prices of competing products from the rest of the world, countries increase import tariffs and other non-tariff barriers on sectors that employ a large proportion of those classified as "poor." If this done by a sufficiently large number of countries, which together constitute a "large" country that is a "price-maker" in the world market, the resulting decline in global demand will lower the price of goods and services that the poor produce. As a result, "poor" households will either not be price competitive to export to markets that have implemented measures of protection or will receive a lower price in export markets that have not implemented these measures.

The coordination problem with regard to import restrictions described here mirrors the literature on export restrictions and food price volatility (Abbott, 2012; Ivanic and Martin, 2014; Gouel, 2016). Countries frequently use export restrictions to protect poor consumers from high or volatile prices on the world market. However, when countries simultaneously respond to higher international prices for food, say rise, by unilaterally imposing export restrictions, the international price of the commodity in question will only further increase. Consequently, the "poor" consumers of this food commodity in countries that imposed the export restrictions may be unable to benefit from lower domestic prices.

3. Data and methodology

3.1 Matching household survey data with tariffs and NTMs

The paper uses a novel approach to assess barriers that individual producers across the income distribution face in international markets. In doing so, it combines household survey data on income and consumption from India (see Box 1) with information on lowest applied tariffs in the top 15 destination markets (EU counted as one) for Indian products in 2012.[6] This is done by matching India's National Industrial Classification (NIC)—which is based on the International Standard of Industry Classification (ISIC)—of an individual's sector of employment, with tariffs faced in India's major export markets at the Harmonized System subheading (6-digit) level.[7] The same concordance was used to determine the variability of non-tariff measures (NTMs) imposed on imports from India by the same top importers for the same reference year across different sectors.[8] The number of (NTMs) applied to India in this analysis includes those applied by these partners on an MFN basis, e.g., those NTMs that are not targeted specifically at India but at all exporters to that country.

The ISIC - HS correlation is not a full match concordance table. There are ISIC codes for which there is no corresponding HS

[4] The authors analyse how reductions in tariffs and non-tariff barriers affect consumer and producer prices, which in turn affect welfare of the average household in the top and bottom 40% of the income distribution defined by household production, household consumption, labor earnings and government transfers.

[5] The literature also discusses foregone opportunities driven by dynamic effects. Using protectionist policies to assist the poor may actually harm the poor by limiting productivity increases and structural transformation.

[6] These importers account for more than 75% of world imports from India.

[7] The tariffs at the HS subheading level matched with the ISIC code are averages weighted by the value of imports from each partner. We also look at how much the tariffs faced have declined from their 1996 level for specific identified sectors. To calculate the reduction in tariffs, the same methodology was used to match tariffs in 1996 for the same partners.

[8] The data on NTMs were extracted from the WTO's NTM database—I-TIP. The database shows the number of NTMs by type—SPS, TBT, ADP, CV, SSG, SG, QR, TRQ and XS—in each HS chapter.

code. Hence the analysis only includes activities in which the associated good/s can be identified with the HS code. For example, some ISIC codes which refer to construction (e.g., ISIC "4100 - Construction of buildings") do not have a matching HS code, and such observations were dropped from the calculation of the statistics.[9] For the analysis of NTMs, the statistics were done only on total NTMs without breakdown by type of NTM.

3.2 Defining the "poor" or "excluded"

In this study, economic "poverty" is measured as a relative phenomenon based on the analysis of income/consumption for the entire distribution by decile group. Consumption expenditure is widely accepted as a proxy for income owing to the difficulty of getting reliable quantitative data on household income through direct enquiries in household surveys (see Box 1). Additional variables in the data enabled us to also look at groups traditionally excluded from the process of economic growth—women, those working in rural areas and those employed in the informal sector.

4. Results

4.1 Tariffs faced in the export market are inversely related to income

Using household level data, the average income (using consumption as proxy) and tariff faced in export

Box 1: Household Survey Data on Employment, Income and Consumption from India

The Government of India's National Sample Survey Office (NSSO) regularly conducts national household surveys on the subjects of employment and consumption. For the present exercise, the data are taken from the 68th round conducted during the period from July 2011 to June 2012, specifically survey data collected from the questionnaire referred to as "Schedule 10: Employment and Unemployment". The number of households surveyed was 101,724 (59,700 in rural areas and 42,024 in urban areas). These sample households correspond to 456,999 individuals (280,763 in rural areas and 176,236 in urban areas).

