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THE FOOD SYSTEM TRANSFORMATION IN VIETNAM:

CHALLENGES FOR THE HORTICULTURAL SECTOR POSED BY EXPORTS AND BY CHANGING CONSUMER PREFERENCES

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CHAPTER I

INTRODUCTION

Food systems are in a process of profound changes on a global scale. Multinational food processing and retailing companies spread globally. This trend is driven by changing consumer demand for food with new safety and quality attributes and by liberalized trade and investment policies (Thompson and Tadlock Cowan, 2000; Reardon et al., 2007). While the influence of the public sector has gradually diminished, private companies bring about new approaches in supply chain governance including private food safety and quality standards (Henson and Reardon, 2005). Closely interlinked with these trends, agriculture and food trade patterns are changing internationally (Aksoy and Beghin, 2005). These developments have important implications for all stakeholders involved in food supply chains, including small-scale farmers in poor countries (IFPRI and ODI, 2006; Swinnen, 2007; Barrett et al., 1999).

Increased demand for high-value agricultural products is fueling competition in the global food system (Regmi, 2001). As a consequence, global food trade has gained a much more prominent role during the last decades. While the share of traditional agricultural commodities like coffee, tea, and cocoa has constantly decreased, high-value agricultural products like fruit and vegetables have become much more important (Aksoy, 2005). As these products are non-homogeneous, trade patterns are different from those of traditional agricultural products. High-value products require strict enforcement of standards along supply chains surpassing national and regional borders. This poses particular challenges to developing countries, where supply chains

are often less integrated and the regulatory framework is less robust (Jaffee and Henson, 2005).

Increased international food trade has led to the introduction of more stringent food quality and food safety regulations in developed countries to regulate the emerging more complex food markets. The agreement on sanitary and phytosanitary measures (SPS) and the accompanying agreement on technical barriers to trade (TBT) of the World Trade Organization (WTO) are an indicator of these developments at the international level (Josling et al., 2004). Governments are allowed within the SPS framework to introduce regulations in order to protect plant, animal, and human health as well as the environment, wild life, and human safety. Potential hazards to human health include residues of antibiotic drugs and pesticides, microbiological pathogens, mycotoxins, parasitic diseases, and heavy metals or toxic waste.

The WTO agreements are meant to prevent undue trade impeding regulations of the public sector. The SPS agreement aims for a harmonization in national regulations, a science-based risk assessment, the principle of equivalence, and regionalization. Still complaints about SPS measures are regularly brought forward to the WTO committee, particularly by developing countries. SPS measures are often perceived as market entrance barriers by developing countries (Henson and Loader, 2001) and have been shown to hinder trade particularly from countries of the developing world to countries of the Organization for Economic Co-operation and Development (OECD) (Disdier et al., 2007). Lack of market access to industrialized countries is a particular problem for fresh produce due to the high food quality and food safety requirements in this product category (Calvin, 2003).

The late 1990s and early 2000s have witnessed some prominent food scares including 'mad cow' disease, foot-and-mouth disease, dioxin scandal and others. Coupled with wide media coverage, consumers have become more conscious about food quality and food safety issues (Gregory, 2000; Knowles et al., 2007). Though this is mostly observed in developed countries, also high-income consumers in developing and transition countries follow this trend.

Food scares have induced renewed efforts in the public sector to improve the quality and safety of food supply (Knowles et al., 2007). Within the supply chains, private actors drive the increasing number of regulations by introducing their own or industry-wide private standards (Fulponi, 2006; Wiegand et al., 2005). This strategy is pursued to differentiate products from those of competitors (McCluskey, 2007). Furthermore, by pre-emptive standard setting before public institutions do so, firms can choose a strategy to minimize their costs (McCluskey, 2006).

It is argued however that private standards are mainly introduced as a response to consumers' food safety concerns and in order to meet changing consumer preferences (Hatanaka et al., 2005). Besides the well-known determinants of trade in general and food in particular (Vollrath et al., 2006), Caswell et al. (2007) showed that consumers influence agricultural and food trade patterns through their higher valuation of food quality and food safety attributes. Consumers with changing preferences force retailers, processors and other upstream supply chain actors to adapt their strategies to meet new demand patterns. In this way, changing consumer preferences are at the heart of the food system transformation (Pingali, 2007).

Actors in upstream stages of supply chains have to meet the private standards in order to secure their market access (Fulponi, 2007). In this way private food safety and food quality standards are thought to have similar trade impeding functions as regulations from the public sector (Martinez and Poole, 2004). However, at the international level private sector regulations do not fall under the jurisdiction of the WTO and therefore pose a new challenge to the international trade policy debate (Henson, 2006). Also within countries it is not always clear for the public sector, how to deal with regulations emanating from the private sector.

With the introduction of private standards, the food safety transformation has gained an unprecedented impetus (Reardon and Timmer, 2006). In a globalizing world changing food systems can be seen on a continuum of increasing commercialization of the agricultural sector, also in developing countries. Traditionally the public sector had major influence on agricultural commercialization and changes in the food system through the provision of macroeconomic stability, infrastructure development and good governance (von Braun, 1995). While these factors have remained critical determinants of agri-food sector development, private actors – and food processors and supermarkets are outstanding here – have become a major force shaping food systems.

As retailers have found food markets in developing countries increasingly saturated, they have shifted their focus to emerging and developing country economies. In anticipation of these developments, retailers in national markets forestall required changes to be competitive once foreign direct investment enters a country. These developments induce growing competition in domestic food markets not only on price but increasingly on food quality and food safety. Competition at the retail level

impacts on traditional supply chains throughout all stages. Adaptive measures like new governance structures including new food quality and food safety regulations are enforced. By setting private standards, supermarkets create their own, dedicated supplier base. In this way they have positioned themselves to be highly competitive in food markets that have been traditionally not well integrated.

Although the analysis of changing retail markets and the emergence of supermarkets has been addressed already in earlier studies (e.g. Findlay et al., 1990; Hollander, 1970), it is only more recently that the issue has been addressed within the agricultural economics literature (Reardon et al., 2003). Reardon et al (2007) describe four different waves in which supermarkets have gained market shares in food retailing. While it took decades for supermarkets in the United States (US) and Western Europe to reach market shares of 70 to 80%, the 'first wave' of supermarket diffusion in developing countries occurred in much of South America, Mexico, East Asia outside China, and northern Central Europe in the early to mid 1990s. In only a decade supermarket shares in retail reached comparable figures to those in some developed countries. The 'second wave' started in the mid to late 1990s and included much of Central America, South Africa, Southeast Asia, and southern Central Europe. The 'third wave' of the late 1990s and early 2000s is still in a process of rapid growth. This group includes India, China, Vietnam, Russia and the first countries in Africa. The 'fourth wave' is just about to take off and their development path regarding supermarket diffusion is still open. Much of Sub-Saharan Africa and the poorer countries from other regions in the world belong to this group.

Also with regard to products, the diffusion of supermarkets occurs in certain waves. First processed products and staples dominate, then semi-fresh products like dairy

products come in, whereas at the last stage fresh produce starts to gain market shares (Reardon et al., 2007). Supermarkets find it particularly difficult to compete with traditional supply chains in fresh produce (Reardon et al., 2007). This is related to the nature of fruit and vegetable supply chains, which have traditionally been shorter than those of products being less perishable. For fresh fruits and vegetables, supermarket procurement systems could not rely on centralized distributors but rather had to develop their own systems.

Fruit and vegetables fit into the group of food items that are also most often affected by SPS measures (Unnevehr, 2000). They are perishable and susceptible to be contaminated with microbiological agents or pesticide residues. At the cultivation, post-harvest, and processing level, fruits and vegetables are characterized by limited economies of scale. Hence, they have the potential to play an important role as employment generator in rural development and poverty reduction strategies (Weinberger and Lumpkin, 2007). Horticultural produce as the major focal point of the analyses in this study has been chosen, because it is the product category where above described changes within the food system transformation can be observed most prominently.

International market integration and domestic retail market growth in Vietnam have been sustained over the last years, making the country an interesting case to look into details of the food system transformation. Vietnam has relatively low wages, a varied climate, and is close to large growing markets in east Asia favoring fruit and vegetable processing and exports (Minot, 1998). Furthermore, Vietnam has been considered to be among the top-three most attractive destination countries for foreign direct investment in the retail sector (ATKearney, 2006). Retail sales in Vietnam

increased at an average annual rate of 15% between 1995 and 2005. The growth rates in the last few years reached almost 20% (GSO, 2007). The number of supermarkets has been growing rapidly in metropolitan areas, and modern retailers are starting to extend their scope to smaller cities and towns. From the first supermarket that opened in 1993, the number grew to 104 in 2005 (ACNielsen, 2007). Also, the fruit and vegetable sector in Vietnam has been growing fast over the past 15 years, with total production more than doubling from 6.6 million MT in 1990 to 13.3 million MT in 2004. After the collapse of the Eastern Bloc, where most of Vietnam's fruit and vegetable exports were destined to in the 1980s, exports constituted around 3% of production in 1990. This share increased to around 10% in 2004. During the same time, the share of fruit and vegetable exports in total food exports has also risen, from 2% in 1990 to 8% in 2004. Fruit and vegetable consumption in Vietnam increased from 88 kg to 145 kg per capita and annum between 1990 and 2004 (FAOSTAT, 2007).

The development potential of the Vietnamese fruit and vegetable sector has been highlighted by a comprehensive study conducted by the International Food and Policy research Institute (IFPRI, 2002). In more detailed analyses peri-urban production was emphasized as a viable mean to supply growing markets in the urban centers with fresh fruits and vegetables (Jansen et al., 1996; Anh et al., 2004). To improve food quality, food safety, and extend shelf-life, already earlier research focused on the development of post-harvest and processing technologies and has highlighted how through the introduction of improved technologies lucrative urban markets could be expanded (Minot, 1998; Hagen, 2002). As a consequence, more focus has been given to the development of commercial enterprises in the fruit and vegetable processing

sector (Son and Anh, 2005). Another study by Hung et al. (2004) examined the impact of tightening international requirements on horticultural processing firms' access to international markets. However, it has never been analyzed how private quality assurance programs affect processing firms chances to sustain international market access in a quantitative approach.

First attempts were undertaken to analyze how small-scale producers would be affected by the food system transformation in Vietnam (Tam, 2004; van Wijk et al., 2005). More recently Moustier et al. (2006a) have looked in a qualitative approach at impacts of supermarket penetration on poor consumers and poor producers, while van Wijk (2006) looked at impacts on whole supply chains. Moustier et al. (2007a) also analyzed how traditional street vendors are affected by changes in local government policies aiming to impede these activities. Aggregate markets at the national level, including fruits and vegetables, were found to lack close integration (Moustier et al., 2003; Fuglie et al., 2005). Fruit and vegetable markets in the two major cities in Vietnam, Hanoi and Ho Chi Minh City, are better integrated but still suffer from a lack of traceability and reliable food safety assurance systems (An et al., 2003; Cadilhon, 2005).

To understand the complex system of fresh fruit and vegetable marketing, a comprehensive approach that includes socio-cultural institutions into consideration is required (Cadilhon et al., 2002). Still, there is a dearth of empirical studies analyzing changing demand patterns from the perspective of the food system transformation. Although Ali et al. (2006) looked into detailed demand patterns of fruits and vegetables in Hanoi, they did not differentiate for product and process attributes relevant within the food system transformation. Food safety in fresh fruit and

vegetable produce is an issue that is discussed in Vietnam as consumer concerns have risen (Moustier et al., 2004; Figuié, 2003; Figuié et al., 2004). The institutional shortcomings in the provision of food safety and food quality for different food products (Moustier et al., 2007b) and vegetables in particular (Moustier et al., 2006b) are partly known. And although it has been highlighted in qualitative studies (e.g. Figuié, 2003) that consumers are concerned about food safety, there is a lack of information about consumers' willingness to pay for specific food safety attributes and the role of consumer perceptions in the valuation process. This information is required to better target public policies.

Based on the general background of the food system transformation and the specific situation in Vietnam, this study is guided by an overall research question: what are the determinants and implications of the food systems transformation for the horticultural sector in Vietnam? This research question is interesting for all those actors involved in the Vietnamese horticultural sector. The actors do not only include the private participants in supply chains, but also public sector institutions setting the framework conditions for the industry and those supporting and consulting the before mentioned actors. Furthermore, as we take the fruit and vegetable supply chains as an example for the overall transformation of the food system in Vietnam, results of our analysis might be interesting for other agricultural sectors in Vietnam too. Furthermore, as we take Vietnam as an example for a country being in the midst of the food system transformation, answers to the before mentioned research question might have implications for other countries being affected and shaping the transformations in their respective countries. In this way, the results will also generate interesting insights for the international institutions being involved in development.

According to the conceptual framework in figure 1, the overall research question is subdivided into an export analysis and two types of domestic demand analyses which lead to the following three more specific research questions:

(1) How do changing international requirements impact on exports of fruits and vegetables from Vietnam, and what is the role of private quality assurance programs (QAPs) in sustaining international market access?

(2) What are the determinants of domestic demand for fresh fruits and vegetables from modern supply chains at the household level, what is the magnitude of demand elasticities for such high-value products, and what future trends can be expected?

(3) What is the role of consumer perceptions in valuing food quality and food safety attributes, and what is consumers' willingness to pay for such attributes?
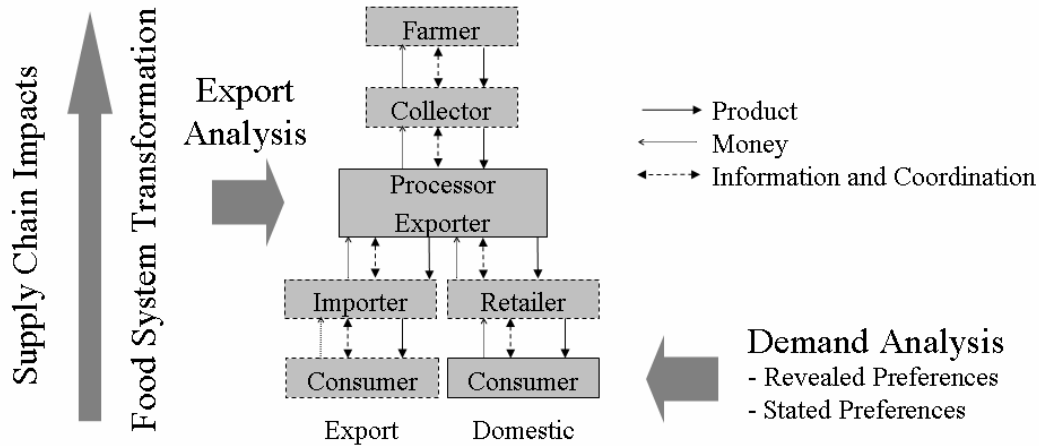
Figure 1: Conceptual framework

The first research question about international market access is addressed in an article entitled "Quality Assurance Programs and International Market Access: Empirical Evidence from the Vietnamese Horticultural Industry". A representative survey of 50 registered fruit and vegetable processing firms from allover Vietnam has been carried out. The resulting data are used for different statistical and econometric analyses. With the help of logistic regression models it is examined how private QAPs impact on sustained access to international markets.

The second research question is addressed in an article entitled "Changing Consumer Buying Habits in Developing Countries: A Disaggregate Demand Analysis for Fruits and Vegetables in Vietnam", which is based on survey data collected from almost 500 households in Hanoi and Ho Chi Minh City. Within an almost ideal demand system (AIDS) framework, the analysis differentiates products from modern supply chains according to place of purchase particularly focusing on modern retailers, food safety assurance with a focus on formal labels, and finally region of production with an

emphasize non-traditional imports. The resulting elasticity estimates are used to project future trends in domestic Vietnamese horticultural markets.

The third research question is addressed in an article entitled "Consumer Valuation of Food Safety and Quality Attributes in Vietnam". Here, the same household survey data are used as for the second article. In addition to revealed preferences, the survey questionnaire also included a contingent valuation module to capture stated preference data. For the analysis, a mediation framework and different econometric techniques are used.

In a final chapter of this cumulative dissertation, the main findings of the three articles are summarized and more general conclusions for policy making and research are drawn.

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CHAPTER II

QUALITY ASSURANCE PROGRAMS AND INTERNATIONAL MARKET ACCESS: EMPIRICAL EVIDENCE FROM THE VIETNAMESE HORTI-CULTURAL INDUSTRY

Marcus MERGENTHALER, Katinka WEINBERGER, Matin QAIM

ABSTRACT

Food safety and quality standards have recently received growing attention in national and international agricultural supply chains. Emerging private sector regulations are often perceived as market entrance barriers, especially for exporters from developing countries. Here, we analyze quality assurance programs (QAPs) in Vietnam's horticultural sector and their effect on access to international markets, using a representative sample of registered fruit and vegetable processing firms. Results of descriptive statistics and regression models show that QAPs are critical determinants of international market access. While the implementation of international programs – like HACCP, GLOBALGAP, or ISO 9000 – notably improves access to OECD countries, national QAPs are decisive for exports to non-OECD countries. Domestic market sales decrease the probability of being an OECD exporter and increase the probability of being a non-OECD exporter, suggesting a certain market segmentation between high-value exports on the one hand and domestic sales and lower-value exports on the other.

KEYWORDS:

high-value markets, export, private standards, food safety, quality management, Vietnam

1. INTRODUCTION

Food scares have triggered higher awareness about food safety problems among consumers in rich countries, but also among more affluent buyers in urban centers of developing and transition countries (Buzby 2001). Josling et al. (2004) describe how this and related trends have led to a growing demand for more stringent food regulations. These requirements can have profound implications for food processing firms in national markets, as for example shown by Muth et al. (2003). Given the increasing amounts of traded high-value agricultural products, and the growing number of supply chains that surpass national and regional boundaries, food regulations have recently become also an issue in international trade (Jaffee and Henson 2005).

Henson and Loader (1999) argued that sanitary and phytosanitary measures required by developed countries would be increasingly challenged by developing country exporters due to their potential trade impeding effects. They mostly referred to public sector standards. In addition, however, there is a growing number of regulations emerging from the private sector. Private measures spread, partly because public regulatory approaches have not kept pace with rapidly changing consumer preferences for food safety and food quality (Henson and Reardon 2005). Garcia Martinez et al. (2007) highlighted how private regulations can add, complement, or substitute public regulations to different degrees and in different set-ups. As these private regulations and requirements might hamper international market access in a similar way as public standards, Martinez and Poole (2004) coined the term of 'commercial barriers to trade'. Though private standards are voluntary, they become *de facto* mandatory once importers require them. This situation is further aggravated by the fact that private standards are not within the regulatory scope of the World Trade Organization.

Reardon et al. (1999) described the different venues food exporters in developing countries can take to deal with such non-tariff import restrictions in high-income countries. Turner et al. (2000) illustrated how the implementation of quality assurance programs (QAPs) at the firm level is considered as a strategic management decision to meet the more stringent private requirements. Overall, however, there is relatively little empirical evidence on how firms in the food industry of developing countries respond to the changing framework conditions in international markets (Henson 2006;Chia-Hu 2006). This research gap is addressed in the present article. Building on a survey of fruit and vegetable processing firms in Vietnam, we analyze whether the implementation of different QAPs has an effect on international market participation.

The article is organized as follows: the next section introduces the conceptual framework. Then the survey of Vietnamese firms and the resulting data are described in section 3. Section 4 gives a descriptive overview of the links between firm characteristics, implementation of QAPs, and international market access. In section 5, different econometric models are specified, in order to analyze determinants of firm exports more formally, while in section 6, the estimation results are presented and discussed. The last section concludes.

2. CONCEPTUAL FRAMEWORK

Agricultural exports are a means for developing countries to generate foreign exchange and contribute to employment and economic development in rural areas. However, compared to domestic markets, export markets are often perceived as more challenging, especially when the trading partners have different economic stages of development and different regulatory approaches. This applies in particular for high-value

exports to developed countries, where food safety and food quality attributes are crucially important.

Information asymmetry related to food safety and quality along supply chains and the resulting need for careful monitoring and enforcement can entail significant transaction costs in exports. Martinez and Poole (2004) stress the importance of organizational and institutional aspects for successfully participating in export markets. Among other factors, formalized QAPs can be a key component within modern institutional setups, as they clearly spell out requirements for suppliers and give customers a comprehensible indication of their trading partners' quality related capacities. In this way, QAPs contribute to market transparency and reduce transaction costs. Indeed, Holleran et al. (1999) showed that the potential to reduce transaction costs along supply chains is often the major reason for firms to implement QAPs. As such type of institutional innovation is of strategic nature, effects are not primarily expected in short term financial and productivity measures, but rather in longer term outcomes like access to specific customers and markets (Tsekouras, Dimara, and Skuras 2002).

Introduction of QAPs and getting access to export markets has not necessarily to be thought of as a clear temporal sequence. QAPs can facilitate access to international markets, but existing exports can also trigger firms to implement QAPs, in order to remain competitive. From a dynamic perspective, causal chains can be elusive. and a detailed analysis would require panel data. We only have cross section data, so that our analysis is static in nature. Yet, from a static perspective, QAPs can be interpreted as a determinants of having (as opposed to gaining) access to export markets at a given point in time. This access may be newly gained or maintained from previous periods.

A number of QAPs have become prominent in the horticultural industry in recent years. Internationally recognized QAPs include standards of the International Organization for Standardization (e.g., ISO 9000), Hazard Analysis and Critical Control Points procedures (HACCP), and the protocols of the Euro Retailer Group for Good Agricultural Practices (GLOBALGAP previously EurepGAP). Though these programs are different in scope, they all focus on the process of production within firms and supply chains through documentation, controlling, and monitoring. ISO 9000 sets out general requirements for a quality management program, which is applied in many industries to improve quality management; HACCP has been developed in the food sector and aims to identify and control critical points in the production process, while GLOBALGAP focuses on the level of primary production. In addition to these international standards, many QAPs have been developed at the national level. They are often based on the same principles as international QAPs, but requirements, enforcement, and certification are tailored to take account of specific, national conditions. Though national QAPs might play an important role in domestic markets, they are usually not recognized internationally – at least not in developed countries.

We hypothesize that QAPs in general increase the probability of processing firms to be present in export markets. Yet we also want to know whether different types of programs have divergent effects in different markets. We therefore further hypothesize that internationally recognized QAPs increase the probability of exports to developed countries, whereas national QAPs are rather relevant for domestic and less demanding foreign markets.

3. DATA

We use the fruit and vegetable processing sector in Vietnam to test our hypotheses on the role of QAPs for export market participation. Horticultural processing in general, and in Vietnam in particular, is an interesting example for several reasons. First, the structure of developing country agricultural exports is changing: while traditional export crops – like tea, coffee, and cocoa – are losing relative weight in commodity baskets, non-traditional exports are gaining market shares (Aksoy 2005). Fruits and vegetables in particular are gaining in importance; their volume of exports has increased fivefold between 1961 and 2001 (Weinberger and Lumpkin 2007). Second, at cultivation, post-harvest, and processing levels, fruits and vegetables are characterized by limited economies of scale (Weinberger and Lumpkin 2007). Hence, they have the potential to play an important role as employment generator in rural development and poverty reduction strategies. Third, after a period of isolation from international markets, Vietnam is opening up its economy and is making increasing efforts to diversify and enhance revenues from agricultural exports. The promotion of fruits and vegetables is an integral part of this strategy (Son and Anh 2005).

For the empirical analysis, a dataset of 50 Vietnamese fruit and vegetable processing firms is employed, which is based on a survey that we conducted between August and October 2005. We define fruit and vegetable processors as enterprises that transform fruits and vegetables into a different state – often but not necessarily in order to preserve them. This processing can involve freezing, canning, pickling, drying, or converting into jams, but also value adding of fresh products like grading, washing, and packaging. This definition goes along with Diop and Jaffe (2005), who included

all SITC (Standard International Trade Classification) items of Revision 1, Chapter 5, except for nuts, roots, and tubers.