In the employment survey, an individual's sector of employment is based on activities pursued during certain specified reference periods: one year, one week and each day of the reference week. The activity status determined on the basis of each reference period is referred to as "usual status," "current weekly status" and "current daily status," respectively. The "usual status" approach is generally preferred as it is based on a relatively longer time horizon. Nonetheless, the current weekly status approach is important in any analysis of wages because these are expressed in weekly terms. Each approach is guided by the "majority time spent" criterion. For instance, under the "usual status" approach, an individual is considered "employed" in a particular industry if he or she spent the majority of his or her time in the last 365 days on that economic activity, rather than being unemployed or engaged in non-economic activities.

The paper analyzed two correlated datasets from the survey in order to identify the relevant sector of employment.

1. The first relates household-level data based on usual status of the sector of employment of the household head with the corresponding household weekly consumption. Each observation refers to a household with its attendant characteristics, including the rural versus urban distinction. Household weekly consumption was used as proxy for income.
2. The second relates individual-level data based on members within the household reporting an economic activity and corresponding income from such activity during the reference week. The economic activity is the usual principal activity of the household member. Additional information on gender and type of the enterprise (formal or informal based on the number of employees) is also available from this dataset, which provides an added dimension in the analysis of the data.

The advantage of using household consumption levels as a proxy for income is that wage-based data do not include income received by self-employed individuals. Analysis of household-level data was purely based on consumption, even if there are individuals within the household that reported income. For the dataset based on individual respondents, individuals (15 years and above, excluding those studying full time) who had an activity during the week and reported its corresponding earnings are included.

[9] Only observations of selected respondents who work in ISIC sectors where a correlation with HS (hence tariffs) exists (32% of respondents) are included in the study. The other 68% work in ISIC sectors that do not have ISIC-HS correlation code. This is mainly an issue related to services sectors. Our study, therefore, has to be seen as an analysis of merchandise sectors only.

markets for each income decile were calculated (Table 1). Households in the poorest decile have an average weekly consumption of only 511 rupees ($9.60), while households in the richest decile consume ten times that amount.

The results show that goods associated with higher income households face lower tariffs while goods associated with low income households face higher tariffs. In the table, the tariff faced by the next higher income decile is consistently and significantly lower except for two neighboring deciles—the difference between tariffs for deciles 2 and 3, and for deciles 6 and 7, are not statistically significant.

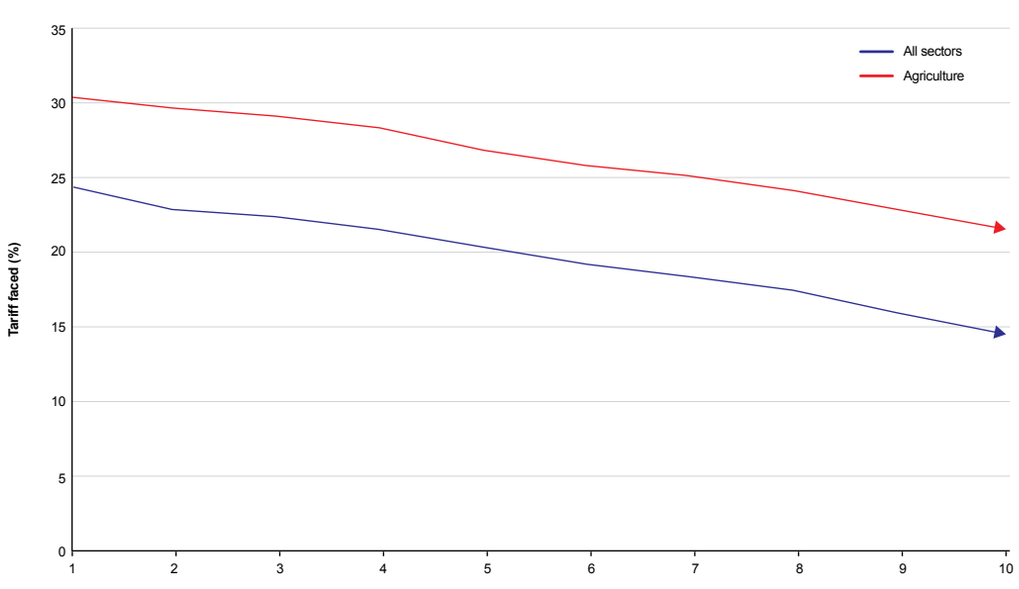
The tariffs for the agriculture sector, in which 62% of the respondents are classified, mirror the same inverse relationship between tariff faced and income decile, but at a much higher tariff magnitude (see Figure 1). The sectors where a large percentage of poor are concentrated include the production of cereals and manufacturing of wearing apparel.