The sample was randomly drawn from a list of almost 100 registered fruit and vegetable processing firms in Vietnam. Complete and up-do-date lists of all (registered and unregistered) firms in the sector are not available. However, their numbers can be estimated to be between 120 and 140 based on national statistics of sales volumes. Expert assessments confirm that our sample can be considered representative of the industry in Vietnam. In terms of their headquarters, half of the firms are located in Vietnam's two major cities, Hanoi (12 percent) and Ho Chi Minh City (38 percent). The other half are located in the major vegetable growing area in the central highlands (14 percent), important fruit growing areas in the Mekong river delta (8 percent), and other provinces of the country.

Firm managers were interviewed face to face, in order to improve data reliability. Though anonymity and confidentiality were assured to respondents, it should be mentioned that information given by managers might potentially be biased, due to strategic considerations and unwillingness to disclose information regarded as sensitive – problems that are well-known in agribusiness research. The structured questionnaire captured information about firm characteristics and their upstream and downstream relations. A particular focus was on food safety and food quality related issues.

4. EXPORTS AND QUALITY ASSURANCE

Based on the data from our survey of fruit and vegetable processing firms in Vietnam, in this section we describe some of the firms' characteristics, managers' perceptions, and implementation of QAPs in relation to a firm's export status.

4.1 Exports of horticultural products in Vietnam

Over the last 15 years, the number of firms in Vietnam's horticultural industry has risen significantly, and integration in international markets has grown constantly. Because of economic liberalization policies and specific state support (World Bank 2005), an increasing share of horticultural processing firms is exploiting opportunities in international markets (figure 1). In 2004, two-thirds of the firms in our sample were exporters. More than half of the exporting firms were OECD exporters, meaning that their most important destination market was a country of the Organization for Economic Co-operation and Development (OECD). In particular, destinations for these firms' exports are Japan, Germany, and the USA, among others. The other exporters sold mostly to non-OECD countries, including Taiwan, Russia, and China.[1] Exported fruits most often mentioned by managers were pineapple, rambutan, guava, and litchi, while the most important vegetables for exports are chilies and cucumbers. Overall, in our sample vegetables play a less prominent role in exports than fruits.

(figure 1 about here)

Exports are a means of diversifying a firm's markets, also potentially increasing revenues. Indeed, we find that both OECD exporters and non-OECD exporters have higher total annual sales than non-exporters. This indicates that lucrative export markets can function as pull factors for companies to initially access and then remain in international markets.

Domestic market structure can have a decisive impact on international market participation of firms in developed countries, as shown by Porter (1990). We expect this to be similar in developing countries. On the one hand, competitive experience in domestic markets can facilitate international market access, as it might help firms to prepare for even higher levels of competition in international markets (Porter 1990).

On the other hand, domestic market thinness can also be a push factor for exports. Looking at our data, we find that non-OECD exporters have much higher domestic sales than OECD exporters, both in absolute and relative terms (figure 2). This suggests a synergetic relationship between domestic and non-OECD export markets, due to similar competitive requirements, as argued by Porter (1990). However, markets of OECD exporters, with higher food safety and quality requirements, seem to be somewhat segmented from the rest. Indeed, more OECD exporters than non-OECD exporters named lack of harmonization between domestic and import country safety and quality regulations as a problem in the export business (table 1).

(figure 2 about here)

4.2   Quality assurance in export markets

Quality related measures, including technology upgrades and changes in the supplier base, are considered as pre-conditions for the initial access to export markets by the majority of firm managers in our survey (table 1). Most exporters stated that they had temporarily lost international market access at some point in the past. In one-third of the cases, lost international market access was linked to quality problems, like spoiled produce due to a non-continuous cold-chain. This highlights that the position of Vietnamese firms in international high-value markets is vulnerable and can easily be lost to competitors in other countries (see also World Bank 2005). Most of Vietnam's trade competitors in Southeast Asia are already more integrated in international markets. For instance, countries like Thailand and Malaysia are considered more experienced and efficient in adhering to food safety and quality requirements in fruit and vegetable processing (IFPRI 2002).

(table 1 about here)

The management of processing firms in Vietnam is challenged to deal with rising food safety and quality requirements (World Bank 2005). An important question is how to communicate relevant information to buyers in a credible way. QAPs have the potential to facilitate communication with trading partners, thus reducing transaction costs. In 2004, such programs were implemented by 66 percent of the fruit and vegetable processing firms in our sample. As can be seen in figure 3, the share was considerably higher among exporters than among non-exporters, which is a first indication that QAPs improve international market access. Further disaggregation shows that many OECD exporters implemented internationally recognized programs, while exporters selling to less demanding markets in non-OECD countries often employed national QAPs.

(figure 3 about here)

The implementation of QAPs is an ongoing process in the Vietnamese horticultural industry. All sampled firms with international QAPs have started to implement them after 1999. National programs had partly been established earlier than this, and they continue to be the central quality assurance strategy in many firms. The gradual implementation of QAPs in Vietnam went along with increasing fruit and vegetable exports, as figure 4 illustrates. This is a further indication that these programs improve or contribute to maintain good export conditions for horticultural processing firms.

(figure 4 about here)

Why do some firms hesitate to adopt formal QAPs then? According to the survey responses, the main reasons are higher costs and management requirements. In some cases, firms had even abandoned programs previously adopted, after realizing that they did not deliver the expected benefits. The total cost increase through QAPs

is estimated to be 9 percent on average (table 2).[2] Strikingly, estimated cost increases are highest for non-exporters, somewhat declining for non-OECD exporters and OECD exporters. It is likely that some of the exporters had already met higher standards before the implementation of formal QAPs, which explains their lower relative cost increases. This phenomenon is what Martinez and Poole (2004) referred to as a "decreasing depths of the compliance gap". Higher costs due to QAPs are associated with investments in more sophisticated equipment and increased labor requirements. Moreover, management time is estimated to be 22 percent higher on average, mainly related to worker supervision, dealing with external audits, and identifying suitable suppliers. Yet, there are also individual firms where managers indicated that quality programs are not associated with higher costs or even allowed cost reductions. This might potentially be attributed to improved operational processes and efficiency gains (cf. Holleran, Bredahl, and Zaibet 1999).

With a certified QAP, firms can charge higher prices for their products (table 2). Perceived price increases are highest among non-exporters, which is probably because certain food safety and quality attributes linked to the implementation of QAPs can help to differentiate products in the domestic market, while they are required or expected basic standards in export markets – particularly in OECD countries. The majority of firms indicated that they use their QAPs for promotion purposes; the share is somewhat higher among exporters than among non-exporters. This underlines the downstream communications function of these programs: if customers rely on a processing firm's QAP, they can reduce their own transaction costs, which is particularly relevant for foreign trading partners. Table 2 also shows that formal QAPs enable firms to secure new customers. Most of the non-exporting firms and more than half of the exporting firms have acquired new domestic customers through QAP implementa-

tion. Most exporters also acquired new foreign customers. Finally, QAPs are felt to positively impact on profits in 56 percent of the firms; in about one-third of the cases, profits remained stable, whereas in a few firms managers also indicated that profits decreased.

(table 2 about here)

5. EFFECT OF QUALITY ASSURANCE ON EXPORT STATUS

The descriptive analyses in the previous section showed that there are substantial differences between processing firms catering to different markets. Comparing mean values, however, is not sufficient in order to attribute a firm's export status to the implementation of QAPs. Therefore, in this section, we specify econometric models that try to explain participation in international trade through QAPs while controlling for other covariates possibly affecting export market participation. In section 6, these models will be estimated empirically.

5.1 Basic model specification

In a basic model specification (model 1), we explain the export status of a processing firm by the following equation, which will be estimated by a logistic regression approach:

(1) $EX1 = \alpha_1\, QAP + \gamma_1\, D + \beta_1\, S + \beta_2\, H + \beta_3\, C + \beta_4\, T + \varepsilon$

The dependent variable ($EX1$) is a dummy, which takes a value of one if the firm exports, regardless of the destination country, and zero otherwise. As treatment variable (QAP), we use a dummy, which is one when a formal QAP of any kind is implemented, and zero when no formal program is used. Our hypothesis is that firms with QAPs have a higher probability of exports, which would result in a positive es-

timation coefficient (α_1) for the treatment variable. In addition, we test for the influence of domestic market sales (D), measured in million US$ per year. Based on our discussion above, the sign of the estimated coefficient γ_1 can be either positive or negative, depending on export destination.

Other covariates control for additional firm characteristics. S is a measure of firm size expressed in terms of the workforce. H denotes human capital, which is hard to measure; we use a dummy, which is one if management considers university education among the top three sources of employee qualification, and zero otherwise. C indicates access to commercial credit: this is a dummy that is one if the most important source of credit for a particular firm is the commercial banking sector, and zero otherwise. T is a quality measure of the processing technology used. In Vietnam, technology from abroad is considered superior to technology produced domestically or in neighboring countries. Therefore, T is as a dummy that is one if the firm uses processing equipment imported from non-neighboring countries, and zero otherwise. To some extent, T can also be considered an indicator of the firm's financial capital endowment. Summary statistics for all covariates are shown in table 3.

(table 3 about here)

5.2 Sample selection

A potential problem might arise, because the implementation of QAPs is probably not random. Furthermore, it is likely that different factors simultaneously affect export market participation and implementation of QAPs. The resulting correlation with the error term might lead to a selection bias, which could obscure the treatment effect. We use a propensity score approach to test and account for this potential problem (Wooldridge 2002). This approach is based on estimating average treatment effects, a

methodology widely applied in the program evaluation literature. Propensity scores are obtained as predicted probabilities of additional logistic regressions, with QAPs as dependent and covariates as independent variables (model 2a):

(2) $\quad QAP = \gamma_1 D + \beta_1 S + \beta_2 H + \beta_3 C + \beta_4 T + \varepsilon$

We use the same firm level variables as described above. The model is used to calculate the estimated probability of having implemented a QAP, which is denoted as propensity score (PS_{QAP}).

In a second stage, the initial export model is replaced with a specification that only includes QAP and the propensity score (PS_{QAP}) as independent variables (model 2):

(3) $\quad EX1 = \alpha_1 QAP + \lambda_1 PS_{QAP} + \varepsilon$

Thus, propensity scores function as controlling variables, containing the information of the covariates affecting the implementation of QAPs. A significant coefficient λ_1 corrects for the selection bias, whereas an insignificant coefficient suggests that the initial results are unbiased.

5.3   Market differentiated models

In a different model specification (model 3), we take account of the fact that export markets are differentiated and might have different requirements in terms of food quality and safety. Therefore, the dependent variable is disaggregated by destination of exports, with no exports, OECD exports, and non-OECD exports as distinct categories (*EX2*).

(4) $\quad EX2 = \alpha_1 QAP_{nat} + \alpha_2 QAP_{int} + \gamma_1 D + \beta_1 S + \beta_2 H + \beta_3 C + \beta_4 T + \varepsilon$

National (QAP_{nat}) and international QAPs (QAP_{int}) are considered as two separate treatment variables. As above, our hypothesis is that firms with QAPs have a higher

probability of exports, which would result in positive estimation coefficients for both treatment variables. The other independent variables are as in equation (1). This model will be estimated with a multinomial logistic regression approach.

To test for a possible sample selection bias, a propensity score approach similar to the one described above is employed. First, a multinomial model is estimated with the dependent variable (QAP^*) having three distinct classes: a firm has no QAP, a national QAP, or an international QAP (model 4a):

(5) $QAP^* = \gamma_1 D + \beta_1 S + \beta_2 H + \beta_3 C + \beta_4 T + \varepsilon$

Propensity scores are estimated for national (PS_{QAPnat}) and international QAPs (PS_{QAPint}). They enter into the following export model (model 4):

(6) $EX2 = \alpha_1 QAP_{nat} + \alpha_2 QAP_{int} + \lambda_1 PS_{QAPnat} + \lambda_2 PS_{QAPint} + \varepsilon$

As in equation (3), significant λ_i would indicate that the initial model specification (model 3) is biased due to sample selection.

6. ESTIMATION RESULTS AND DISCUSSION

6.1   Impact of general firm characteristics on export market participation

Estimation results for the export models described in the previous section are shown in table 4. The coefficients can be interpreted as marginal effects on the probability to export. In model 1, only firm size and human capital endowment have significant impacts on participation in international trade. An increase in firm size by 100 employees raises the probability to export by 7.5 percentage points. A positive impact of firm size on exports was also found in other empirical studies (Naude and Serumaga-Zake 2003). In firms where management considers university education among the most important sources of employee qualification, the predicted probability of being an exporter is 27 percentage points higher than in other firms. This is similar to Fischer

(2004), who also found that education and training of staff are a major determinant of a firm's success in international food markets. Interestingly, when export markets are further disaggregated (model 3), firm size and human capital endowment lose their statistical significance, both for non-OECD and OECD exports. This, however, should not be over-interpreted. As the sample size is small, standard errors are relatively large. The signs of the coefficients are as in model 1.

6.2   Impact of quality assurance programs on export market participation

Significant positive impacts of QAPs on international market access are detected in model 1 (table 4). *Ceteris paribus*, the predicted probability of being an exporter is 33 percentage points higher for firms with a QAP than for those without. The results in model 3 show that the type of QAP differentiates between markets. The predicted probability of exporting to a non-OECD country is 33 percentage points higher for firms with national QAPs than for firms without any certified program. For OECD exports, in contrast, international QAPs are of crucial importance. Implementing an international QAP increases the probability to export to an OECD market by 39 percentage points; national QAPs have no significant effect for participation in these higher-value markets.

(table 4 about here)

Models 2 and 4 are used to test whether there is a selection bias in the QAP treatment effect. As described above, propensity scores are calculated based on additional logistic regressions, results of which are reported in table 5. In these selection models, companies with access to commercial credits are more likely to implement QAPs. The multinomial logit model, which distinguishes between national and international QAPs, shows that access to the commercial credit market is particularly rele-

vant for international QAPs. For national QAPs, human capital and technological endowments have significantly negative effects. For international QAPs human capital has a positive impact. Domestic sales appear to have no significant impact on the implementation of QAPs.

(table 5 about here)

Table 4 shows that the coefficients of the propensity scores in export models 2 and 4 are not significant. This indicates that the initially estimated treatment effects for QAPs in models 1 and 3 do not suffer from a selection bias.

6.3   Domestic market sales and export market participation

When export markets are not distinguished (model 1), the value of domestic market sales is not a significant factor influencing a firms' export status. However, domestic market sales are a highly significant and distinguishing factor for differentiated export markets. Domestic sales have a positive impact on exports to non-OECD countries (model 3): with every additional million in domestic sales, the probability to be a non-OECD exporter increases by almost 10 percentage points (at sample means). In contrast, an additional million of domestic sales decrease the probability to be an OCED-exporter by 15 percentage points (table 4).

We analyze the relationship between domestic market sales and the different export markets more explicitly. By using the estimated coefficients of model 3, we predict export probabilities for firms with different levels of domestic sales, at the same time accounting for the influence of different types of QAPs. The results are displayed in figure 5. When firms do not have any QAP, the probability to export to OECD-countries decreases sharply from less than 40 percent to zero as domestic market sales increase. Implementation of national QAPs hardly changes the picture for

OECD exports. However, with implementation of international QAPs, export probability at low levels of domestic sales increases to almost 80 percent. This probability decreases with domestic sales – although less rapidly than for firms with national or no QAPs. At high levels of domestic sales, export probability to OECD-countries becomes almost zero, whereas the probability of non-OECD exports increases.

While the overall probability of exports at a given QAP status does not vary much at different levels of domestic sales, the relative probability of OECD versus non-OECD-exports decreases exponentially, particularly for firms with international QAPs. Therefore, domestic sales are a highly distinguishing factor for different export markets, particularly when firms have international QAPs and to a lesser degree when they do not have any QAP. This confirms that there are synergies between domestic and non-OECD markets, whereas such synergies do not occur with OECD markets. These markets are more demanding and therefore require a higher degree of specialization, which supports the market segmentation hypothesis discussed above.

(figure 5 about here)

7. CONCLUSIONS

Rising consumer concerns about food safety and food quality issues have led to a growing importance of private food regulations at national and international levels. Consequently, developing country exporters might face market entrance barriers into international trade. In this article, a sample of fruit and vegetable processing firms from Vietnam has been used to analyze whether the implementation of QAPs helps to improve international market access. Descriptive statistics and econometric analyses clearly confirm that such programs do facilitate participation in international trade. However, the effect is market specific and depends on the type of program imple-

mented. While international QAPs – like HACCP, GLOBALGAP, or ISO 9000 – notably improve access to OECD countries, national programs seem to be sufficient for exports to non-OECD countries. This suggests segmentation between domestic and non-OECD markets on the one hand, and OECD markets with higher food safety and quality requirements on the other. Market segmentation is further indicated by a positive relationship between domestic market sales and non-OECD exports, and a negative relationship between domestic sales and OECD exports.

The factors affecting the implementation of QAPs at the firm level are less clear. Access to commercial credits plays a role for international programs, suggesting that infrastructure and institutional conditions matter. From a policy point of view, this indicates that further formalization of the business environment will facilitate the implementation of international QAPs, thus improving domestic firms' access to high-value OECD markets. Nonetheless, also national QAPs can be a suitable strategy for processing firms, particularly when they are not well equipped with human and financial capital. While not helping in the access to OECD countries, national QAPs improve the competitive position in non-OECD markets. Firms in our sample that opted for this strategy have considerably higher annual sales than both OECD exporters and non-exporters. As non-OECD exporters cater to markets that have similar food safety and quality requirements as in the home market, they can rather exploit possible economies of scale in production and avoid possible diseconomies of scale in monitoring and coordination. This points in the direction of increasingly lucrative South-South trade, as also discussed by Reardon et al. (2007).

Our results also have implications for rural development. Since the horticultural sector in Vietnam and other developing countries provides livelihoods for many of the rural poor, either as farmers or as wage laborers in primary production and

processing, these people directly depend on the industry's success in international markets. Increasing consumer demand for high-value products offers new income earning opportunities, when food systems manage to adapt properly to the new conditions. This is not only a challenge for exporters, but also for upstream stages of the supply chain. For instance, many managers of exporting firms stated in the interviews that they have problems identifying suitable primary producers, who can supply required qualities. Therefore, beyond the implementation of QAPs at the level of processing firms, success in high-value export markets requires comprehensive adjustments in the supply chain, including awareness creation, training, as well as appropriate institutional and technological innovation.

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[1] In official export statistics, China is the most important export destination (cf. Hung, An, and Loc 2007), while in our sample exports to China play a smaller role. The reason is probably that exports to neighboring China are sometimes conducted by non-registered firms, or by traders of fresh, unprocessed products without further value-adding activities. Our survey explicitly focused on registered processing firms.

[2] Exact cost calculations for QAPs are not a straightforward task; there is no general agreement on how to exactly categorize and capture different costs (Antle 1999). Most firms in our sample did not keep detailed records of costs related to QAPs, so that we asked the managers to give a percentage estimate, taking total costs without QAPs as the reference. A similar approach has also been used in other studies (e.g. Mezher 1999).

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TABLES

Table 1: Managers' perceptions regarding quality issues and exports by firm export status

	non-OECD exporter	OECD exporter	All
Lack of harmonization in regulations	7%	26%	12%
Quality as precondition for export	79%	79%	79%
Exports ceased in past	71%	79%	76%
...due to quality problems	30%	27%	28%

Notes: None of the differences between non-OECD exporters and OECD exporters were significantly different at the 10% level tested by Fisher's exact probability test.

Table 2: Managers' perceptions about QAPs by firm export status

		Firm exports			
		No	non-OECD	OECD	All
Mean shares	Mean cost increase	12%[a]	9%[ab]	7%[b]	9%
	Mean management time increase	33%[a]	11%[b]	24%[b]	22%
	Mean increase in prices charged for products	15%[a]	8%a[b]	6%[b]	9%
Share of firms	Used for promotion	75%[a]	100%[a]	77%[a]	84%
	New domestic customers	88%[a]	55%[a]	54%[a]	63%
	New foreign customers	0%[a]	80%[b]	92%[b]	65%
	Increase in profits	50%[a]	55%[a]	62%[a]	56%

Notes: Numbers followed by the same letters are not significantly different from each other. The non-parametric Mann-Whitney test was used for continuous variables. Fisher's exact probability test was used for categorical variables.

Table 3: Summary statistics of covariates by firm export status

	Firm exports			
	No	non-OECD	OECD	All
Workforce (full time equivalents)	98.49[a]	272.16[b]	220.82[b]	193.60
	[149.36]	[290.44]	[300.10]	[260.65]
University educated workforce (dummy)	0.35[a]	0.86[a]	0.68[a]	0.62
Access to commercial credit (dummy)	0.53[a]	0.64[a]	0.68[a]	0.62
Imported technology (dummy)	0.65[a]	0.71[a]	0.79[a]	0.72
Domestic sales (million US$)	0.48[ab]	1.69[a]	0.48[b]	0.82
	[0.85]	[2.97]	[0.90]	[1.78]

Notes: Table reports means and standard deviations in brackets. Numbers followed by the same letters are not significantly different from each other. The non-parametric Mann-Whitney test was used for continuous variables. Fisher's exact probability test was used for categorical variables.

Table 4: Logit regressions for export market participation

	Binary logit models		Multinomial logit models			
	Model 1	Model 2	Model 3		Model 4	
	Export	Export	non-OECD	OECD	non-OECD	OECD
Treatment						
All programs	0.333***	0.297**				
	[0.115]	[0.142]				
National QAPs			0.332***	-0.038	0.223**	0.039
			[0.096]	[0.193]	[0.088]	[0.185]
International QAPs			0.022	0.387**	-0.011	0.378**
			[0.271]	[0.170]	[0.270]	[0.157]
Covariates						
Workforce (hundreds)	0.075*		0.041	0.038		
	[0.042]		[0.031]	[0.036]		
University educated workforce	0.272***		0.166	0.123		
	[0.102]		[0.197]	[0.128]		
Access to commercial credit	-0.070		-0.073	-0.005		
	[0.167]		[0.193]	[0.185]		
Imported technology	0.230		0.080	0.143		
	[0.161]		[0.189]	[0.220]		
Domestic sales (million US$)	-0.018		0.099**	-0.151**		
	[0.039]		[0.043]	[0.060]		
Propensity scores (PS)						
PS all QAPs		-0.083				
		[0.225]				
PS national QAPs					-0.005	-0.497
					[0.328]	[0.339]
PS international QAPs					0.435	-0.054
					[0.452]	[0.380]
Constant	-0.400*	-0.023	-0.405*	-0.129	-0.098	-0.023
	[0.234]	[0.107]	[0.238]	[0.173]	[0.122]	[0.103]
Summary statistics						
Observations	50	50	50		50	
Log likelihood :	-25.57	-30.00	-43.92		-48.01	
Chi2:	38.67***	4.36	335.97***		112.06***	

Notes: Table reports marginal effects at sample means and standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: First stage logit regressions for the implementation of QAPs

	Binary logit model Model 2a	Multinomial logit model Model 4a	
	All QAPs	National QAPs	International QAPs
Workforce (hundreds)	0.044	0.021	0.021
	[0.043]	[0.042]	[0.022]
University educated workforce	-0.098	-0.312*	0.201**
	[0.166]	[0.182]	[0.101]
Access to commercial credit	0.265**	0.039	0.244*
	[0.127]	[0.136]	[0.128]
Imported technology	-0.323	-0.285*	-0.047
	[0.218]	[0.158]	[0.149]
Domestic sales (million US$)	0.021	0.026	0.002
	[0.040]	[0.033]	[0.029]
Constant	0.196	0.353**	-0.319*
	[0.191]	[0.151]	[0.167]
Summary statistics:			
Observations	50	50	
Log likelihood :	-26.70	-45.89	
Chi2:	16.25***	23.01**	

Notes: Table reports marginal effects at sample means and standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

FIGURES

Figure 1: Share of fruit and vegetable processing firms exporting to different markets (1990-2004)
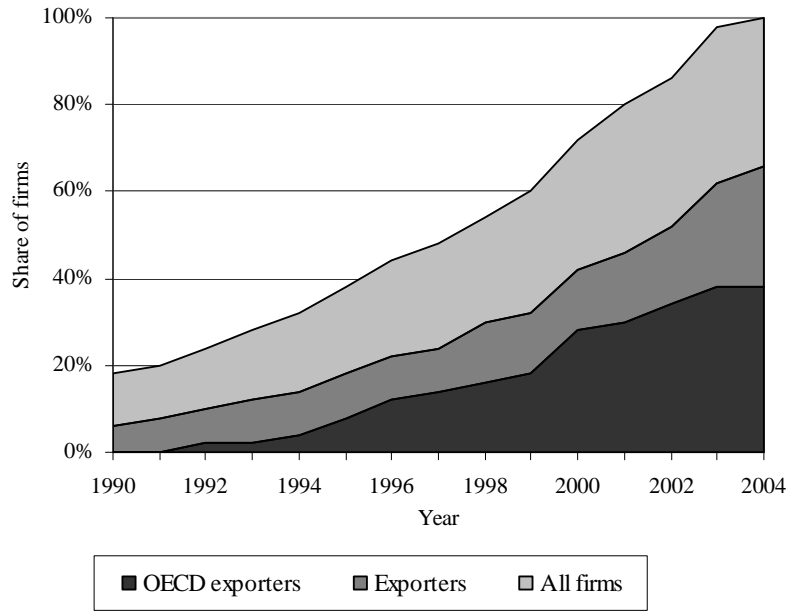
Source: Based on own survey data.