Table 1: Average tariff faced by income decile based on household weekly consumption

Income Decile	Household Weekly Income		Average Tariff Faced (%)
	Rupees	US $	Simple[a]
1	511	9.6	24.4 a
2	783	14.8	22.9 b
3	962	18.2	22.4 b
4	1,130	21.3	21.5 c
5	1,305	24.6	20.3 d
6	1,504	28.4	19.2 e
7	1,761	33.2	18.4 e
8	2,118	40.0	17.5 f
9	2,713	51.2	16.0 g
10	5,112	96.5	14.5 h

a Using Duncan's test on the average tariff faced. Average tariffs are significantly different across deciles except when they are tagged with the same letter of the alphabet.

Figure 1: Tariff faced by income decile in agriculture and averaged across all sectors



4.2 Rural households, women and informal workers face higher tariffs in the export market

Rural vs urban

Households in rural areas face an average tariff which is 10.9 percentage points higher than their urban counterparts (22.6% versus 11.7%). Rural households consistently face higher tariffs, with the widest differences in the lower income deciles (Table 2).

Distance to an urban area makes a difference

Households within 0 km from the state capital or the nearest recognized city or urban area , face the lowest tariffs in international markets at 9.6%.[10] More than 10% of the respondents live within such an urban zone. Next, those living within one to fifty kilometers from the closest urban center faced an average tariff of 14.3% (Table 3). The average tariff for the center dwellers is 14.8 percentage points lower than the 24.4% tariff faced by those who are farther than 600 km from the city

Table 2: Average tariff faced by income decile in rural and urban areas

Income Decile	Tariff Faced (%)		
	Rural	Urban	Difference[a]
1	26.4	15.0	11.4
2	25.0	13.4	11.6
3	24.5	13.6	10.9
4	23.6	13.3	10.3
5	22.5	12.4	10.1
6	21.3	13.1	8.2
7	20.9	11.7	9.2
8	20.5	11.0	9.5
9	19.5	10.0	9.5
10	19.2	8.8	10.4
Overall	22.6	11.7	10.9

a The difference in all income deciles is statistically significant.

Table 3: Average income and tariff faced by distance to the nearest urban area

Distance (km) to nearest urban area	Average Income (Rupees)	Number of respondents	Average Tariff (%)	Duncan's test outcome[a]
GT 600	1,002	428	24.4	a
401–600	1,116	1,883	17.3	b c
301–400	1,199	3,509	16.3	d c
201–300	1,235	4,992	15.7	d
151–200	1,406	2,806	17.5	b
101–150	1,429	3,215	17.5	b
51–100	1,415	2,444	17.5	b
1–50	1,881	1,685	14.3	e
0 (Center)	2,185	2,610	9.6	f

a Duncan's test on the average tariff faced is used to assess whether averages across deciles are statistically different. Average tariffs are significantly different across deciles when they are tagged with different letters. They are not significantly different when they are tagged with the same letter of the alphabet.

[10] For example, Bagalkot in the state of Karnataka is 518 km to Bangalore, which is the state capital. However, Bagalkot is only 406 km to Pune, a prominent urban area in the state of Maharashtra; this is therefore the closest distance to an urban area, which is used in the analysis. This measure is taken from Das et al. (2015)..

(less than 2% of respondents). Except for those living the farthest at more than 600 kilometers, any other distance from the nearest urban center does not make any significant difference in tariffs faced (averages with overlapping letters b to d). This confirms the finding shown above that people living in rural areas face higher tariffs than people living in urban areas, and emphasizes that it is distance to an urban center, not just the inherent classification of each district, that matters. The results also affirm that the poor face higher tariffs since, as shown in Table 3, incomes are lower for those who live far from urban conglomerates.

Men vs women

Data on individuals within the sample household reporting a principal economic activity and income during the reference week complemented the household-level data. Using actual wages, the same methodology was used to assign each individual to the appropriate income decile.