Figure 2: Magnitude and composition of mean annual sales by firm export status (2004)
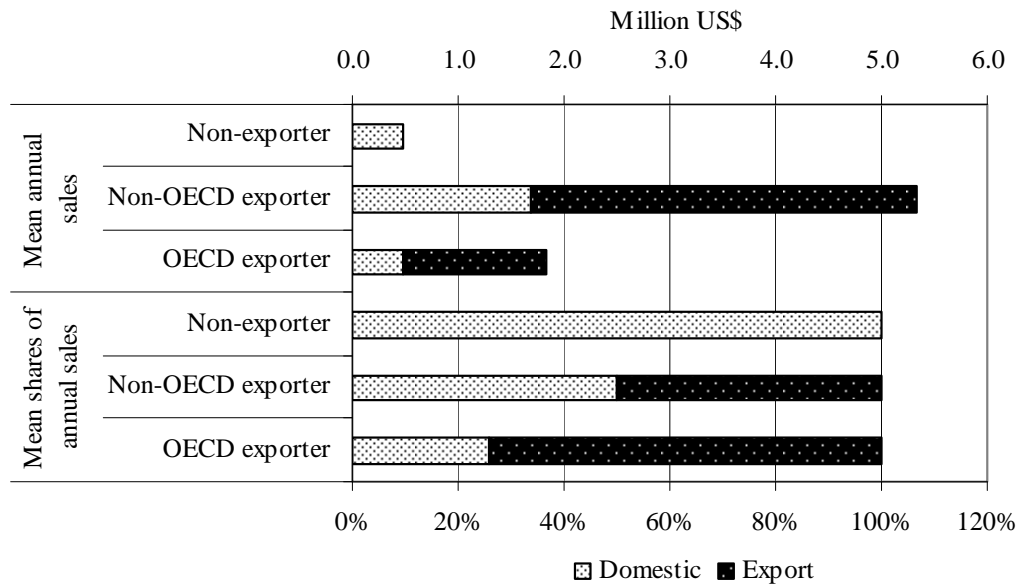
Figure 3: Share of firms implementing different QAPs by firm export status (2004)
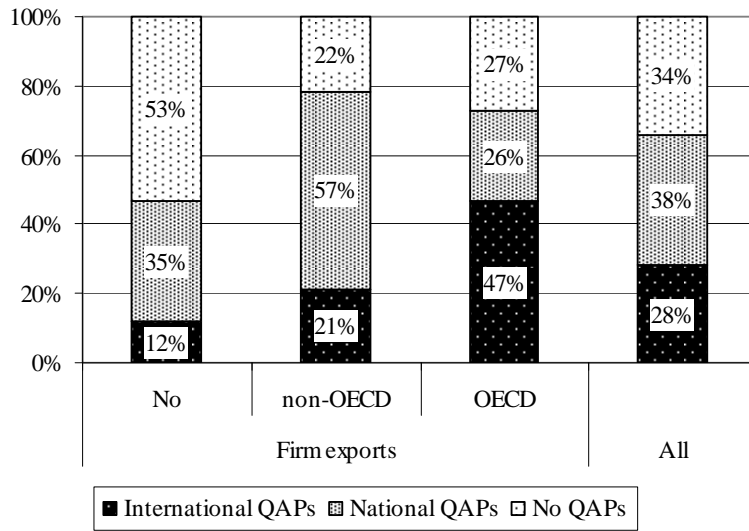
Source: Based on own survey data.

Figure 4: Volume of Vietnam's fruit and vegetable exports and share of processing firms implementing different quality assurance programs (1990-2004)
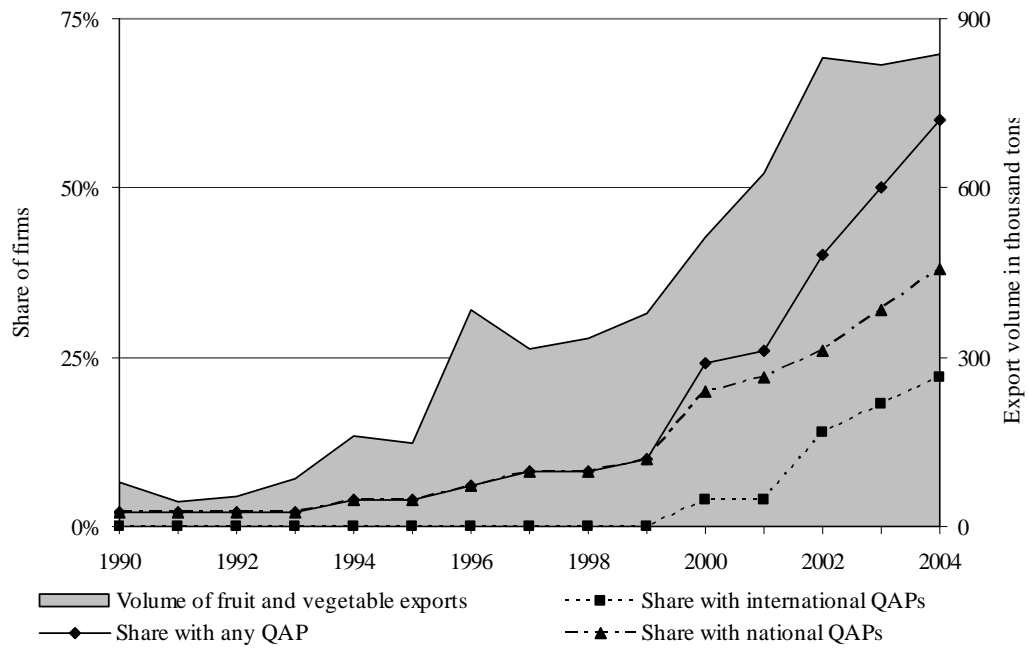
Note: Export volumes are based on FAOSTAT (2007); firm shares are based on own survey data.

Figure 5: Predicted export probabilities by domestic sales and QAPs
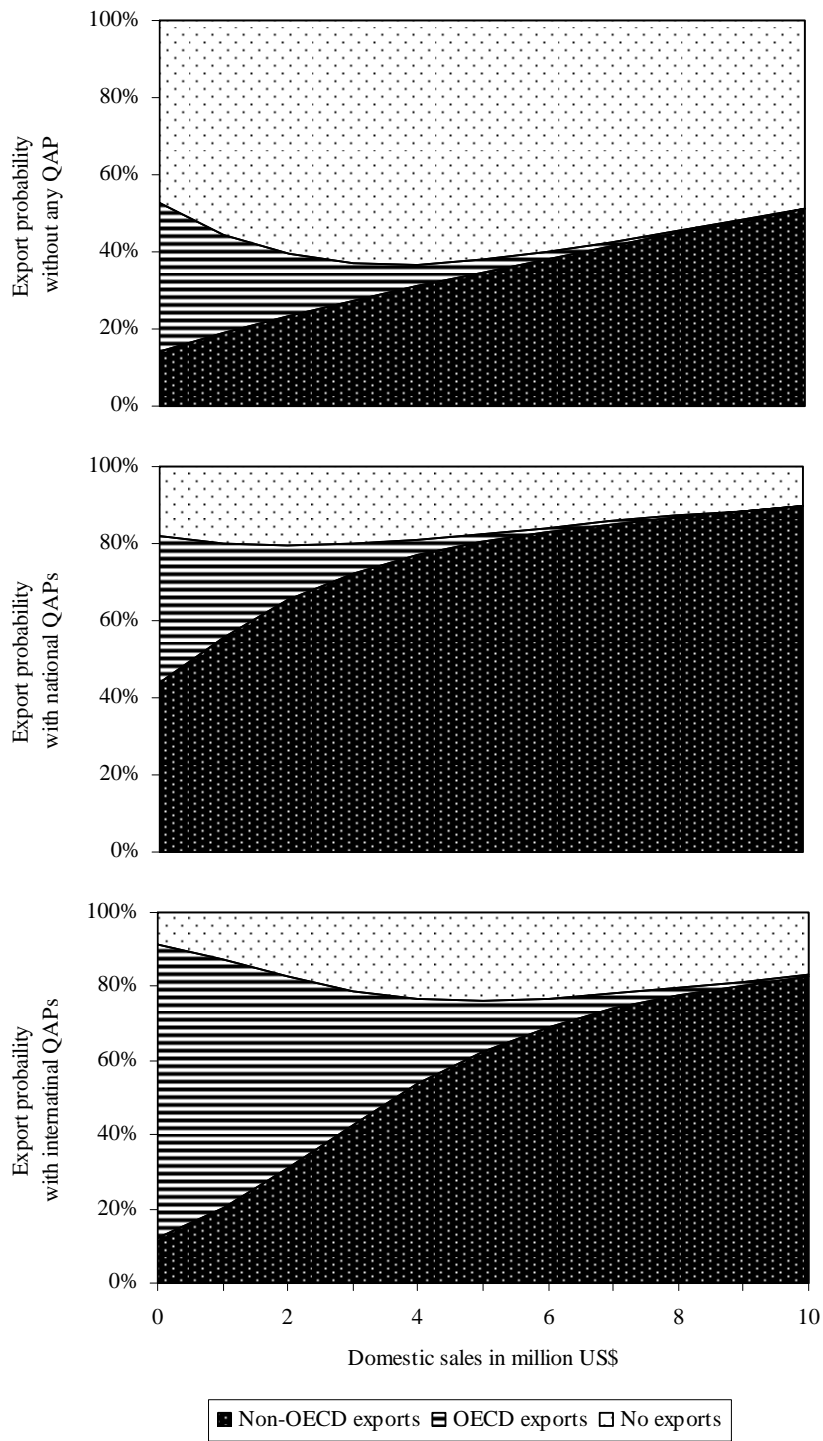
Source: Based on own survey data.

CHAPTER III

CHANGING CONSUMER BUYING HABITS IN DEVELOPING COUNTRIES: A DISAGGREGATE DEMAND ANALYSIS FOR FRUITS AND VEGETABLES IN VIETNAM

Marcus MERGENTHALER, Katinka WEINBERGER, Matin QAIM

ABSTRACT

Food systems in developing countries are currently undergoing a rapid transformation towards high-value products, with important implications for the local economy. While supply side aspects of this transformation have been analyzed previously, issues of consumer demand have received much less attention. This article analyzes changing consumption habits for fresh fruits and vegetables in Vietnam, using household survey data and a demand systems approach. Demand for products from modern supply chains – particularly modern retailers and non-traditional imports – is highly income elastic, and the income effect is stronger than the impact of prices and supermarket penetration. This highlights the importance of considering demand side aspects when projecting future trends. Our results imply a continued restructuring of the food sector in the further process of economic development.

Keywords:

transformation of food systems, supermarkets, food safety, non-traditional imports, Southeast Asia, Vietnam

Introduction

Economic growth, international market integration, urbanization, and changing lifestyles are associated with transformations in the food systems of developing countries. The increasing role of modern retail outlets, food safety and quality standards, vertical market integration, and international trade in high-value products characterize these changes (Pingali, 2007a). Different authors have looked into the rise of supermarkets in developing countries (e.g. Reardon et al., 2003). The growing role of private food safety and quality standards was examined by Henson and Reardon (2005) and Unnevehr (2000) highlighted the induced difficulties for developing countries in accessing export markets. Also, the analysis of contract agriculture in developing countries has received increasing attention, especially with a view to the small farm sector (e.g. Swinnen, 2007; Sartorius and Kirsten, 2007). However, in spite of the hypothesized importance of both supply and demand side factors in the food system transformation, most of the available studies concentrate primarily on aspects of supply. Relatively little empirical work so far has been dedicated to related issues of consumer demand.