Overall, the average tariff facing men is 6 percentage points lower than that facing women (Table 4). Women consistently face higher tariffs across all deciles, except for the highest decile where men face tariffs that are on average one percentage point higher than those faced by women. Interestingly, in the two highest deciles the average income of women is higher than that of men. This further bolsters the finding in the previous section that lower-income groups face higher tariffs. However, the number of women in the higher-income deciles is much fewer than the number of men. In the 10th income decile, for example, women only account for 6% of the respondents.

Formal vs informal workers

The household surveys reporting the principal economic activity during the reference week also identified the type of enterprise individuals were employed in. From this information, each enterprise was classified as belonging either to the formal or to the informal sector. The survey's definition of the informal sector is an enterprise employing less than 10 workers. Unfortunately, only 54% of respondents reported the number of employees in the enterprise in which they worked. Nonetheless, workers in informal sector enterprises face an average 9.8% tariff, which is significantly higher than the 7.2% for enterprises classified as in the formal sector.

4.3 Globalization did not narrow the bias against the poor

While global tariffs fell from 1996 to 2012, the tariffs facing the poor, workers in rural areas and women remained higher than those facing the rich, workers in urban areas and men, respectively (Table 5). In fact, the reduction in tariffs was slower for workers in rural areas and for women, while the tariff gap between the highest

Table 4: Weekly wage and tariff faced by gender and income decile

Wage Decile	Weekly Wage (Rupees)		Tariff Faced (%)		
	Men	Women	Men	Women	Difference[a]
1	208	206	20.4	21.7	-1.3
2	386	382	22.2	22.6	-0.4
3	529	522	19.9	21.5	-1.6 +
4	666	663	19.9	20.2	-0.4
5	767	744	18.1	21.7	-3.6 +
6	934	920	15.8	18.2	-2.4 +
7	1,113	1,091	14.7	19.7	-4.9 +
8	1,419	1,401	12.0	15.1	-3.1 +
9	2,190	2,254	7.8	8.6	-0.8
10	8,268	8,508	4.6	3.6	1.0 +
Overall	1,675	720	14.4	20.4	-6.0 +

a The sign + denotes that the difference between the average tariff faced by men and by women is significant (based on a t-test).

and lowest income decile remained unchanged over the 16-year period.

Table 5: Average tariff reduction between 1996 and 2012 (change in percentage points)

Sample	Reduction (%)
Decile 1 (lowest 10%)	2.6
Decile 10 (highest 10%)	2.5
Rural	2.4
Urban	3.3
Women	2.5
Men	2.7

4.4 Non-tariff measures are biased against the poor

In addition to higher tariffs, the products produced by poor workers face a greater number of non-tariff measures. On average, the poorest (income deciles 1 and 2) face some 200 different types of NTMs while workers belonging to the top income decile face only 127 (72 less NTMs compared to the first decile). Unlike for tariffs, which consistently decline across the income deciles, the total number of NTMs for the poorer 5 deciles are not significantly different; the total count varying from 192 to 201. On the other hand, the number of NTMs falls significantly between the 9th and 10th deciles, with the latter facing 39 NTMs less than the former (Table 6).

Table 6: Total count of all types of NTMs faced, by income decile

Income Decile	Number of NTMs Faced	Duncan's test[a]
1	199	a b
2	201	a
3	201	a
4	192	b
5	194	a b
6	180	c
7	182	c
8	169	d
9	166	d
10	127	e

a Using Duncan's test on the average count of NTMs faced. Averages tagged with the same letter of the alphabet are not significantly different.

4.5 Preliminary evidence that a coordination problem exists

Higher tariffs on goods produced by poor workers likely reflects efforts by India's trade partners to protect sectors where their own poor work. The same pattern can be seen in the tariffs on India's imports, by matching India's own applied MFN tariffs in 2012 by sector to the income data from the survey. Goods produced by the richest workers (in the 10th decile) face a tariff of less than one-third the level on goods produced by the poorest workers (the lowest 2 deciles of the population—Table 7).

Table 7: India's import MFN applied tariffs in 2012 by income decile

Income Decile	Applied MFN[a]
1	35.6 c
2	39.0 a
3	37.5 b
4	35.3 c
5	33.8 d
6	29.9 e
7	28.0 f
8	23.3 g
9	16.9 h
10	11.6 i

a Using Duncan's test on the average count of MFNs faced. Averages tagged with the same letter of the alphabet are not significantly different.