Pingali (2007b) describes changing demand patterns towards a "westernization of diets" in developing countries as an important driving force of the agrifood system transformation. Yet, these analyses remain at an aggregate level and do not include determinants of household demand. At the household level, changing buying patterns for meat products were explored by Jin (2007) in South Korea. Consumer choices between different retail outlets were analyzed by Rodríguez et al. (2002) in Argentina, whereas Wang et al. (2007) looked at consumer demand for food safety in a Chinese

context. We are not aware of recent demand analyses in developing countries that look specifically into household demand for food products from modern, high-value supply chains with special quality and safety attributes. This is considered a research gap, because knowledge about economic demand parameters is instructive for projections of future trends. For instance, knowing the income elasticity of demand for products purchased in supermarkets, or for foods with formal safety declarations, could help supply chain actors to better adjust to changing consumer preferences and buying habits in the process of economic development.

Here, we address this gap through empirical analyses for Vietnam. In order to estimate disaggregated demand parameters for fresh fruits and vegetables with special supply chain related attributes, we use an almost ideal demand system (AIDS). Traditional demand analyses generally produce demand parameters for highly aggregated food categories. Even when carried out for individual food items, supply chain related attributes – such as place of purchase – are usually not considered. Nor are standard databases suitable for such kind of disaggregation. Living standard measurement surveys, which are available for many countries nowadays, provide representative data on expenditures and other household characteristics, but the analyst has to live with predetermined product categories, which usually ignore existing product differentiation (cf. Senauer, 2006). Disaggregate product or process attributes of fruits and vegetables considered in our context are (i) place of purchase, particularly considering modern retailers, (ii) food safety indications, with an emphasis on formal labels, and (iii) region of production, with a focus on non-traditional imports.

The analysis builds on a survey of 499 households that we conducted in Vietnam's major metropolitan areas in 2005. Given its rapid economic development and

recent policy reforms, Vietnam is an interesting developing country to study details of the food system transformation. Changing demand patterns and fast developments in the retail sector are observed in the context of ongoing economic liberalization (Maruyama and Trung, 2007). Against the background of the country's accession to the World Trade Organization (WTO) in 2007, Vietnam is considered to be among the most attractive destination countries for foreign direct investment in the retail sector (ATKearney, 2006). Retail sales in Vietnam grew at an average annual rate of 15% between 1995 and 2005. The growth rates in the last few years reached almost 20% (GSO, 2007).

The article proceeds as follows: in the next section, the methodology and survey data are briefly described. Then, characteristics of emerging supply chains in Vietnam are illustrated, before the estimation results are presented and discussed. Based on the estimated parameters, demand elasticities are derived, which are used for projections of likely future market developments. The last section concludes and discusses policy implications.

Methodology and data

Demand model

For the estimation of demand parameters, we employ a two-stage budgeting framework. We assume that consumers first allocate expenditures among non-food, away-from-home food, and home food commodities. For the first budgeting stage, we employ an extended Working-Leser Model to derive expenditure elasticities in the absence of price information. At the second stage, the home food budget is allocated

to different fresh and processed food items using an AIDS. Our aggregate AIDS model consists of six food categories, viz. fresh fruits and vegetables, preserved fruits and vegetable products, rice, animal products, beverages and stimulants, and other foods. In three different kinds of disaggregated models, the fresh fruits and vegetables group is replaced respectively by four sub-categories representing different supply chain related attributes. Hence, each of the three disaggregated AIDS models consists of nine food categories to be estimated at the second budgeting stage (see table 1).

(Table 1 here)

The AIDS was developed by Deaton and Muellbauer (1980) to estimate a complete set of demand parameters. In the demand system estimation, we impose the standard parameter restrictions as described by Deaton and Muellbauer. Pollak and Wales (1992) introduced demographic translation in the estimation of demand equations to include socio-demographic variables. Their translation approach is also used in our AIDS estimation. We apply the method proposed by Cox and Wohlgenant (1986) to eliminate demand related price variation in the data, since only supply related variation should be used for estimation. Furthermore, we use a two-stage Heckman procedure described in Heien and Wessells (1990) to account for censoring and a potential sample selection bias.[1] In the first step, we model the decision to buy food of a certain category employing probit models. The results are then used to calculate the inverse Mills' ratio, which is included as an additional explanatory variable in the second-step AIDS estimation.

Data

Between August and October 2005, we conducted an interview-based survey in Vietnam's two major cities, Hanoi and Ho Chi Minh City (HCMC). These two cit-

ies represent more than one-third of all retail sales in Vietnam, which is three times higher than the corresponding population shares. Also in other countries, urban centers are the places where the food system transformation has been most rapid and visible in the recent past. The survey covered 499 households in almost all administrative districts of both cities, including urban and peri-urban areas. The sample is a random sub-sample of the nationally representative Vietnam Living Standard Survey 2002 (VLSS2002) for Hanoi and HCMC. It also covers households located in the suburbs and villages surrounding the inner city districts. These peri-urban districts are characterized as more rural, so that the sample represents a relatively broad picture of different types of consumers. Per capita expenditure levels for households in peri-urban districts are around 40% lower, and the mean distance to the next supermarket is more than six times higher than for households in urban districts.

The interviews were carried out with the primary food purchasers in the household. A standardized questionnaire was used that covered all consumption expenditures and other household characteristics. For fruits and vegetables consumed, detailed information about quantity, price, place of purchase, safety declarations, and region of production was collected. The focus on fresh fruits and vegetables was chosen, as they constitute high-value products for which food safety and quality aspects receive increasing consumer attention (Figuié, 2003). Furthermore, they are characterized by limited economies of scale in production, so that they can potentially play an important role in rural poverty reduction strategies (Weinberger and Lumpkin, 2007). At the wholesale and retail level, they are considered a strategic marketing instrument for modern retailers. Competition between the traditional and the modern retail sector is fierce, as the market share for fresh fruits and vegetables of modern retailers is often still lower than for other product categories (Reardon et al., 2003).

Selected household characteristics, which are included in the regression models later on, are shown in table 2. A comparison of some variables of our sample with the full sample of the VLSS2002 for Hanoi and HCMC reveals that households in our sub-sample are slightly richer and better educated; but otherwise, the values are very similar, which confirms the representativeness of our sample for the regions surveyed. Average annual per capita household expenditures, which we use as a reliable measure of permanent incomes, amount to around 9.8 million Vietnamese Dong (VND). This corresponds to 615 US Dollars, based on official exchange rates, and 2,960 US Dollars based on purchasing power parity in 2005. Education, measured in years of schooling of the respondent, is included to take account of knowledge and awareness. Structural differences between the two cities are indicated by the Hanoi dummy. Supermarket penetration is captured by considering households' distance to the nearest supermarket. Inclusion of an urban dummy in estimation can help to analyze the influence of urbanization trends on household demand patterns. While there is correlation between the urban and distance-to-supermarket variables, this does not cause a serious collinearity problem. Having both variables in the models is instructive to disentangle the urbanization and supermarket penetration effects, which are related but not identical.

In addition to these socio-economic variables used in the AIDS estimation, additional variables are included in the probit models. They are hypothesized to impact on the purchase decisions but not on conditional demand. Hence, they function as exclusion restrictions. Female labor force participation, often referred to as an important demand side driver of the food system transformation, is included as a dummy. It takes the value of one if the respondent is female and if she is employed. Finally, car ownership could have an impact on consumers' buying decisions for products from

modern supply chains. This variable gives an indication of transportation costs associated with purchases from different supply chains.

(Table 2 here)

Emerging supply chains in Vietnam

In metropolitan areas of Vietnam, annual per capita consumption of fresh fruits and vegetables amounts to 149.7 kg on average. Consumed quantities are 23% lower in the poorest and 31% higher in the richest expenditure quartile. Table 3 shows consumption and buying patterns and the role of different supply chains. As outlined above, we use three examples of supply chain related attributes to analyze changing buying habits in the food system transformation. These are (i) place of purchase, particularly considering modern retailers, (ii) food safety indications, with an emphasis on formal labels, and (iii) region of production, with a focus on imports.

(Table 3 here)

Modern retailers

Similar as in other developing countries, in Vietnam modern retailers, particularly supermarkets, are in a process of developing more specialized, more integrated, and shorter supply chains for efficiency gains as well as improved food safety assurance (cf. Balsevich et al., 2003; Cadilhon et al., 2006). This development is embedded in the government strategy to modernize the country's food system. Consequently, the number of supermarkets has been growing rapidly in metropolitan areas, and modern retailers are starting to extend their scope to smaller cities and towns. From the first supermarket that opened in 1993, the number grew to 104 in 2005 (ACNielsen, 2007).

This growth further continues: city administrations have already approved licensing applications for further supermarket establishments of different formats (Moustier et al., 2006a). In the development of the national retail market, local investors are increasingly joined by multinational chains. Until 2007, foreign investors had to establish a joint venture with a Vietnamese company if they wanted to be active in the country. As a result of the accession to the WTO, capital limitations have been loosened in 2008, and market access will be completely opened up in 2009. Despite the investments in modern retail formats, fresh horticultural produce is still mainly bought in traditional retail outlets (Maruyama and Trung, 2007). According to our sample, modern retail outlets, including supermarkets and specialized vegetable shops particularly catering for upscale consumers, have currently a market share of 5.6% for fresh fruits and vegetables.

Food safety

Due to the complexity and diversity of traditional supply chains, food safety monitoring has become a challenging task in Vietnam. Problem awareness is high in the public. More than 90% of all sampled households were conscious of reports on spoiled or contaminated fruits and vegetables in the media, particularly television; 93% were concerned about the safety of fresh fruits and vegetables. To minimize risk of exposure, consumers mostly employ informal safety assurance measures. This includes thorough visual and olfactory inspection of products at the place of purchase or consumers' trust to sellers. Nonetheless, there are also consumers that do not utilize any indications of safety for a considerable amount of their fresh fruits and vegetable purchases (18.3% of total quantities).

Slowly, formal safety assurance mechanisms have gained in importance. Already in 1995, the Vietnamese government launched a 'safe vegetables' program ('*rau sach*' or '*rau an toan*') to counteract food safety problems in horticultural produce. In this context, the Ministry of Agriculture and Rural Development issued a temporary regulation on the production of 'safe vegetables', which adopted maximum residue levels from Codex Alimentarius as benchmark in 1998. Since then, the government has fostered the development of vegetable production with improved food safety through the agricultural and rural development service. In cooperation with local authorities, the 'safe vegetable' label is promoted in annual fairs for farmers and in advertising programs for retailers and consumers.

Within the program, training and technical support is given to farmers to improve management of irrigation water, fertilization, and application of pesticides. Produce is marketed through specialized supply chains in a limited number of 'safe vegetable' shops and supermarkets. The municipal health care service is meant to work closely with responsible agencies to regularly control the quality and hygienic conditions in vegetable production and marketing. However, quality controls are mostly organized internally in the cooperatives. Furthermore, awarding the 'safe vegetable' label is not authenticated by a standardized certification process, and no formalized sanction mechanisms exist in case of non-compliance (Moustier et al., 2006b). Laboratory analyses are hardly conducted or can detect only few types of pesticides (Tam, 2005). Lack of standard enforcement mechanisms enhances asymmetric information and distrust between producers and consumers (Hoan et al., 2005). Only 33% of the respondents in our survey confirmed that they would trust the claims made by the 'safe vegetable' label. For privately labeled products, producers often cultivate under contract schemes and follow tight technical specifications, or they receive other

incentives to secure food safety. So far, fruits and vegetables with formal food safety assurance are still a niche market in Vietnam. Their current market share is 3.8% in metropolitan areas (table 3). Growth seems to be mainly hampered by lax control, lack of sanction mechanisms, and a still limited supply at few retail outlets (Hoang and Nakayasu, 2006).

Imports

Imports occur for products which cannot be sourced domestically at competitive prices or in required qualities. Horticultural imports from China enter the country mainly in the off-season. Survey responses revealed that these imports are generally perceived as low quality by consumers in metropolitan Vietnam. Imports from non-neighboring countries have started more recently through new, high-value supply chains. These mostly involve temperate fruits not grown in Vietnam such as apples or grapes, originating partly in industrialized countries like the US and New Zealand. The present market share of such non-traditional imports amounts to 1%. As table 3 indicates, the bulk of fresh fruits and vegetables originate from domestic growing areas, but consumption differences between the poorest and richest quartiles suggest that income increases might lead to a more diversified picture in the future.

Estimation results

For the estimation of demand parameters, a two-step procedure is employed, as described above: in the first step, probit models on the decision to purchase are estimated, before the AIDS models are run in the second step. As we are mainly interested in demand for fruits and vegetables with different supply chain related attrib-

utes, only these results are reported here.[2] The probit models are significant in most cases according to a likelihood-ratio test (table 4), and the conditional demand equations according to an F-test for the system estimation (table 5). The goodness-of-fit measures are fairly high in most cases, especially for the equations involving modern supply chains, indicating that the models have relatively good explanatory power. The inverse Mills' ratio is significant in all AIDS equations, confirming that a sample selection bias would have been an issue without the Heckman procedure.

Expenditure and distance to the nearest supermarket are mostly significant in the probit and AIDS models for modern supply chains. Own-prices are significant to a lesser degree. Urbanization influences the shift from own production to purchases in traditional markets, but has no significant impact on the decision to buy from modern supply chains. Therefore, consumer buying habits towards products from modern supply chains are – *ceteris paribus* – rather triggered by a higher supermarket penetration associated with the food system transformation than by urbanization trends *per se*.

Differences between the two cities regarding modern supply chains are significant for imports from non-neighboring countries. HCMC's better international market access, partly through its seaport, is probably an important factor in this connection. Education positively influences demand for products from modern supply chains, reflecting higher safety concerns among better-educated people. For non-traditional imports, education's positive impact on demand also results from a greater familiarity with 'exotic' products. Female labor force participation does not affect the decision to buy from modern supply chains, whereas car ownership increases the probability to shop in modern retail outlets.

(Tables 4 and 5 here)

Demand elasticities

To get a better understanding of the magnitude of different factors, demand elasticities are calculated for total household expenditures, supermarket distance, and own-prices. In table 6, the expenditure elasticities of the aggregated food categories are compared with previous estimates for Vietnam and other countries in Southeast Asia. Our elasticities reasonably fit into the overall picture. It should be stressed that the other estimates refer to national populations as a whole, while ours are confined to metropolitan areas, where households are somewhat richer than in remote rural areas on average. Accordingly, our expenditure elasticity for rice (the basic staple food) is lower, and those for higher-value products are somewhat higher.

(Table 6 here)

Expenditure elasticities

In growing economies, substantial future demand growth can be expected for food products with high income or expenditure elasticities. Goods with high expenditure elasticities create incentives for farmers and other supply chain actors to harness opportunities in these emerging markets. However, expenditure elasticities for aggregated food groups can mask important heterogeneity that exists among individual food items or goods with different product and process attributes. For instance, the aggregated expenditure elasticity for fresh fruits and vegetables in metropolitan areas of Vietnam indicates a rise in consumption with increasing incomes, which however will be under-proportional. Thus, the relative importance of the sector in the overall

economy is expected to shrink over time. While this might be true for the fruits and vegetable sector as a whole, it is not true for high-value supply chains, as table 7 indicates. Disaggregated expenditure elasticities for fresh fruits and vegetables from emerging supply chains are significantly higher than the aggregate elasticity. This applies in particular for modern retailers and non-traditional imports. Likewise, these elasticities are higher than the disaggregated elasticities for products from traditional supply chains. Expenditure elasticities of greater than one indicate that these are luxury goods, so demand is expected to rise substantially in the further process of economic development.

(Table 7 here)

Distance and price elasticities

Actors in supply chains can stimulate demand by making their products available on a broader basis. Modern retailers partially achieve this by increasing the penetration rate of their retail outlets, that is, locating supermarkets in closer consumer proximity. In this way, supermarket penetration induces local competition among retailers. As a consequence, not only supermarkets offer products from modern supply chains such as products with formal safety assurance. Specialized vegetable shops have emerged that sell horticultural produce with the 'safe vegetable' label. Even in market stalls in the inner city districts, some retailers can be found that offer fresh fruits and vegetables with formal labels. The same holds for non-traditional imports. The fact that the modern supply chain categories in our context are neither identical nor mutually exclusive is further highlighted by supermarkets' procurement strategies due to their still limited supplier base: At times, they get their supply through similar supply chains as traditional retailers (cf. Hoang and Nakayasu, 2006).

The low distance elasticity for the aggregate fresh fruits and vegetables category shows that supermarket penetration has hardly any impact on aggregate demand for fruits and vegetables (table 7). In contrast, the impact is considerable for all three types of modern supply chains. Distance elasticities indicate that a 10% reduction of supermarket distance to a household increases consumer demand from modern retailers by almost 7%; demand for formal safety assurance and non-traditional imports increases by almost 6% and 3%, respectively.

Table 7 also shows own-price elasticities. Absolute price elasticities for fruits and vegetables from modern supply chains are higher than the aggregate and the disaggregated price elasticities for products from traditional sectors. Consumers therefore react more sensitive to price changes for products from these supply chains. Absolute values of greater than one indicate that efficiency gains in modern supply chains, leading to lower prices, will increase demand over-proportionally.

Projections

To illustrate supply chain implications, we make simple projections of demand patterns over a period of 10 years (2005-2015). For this purpose, the calculated elasticities are multiplied with the expected annual growth of the respective variable to generate a growth factor. Growth in expenditure levels, a reduction in the distance to supermarkets through higher penetration rates, and changes in prices are considered in the projections. For expenditure growth, we take a conservative annual growth rate of 10%,[3] which corresponds to an increase from 9.8 million VND in 2005 to a mean expenditure level of around 25 million VND in 2015. Based on past trends in the growth of supermarket numbers, we presume that the distance to the next supermarket would

decrease by 10% per year. According to this assumption, the mean distance would be reduced from 4.8 km in 2005 to 1.7 km in 2015. This corresponds to a reduction from 2.0 km to 0.7 km in urban and from 12.2 km to 4.3 km in peri-urban districts. For prices, we assume that real prices remain constant, except in modern supply chains. As it has been observed in other countries, it is expected that, due to efficiency gains, prices will be reduced; we assume a 3% reduction per annum.

Figure 1 shows that purchased quantities of fresh fruits and vegetables from modern supply chains are projected to grow rapidly over the coming years. Growth is particularly high for products from modern retailers, but also for imports from non-neighboring countries where the starting base is very low. Purchased quantities are expected to grow by a factor of more than 10 until 2015, to reach more than 90 kg for modern retailers and 15 kg for non-traditional imports. Fruits and vegetables with formal safety assurance are also projected to grow, though less rapidly to reach 23 kg within 10 years. Market shares are likely to quintuple to reach almost 30% for modern retailers, and more than 5% for non-neighboring imports. For products with formal safety assurance, market shares are expected to double until 2015.

(Figure 1 here)

Figure 2 shows a decomposition of growth effects for modern retailers. The expenditure effect is clearly dominating. Around 81% of growth can be attributed to this factor. The supermarket penetration effect is responsible for about 9% of growth, while own-price effects account for the remainder. This clearly highlights the importance of considering demand aspects, when projecting future trends in the food system transformation.

(Figure 2 here)

Reardon et al. (2003) estimate that the share of supermarkets in fresh foods is roughly 15-20% already today in Southeast Asian countries like Indonesia, Malaysia, and Thailand.[4] In this context, our projections appear reasonable. Still, exact future growth rates are hard to predict, as they depend on policy measures, too: further restriction of street vending and informal markets, increasing food safety requirements in traditional markets, licensing new supermarkets, and liberalizing foreign direct investment for multinational retailers can change supply side conditions considerably. On the demand side, income and expenditure growth is volatile and depends on future economic development. Nonetheless, it can be expected that in the medium and long run, high-value fruits and vegetables with quality and safety attributes are likely to leave the niches that they currently occupy to become the default choice of larger population segments in metropolitan Vietnam. Similar trends are likely also for smaller cities and towns, probably with a certain time lag.

Conclusions

In spite of the stated importance of supply and demand side factors in the food system transformation, most of the studies available until now have concentrated primarily on supply side aspects. Addressing the resulting research gap, we have analyzed changing consumer buying habits and the underlying determinants based on household survey data from Vietnam. We have estimated demand parameters for fresh fruits and vegetables in the two metropolitan areas, Hanoi and Ho Chi Minh City. The focus has been on purchases from modern, high-value supply chains. Supply chain related attributes specifically considered are place of purchase, food safety indications, and region of production. The estimation results demonstrate that con-

sumers' decisions to buy fresh fruits and vegetables from emerging modern supply chains are heavily driven by total household expenditures. Expenditure elasticities range between 1.2 and 2.6. Price elasticities were found to be between -1.5 and -1.1, and distance-to-supermarket elasticities between -0.7 and -0.3. The impact of prices and supermarket penetration on demand form modern retailers is lower than the expenditure effect. This clearly highlights the importance of considering demand side aspects, when projecting future trends in the food system transformation.

Given that Vietnam is currently undergoing a rapid economic development – with incomes growing fast and supermarkets reaching higher penetration rates – high-value supply chains will rapidly gain market shares at the expense of more traditional sub-sectors. Though traditional horticultural and agricultural sectors are also projected to expand, growth rates will be lower than for modern supply chains. The food and retail industry needs to adapt accordingly. Traditional retailers could benefit by offering additional services to consumers. Safety labeled fruits and vegetables could be an option. This will critically depend on improved command and control systems to counteract consumers' low levels of trust in these labels. As an alternative, retailers could develop contract arrangements with preferred farmers, or farmers may possibly establish special high-quality farmer markets. In both cases, quality and safety standards could be communicated face to face to consumers. Within such more direct links between producers and final buyers, consumers' trust to their preferred retailer can be substantiated. Traditional retailers also could try to diversify their supply to include new products, like non-traditional imports. Modern retailers, on the other hand, will further build on their high-quality reputation. In order to meet high consumer expectations, they have to extend their dedicated supplier basis and create integrated supply chains on a wider scale. If this continues to prove difficult in the domes-

tic market, horticultural produce will be increasingly sourced from abroad, which would further fuel domestic competition with possible hardships for local agricultural producers.

Rising competition is a challenge, especially for the millions of small-scale farmers in Vietnam. Although traditionally produced and marketed fruits and vegetables are also projected to grow in absolute terms and will therefore continue to constitute a substantial market share, their relative importance will nevertheless shrink in the coming years. Farmers should actively try to get involved in modern supply chains to profit from emerging market opportunities. This will likely require new institutional mechanisms such as farmer groups or cooperatives to reduce transaction costs and facilitate access to necessary knowledge and production technology. Horizontal cooperation could also help farmers emerge as stronger and more attractive partners in public or private sector out-grower schemes.

More research on changing demand patterns and buying habits in developing countries is necessary to supplement the growing body of literature on analysis of supply side issues in the rapid transformation of food systems. Only when both supply and demand side aspects are well understood, can policies be designed to manage the transformation efficiently and equitably. Our study is only an initial step in this direction.

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[1] Though this approach was put into question by Shonkwiler and Yen (1999), Tauchmann (2005) has more recently shown by the use of Monte-Carlo simulations that Heckman procedures are a good choice for practical applications.

[2] The other estimation results can be made available upon request.

[3] Based on the two rounds of the Vietnam Living Standard Survey in 2002 and 2004, average annual income growth rates reached almost 14% in the two cities.

[4] The current share of supermarkets in fresh products is 25-35% in South America, and around 10% in Central America (Berdegue et al., 2005), while it is still quite low in Sub-Saharan Africa. In general, the share of supermarkets in developing countries is lower in fresh than in processed foods (Reardon et al., 2003).