Similarly, the applied MFN tariffs in the United States and China (taken from the WTO Integrated Database based on the Member's own data notification) tend to be higher for goods produced by poorer workers (based on average wage data from the UNIDO database). Goods produced by workers in the fifth, or richest, quantile face tariffs that are markedly lower than on goods produced by workers from the first, or poorest, quantile across all three countries (Table 8). While the average tariff falls consistently across income groups in China and India, the average U.S. tariff for sectors corresponding to the richest quantile (3.7%) is close to that of the second-poorest quantile (3.8%). However, this appears to be driven by the very high tariff on tobacco.[11] Since the

[11] In the US some tobacco products have tariffs as high as 350%, corresponding to ISIC 1200, while the average wage in the tobacco sector is very high, with individuals employed in the sector being included in the top quantile of the income distribution.

U.S. tariffs on in-quota tobacco imports from selected partners are lower than the tariffs quoted here, the actual applied average duty is lower. Excluding tobacco, the average tariff for the richest quantile is only 0.8%, less than a fifth of the average tariff of the poorest quantile. These results reinforce the view that there is a coordination problem—the "poor" are disadvantaged in terms of market access because trading partners appear to impose trade restrictions disproportionately on sectors that employ poor households.

Table 8: Import tariffs by wage or income quantiles for selected countries

Wage/ Income Quantile	Average MFN for indicated year (%)		
	USA 2008	China 2010	India 2012
Q1	4.5	12.7	37.3
Q2	3.8	10.9	36.4
Q3	3.3	9.8	31.8
Q4	2.3	9.3	25.6
Q5	3.7[a]	9.2	14.3

a This goes down to 0.8% if the high tariff on ISIC 1200 is excluded from the analysis.

5. Conclusions

This paper shows that tariffs tend to be higher and non-tariff measures more prevalent for the poor, thus limiting their opportunities to access international markets. Countries individually may seek to protect their own "poor" from foreign competition by raising tariffs on the goods these households/individuals produce.[12] There is indeed evidence suggesting that trade policy is biased towards imposing barriers on sectors that employ poor individuals. But, when all countries protect the sectors where the poor work and if the poor are employed in similar kind of sectors in all countries, a coordination problem arises. That is, the goods (and services) produced by the poor will face higher barriers to access international markets than those produced by the non-poor. This will depress global demand for the goods (and services) that the poor produce, thus worsening their income prospects.

In order to assess the obstacles that the "poor" face in accessing international markets, this paper analyzed tariffs faced on goods produced by Indian workers, by sector of occupational activity. It then calculated the average tariff faced by individuals classified according to their position in the overall income distribution. Individuals also were classified according to other characteristics, such as gender, whether they work in the formal or informal sector or whether they work in urban or rural areas.

The results show that tariffs faced in destination markets are higher for goods produced by individuals in lower income groups. Households in rural areas face higher average tariffs than their urban counterparts, with tariffs consistently higher for households located further away from an urban center. Women consistently face higher tariffs than do men. Small informal enterprises also face higher tariff barriers than do large formal enterprises. Moreover, the sectors the poor work in are also disproportionately burdened by non-tariff measures. These findings underline the fact that the poor could be paying the highest penalty if efforts to reduce barriers to trade stall, or worse, countries retreat from the liberalization already achieved. Facilitating access to external markets for the goods that the "poor" produce is key to maximize the potential benefits of trade for poverty.

The recent debate on globalization and income inequality has often indicated that the reduction of trade costs has contributed to rising inequality. This paper reveals a new aspect in this debate. The problem may not be too much globalization, but too little "inclusive" globalization. Many sectors that employ a large proportion of those classified as "poor" still face higher barriers to trade. More research is needed to assess the general equilibrium effects of removing this unbalanced access to international markets and whether this would help reduce income inequality. However, this paper explains why the reduction of the trade costs for the goods that the poor (rural workers and women) produce would require international cooperation.

[12] This can be the outcome of legitimate concerns, such as the need to protect jobs of workers where labor market frictions or other reasons prevent them from easily moving to more competitive sectors.

References

Abbott, P. C. (2012). "Export restrictions as stabilization responses to food crisis." *American Journal of Agricultural Economics* 94(2): 428–434.

Atkin, David and Dave Donaldson (2015). "Who's Getting Globalized? The Size and Implications of Intra-national Trade Costs." NBER Working Paper No. 21439.

Banerjee, Abhijit, and Andrew Newman (2004). "Inequality, growth and trade policy". Massachusetts Institute of Technology, Department of Economics, and University College London, Department of Economics. Unpublished Manuscript.

Campa, J. and L. Goldberg (2002), "Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon?" NBER working paper No. 8934.

Das, Samarjit, Chetan Ghate, and Peter E. Robertson (2015). "Remoteness, Urbanization, and India's Unbalanced Growth." *World Development* 66, Pages 572-587.

Donaldson, Dave (2016). "Railroads of the Raj: Estimating the impact of transportation infrastructure." *American Economic Review*, forthcoming.

Emran, M. Shahe, and Zhaoyang Hou (2013). "Access to Markets and Rural Poverty: Evidence from Household Consumption in China." *The Review of Economics and Statistics* 95, No. 2, Pages 682-697.

Freund, Caroline and Caglar Ozden (2016)."Loss Aversion and Trade Policy", World Bank Policy Research Working Paper No. 3385.

Gouel, Christophe (2016). "Trade Policy Coordination and Food Price Volatility." *American Journal of Agricultural Economics* 98 (4): 1018-1037

Grossman, Gene M. and Elhanan Helpman (1994). "Protection for Sale," *American Economic Review* 84:4, pp.833–50.

Han, Jun, Runjuan Liu, and Junsen Zhang (2012). "Globalization and wage inequality: Evidence from urban China" *Journal of International Economics* 87: 288–297.

Ivanic, M. and W. Martin (2014). "Implications of Domestic Price Insulation for Global Food Price Volatility," *Journal of International Money and Finance* 42:272-88.

Kone, Z.L., M.Y. Liu, A. Mattoo, C. Ozden and S. Sharma (2016). "Internal Borders and Migration in India," mimeo, The World Bank, Washington D.C.

Kovak, Brian K. (2013). "Regional Effects of Trade Reform: What is the Correct Measure of Liberalization?" *American Economic Review* 103(5): 1960–1976

McCaig, Brian (2011). "Exporting Out of Poverty: Provincial Poverty in Vietnam and US Market Access." *Journal of International Economics* 85 (1): 102–13.

Nicita, A., M. Olarreaga and P. Guido (2014). "Pro-poor trade policy in Sub-Saharan Africa." *Journal of International Economics* 92 (2014) 252–265.

Nicita, A. (2009). "Who Benefited from Trade Liberalization in Mexico?" *Journal of Development Economics*, forthcoming.

Porto, Guido (2010). "International Market Access and Poverty in Argentina."*Review of International Economics* 18(2), 396–407.

Szamosszegi , A., and C. Kyle (2011). An Analysis of State-owned Enterprises and State Capitalism in China, US-China Economic and Security Review Commission.

Topalova, Petia (2010). "Factor immobility and regional impacts of trade liberalization: evidence on poverty from India." *American Economic Journal: Applied Economics* 2 (4), 1–41.

Ural Marchand, Beyza (2012). "Tariff pass-through and the distributional effects of trade liberalization" *Journal of Development Economics* 99, issue 2: 265-281.

Winters, L. Alan, Neil McCulloch and Andrew McKay (2004). "Trade Liberalization and Poverty: The Evidence So Far." *Journal of Economic Literature* 42(1): 72-115.

Wood, A. (1997). "Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom." *World Bank Economic Review* 11, no. 1: 33-57.

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Global trade has contributed strongly to reducing poverty but important challenges remain in making trade work for the poorest. This publication presents eight case studies to reveal how trade can help to reduce poverty in developing countries. It focuses on four constraints faced by the extremely poor – namely that they tend to live in rural areas, work in the informal sector, live in fragile and conflict-affected regions and face gender inequality. The case studies identify ways to overcome these constraints, including through the adoption of policies that maximize the contribution of trade to poverty reduction. The studies also highlight the ongoing gaps in data and research that constrain policy-making. The publication is a follow-up to *The Role of Trade in Ending Poverty*, co-published by the WTO and the World Bank in 2015, which examined the challenges the poor face in benefiting from trade opportunities. The country-specific approach of this new publication complements the global perspective of the previous report.

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ISBN 978-92-870-4522-5