Table 1. Expenditure categories with their respective budget shares

Basic categories	Budget share	Supply chain related attributes in the disaggregated models replacing the aggregate:		Abbreviation	Budget share
First budegeting stage					
Non-food	41.5%				
Away-from-home food	12.9%				
Home food	45.7%				
Second budegeting stage		Place of purchase	Own production	(Own)	0.7%
Other food	5.0%		Traditional retailing	(Trad)	8.4%
Beverages and stimulants	3.3%		Modern retail outlets	(Mod)	0.5%
Animal products	21.3%		Other sources	(Other)	0.4%
Rice	5.5%				**10.1%**
Preserved fruits and vegetables	0.5%	**or**			
Fresh fruits and vegetables	10.1%	Safety assurance	No concerns or no measures	(No)	1.9%
	45.7%		Inspection at purchase	(Insp)	6.0%
			Trust to seller	(Trust)	1.9%
			Formal safety assurance	(Form)	0.3%
					10.1%
		or			
		Region of production	Domestic production	(Dom)	8.9%
			Imports from China	(China)	0.6%
			Non-traditional imports	(Imp)	0.3%
			Not specified	(Not)	0.4%
					10.1%

Table 2. Variable definitions and sample statistics compared to VLSS2002 data

Variable	Description	All	
		Own survey	VLSS2002
Exp	Annual per capita expenditure (million VND)	9.76 [6.43]	9.20 [6.08]
Dist	Distance to the next supermarket (km)	4.77 [7.21]	-
Edu	Years of schooling	8.67 [4.48]	-
	Household head with 12 years of schooling or more	38.5%	35.3%
Female	Food purchaser is female and employed	21.1%	-
Car	Car owning households	2.7%	1.0%
Urban	Households in urban areas	73.0%	73.8%
Hanoi	Households in Hanoi	36.7%	36.2%

Notes: The table shows mean values and standard deviations in brack-ets. Expenditure data from the VLSS2002 was adjusted by the official consumer price index.

Table 3. Average per capita consumption (kg/year) of fresh fruits and vegetables by supply chain

Product attributes of fresh fruits and vegetables		All	Poorest quartile	Richest quartile
Place of purchase	Own production	12.9	25.8	4.6
	Traditional retailing	124.2	85.0	165.6
	Modern retail outlets	8.4	0.4	22.1
	Other sources	4.2	3.6	4.2
Safety assurance	No concerns or no measures	27.5	39.7	21.9
	Inspection at purchase	85.4	57.1	108.4
	Trust to seller	31.2	16.3	52.8
	Formal safety assurance	5.7	1.7	13.3
Region of production	Domestic production	139.4	109.2	178.4
	Imports from China	4.7	3.0	7.1
	Imports from non-neighboring countries	1.4	0.0	4.6
	Not specified	4.2	2.6	6.4
	All	149.7	114.8	196.5

Table 4. Probit models of the decision to purchase fresh fruits and vegetables from different supply chains

	Place of purchase				Safety indicators					Region of production		
	Own	Trad	Mod	Other	No	Insp	Trust	Form	Dom	China	Imp	Not
Exp	-0.245	-0.988***	1.0188***	0.156	0.021	0.116	0.159	0.207	0.607	-0.267	0.980***	0.775***
	[0.233]	[0.325]	[0.2334]	[0.247]	[0.195]	[0.194]	[0.169]	[0.228]	[0.560]	[0.177]	[0.287]	[0.216]
O. price	-0.173	0.019	-0.240**	-0.234***	-0.442***	-0.144	0.145*	-0.067	-1.469***	0.044	-0.069	-0.295**
	[0.147]	[0.152]	[0.101]	[0.075]	[0.082]	[0.117]	[0.086]	[0.084]	[0.320]	[0.085]	[0.100]	[0.139]
Dist	0.530***	0.125	-0.2155***	0.171**	0.319***	-0.057	0.085	-0.212*	0.356*	-0.090	-0.113	-0.116
	[0.123]	[0.152]	[0.0893]	[0.081]	[0.082]	[0.074]	[0.073]	[0.118]	[0.184]	[0.080]	[0.111]	[0.091]
Urban	-0.682**	0.972***	0.324	-0.059	-0.065	0.062	0.275	0.444	-a	-0.044	0.412	-0.280
	[0.285]	[0.287]	[0.3039]	[0.207]	[0.215]	[0.205]	[0.199]	[0.347]	-	[0.238]	[0.478]	[0.285]
Hanoi	1.152***	0.451	0.3900*	0.717***	1.124***	0.245	-0.396***	-0.034	-1.171***	-0.427***	-1.161***	0.961***
	[0.217]	[0.289]	[0.2161]	[0.175]	[0.162]	[0.162]	[0.148]	[0.210]	[0.393]	[0.157]	[0.261]	[0.194]
Edu	-0.063	-0.007	0.152	0.099	-0.182	0.045	0.239**	0.229	-0.123	0.173	0.390*	-0.392***
	[0.132]	[0.155]	[0.150]	[0.129]	[0.120]	[0.113]	[0.108]	[0.143]	[0.221]	[0.117]	[0.233]	[0.137]
Female	-0.617**	-0.206	0.097	-0.718***	-0.178	0.014	-0.069	0.254	-0.669	-0.010	0.129	0.782***
	[0.289]	[0.3103]	[0.216]	[0.255]	[0.186]	[0.184]	[0.159]	[0.198]	[0.471]	[0.176]	[0.270]	[0.203]
Car	-0.634	-0.680	0.842**	0.143	-1.108*	0.379	0.011	0.338	-a	0.091	0.701	-0.645
	[0.469]	[0.6316]	[0.423]	[0.541]	[0.613]	[0.561]	[0.373]	[0.416]	-	[0.432]	[0.502]	[0.640]
Constant	0.311	10.5980**	-13.485***	-4.236**	0.312	-1.188	-2.633	-3.530	15.410***	0.723	-11.846***	-7.196***
	[2.258]	[4.1471]	[2.534]	[2.158]	[1.949]	[1.928]	[1.715]	[2.285]	[5.433]	[1.785]	[2.839]	[2.372]
Regression statistics:												
Log l:	-128.55	-52.29	-124.03	-133.05	-221.17	-247.67	-302.99	-133.58	-9.59	-271.81	-98.52	-132.15
Chi2:	143.77	78.49	83.03	67.81	148.09	14.76	34.4	34.23	46.69	22.99	62.07	85.86
P. R2:	0.42	0.18	0.27	0.16	0.28	0.04	0.06	0.14	0.34	0.05	0.26	0.21

Notes: All estimations based on n = 499 observations. The dependent variable is a dummy that equals 1 if a household purchases fresh fruits and vegetables of the respective category and 0 otherwise. For an explanation of abbreviations, refer to tables 1 and 2. All cross prices were included as independent variables, but are not shown here. Robust standard errors are shown in brackets.

*, **, *** Estimates are significant at the 10%, 5%; and 1% level, respectively.

a Variable not included due to perfect collinearity with the dependent variable.

Table 5. Demand system estimates for fresh fruits and vegetables from different supply chains

	Own	Place of purchase				Safety indicators				Region of production		
		Trad	Mod	Other	No	Insp	Trust	Form	Dom	China	Imp	Not
Exp	-0.005	-0.055***	0.022***	0.005**	-0.001	-0.040***	0.004	0.010***	-0.046***	-0.006***	0.011***	0.006**
	[0.003]	[0.009]	[0.004]	[0.002]	[0.006]	[0.010]	[0.006]	[0.002]	[0.008]	[0.002]	[0.002]	[0.003]
O. price	0.003	0.046***	0.001	-0.001	-0.001	0.026***	0.019***	0.001	0.052***	0.003***	0.000	-0.005***
	[0.002]	[0.006]	[0.002]	[0.001]	[0.003]	[0.006]	[0.003]	[0.001]	[0.005]	[0.001]	[0.001]	[0.002]
Dist	0.008***	0.004	-0.010***	0.003***	0.013***	-0.008**	-0.001	-0.002*	0.009***	-0.002***	-0.003***	0.000
	[0.001]	[0.004]	[0.002]	[0.001]	[0.003]	[0.004]	[0.003]	[0.001]	[0.004]	[0.001]	[0.001]	[0.001]
Urban	-0.022***	0.061***	-0.002	0.000	-0.006	0.031***	0.006	0.002	0.032***	-0.001	-0.002	0.001
	[0.004]	[0.012]	[0.005]	[0.003]	[0.008]	[0.012]	[0.008]	[0.003]	[0.010]	[0.002]	[0.002]	[0.003]
Hanoi	0.009***	-0.009	0.005	0.009***	0.034***	0.009	-0.033***	0.001	0.017**	-0.005***	-0.009***	0.009***
	[0.003]	[0.008]	[0.004]	[0.002]	[0.006]	[0.009]	[0.006]	[0.002]	[0.008]	[0.002]	[0.002]	[0.003]
Edu	0.000	0.004	0.006**	-0.001	-0.005	0.003	0.008**	0.003**	0.005	0.002**	0.003***	-0.001
	[0.002]	[0.005]	[0.002]	[0.001]	[0.004]	[0.006]	[0.004]	[0.001]	[0.005]	[0.001]	[0.001]	[0.002]
Mills'	0.038***	0.039***	0.044***	0.040***	0.063***	0.070***	0.064***	0.039***	0.060***	0.029***	0.042***	0.034***
	[0.002]	[0.007]	[0.003]	[0.002]	[0.003]	[0.004]	[0.003]	[0.002]	[0.015]	[0.001]	[0.002]	[0.002]
Constant	0.057**	0.647***	-0.156***	-0.036***	0.097*	0.485***	-0.003	-0.070***	0.569***	0.058***	-0.081***	-0.051**
	[0.026]	[0.072]	[0.031]	[0.018]	[0.052]	[0.100]	[0.057]	[0.019]	[0.067]	[0.014]	[0.015]	[0.022]
Regression statistics:												
R2:	0.54	0.29	0.51	0.61	0.53	0.44	0.56	0.57	0.24	0.71	0.65	0.45
Chi2:	568.19	204.69	442.43	732.01	516.19	341.83	550.2	664.87	175.21	1229.4	909.73	377.38

Notes: All estimations based on n = 499 observations. The dependent variable is the home food budget share of each category. For an explanation of abbreviations, refer to tables 1 and 2. All cross prices were included as independent variables, but are not shown here. Standard errors are shown in brackets.
*, **, *** Estimates are significant at the 10%, 5%; and 1% level, respectively.

Table 6. Comparison of income (expenditure) elasticities for major food groups

	Indonesia	Philippines	Thailand	Vietnam	Hanoi & HCMC	
Beverages & tobacco	0.91	0.89	0.92	1.10	1.15	Beverages & stimulants
Breads & cereals	0.38	0.39	0.43	0.51	0.28	Rice
Fish	0.81	0.78	0.79	0.90	0.93	Animal products
Meat	0.73	0.70	0.70	0.78		
Dairy	0.78	0.75	0.75	0.86		
Fats& oils	0.42	0.42	0.45	0.53		
Fruits& vegetables	0.58	0.56	0.56	0.64	0.61	Fresh fruits & vegetables
					1.27	Preserved fruits & vegetables
Other foods	0.73	0.70	0.69	0.78	0.67	Other foods

Source: Figures for Indonesia, the Philippines, Thailand, and Vietnam are taken from Seale, Regmi and Bernstein (2003). Figures for Hanoi & HCMC are from own calculations.

Table 7. Expenditure, own-price, and distance elasticities of fresh fruits and vegeta-bles from different supply chains

| | Fresh fruits & vegetables | Place of purchase | | | | Safety indicators | | | Region of production | | |
		Own	Trad	Mod	Other	No	Insp	Trust	Form	Dom	China	Imp	Not
Expenditure	**0.61**	0.27	0.52	**2.50**	1.04	0.67	0.61	0.91	**1.16**	0.59	0.41	**2.59**	2.02
Distance	**0.02**	1.47	0.02	**-0.65**	0.40	0.54	-0.07	0.03	**-0.55**	0.05	-0.16	**-0.29**	-0.24
Own price	**-0.64**	-1.34	-0.67	**-1.48**	-1.48	-1.51	-0.83	-0.68	**-1.12**	-0.65	-0.87	**-1.17**	-1.66

Note: For an explanation of abbreviations, refer to tables 1 and 2.

Figure 1. Projected purchase quantities and market shares of modern supply chains for fresh fruits and vegetables
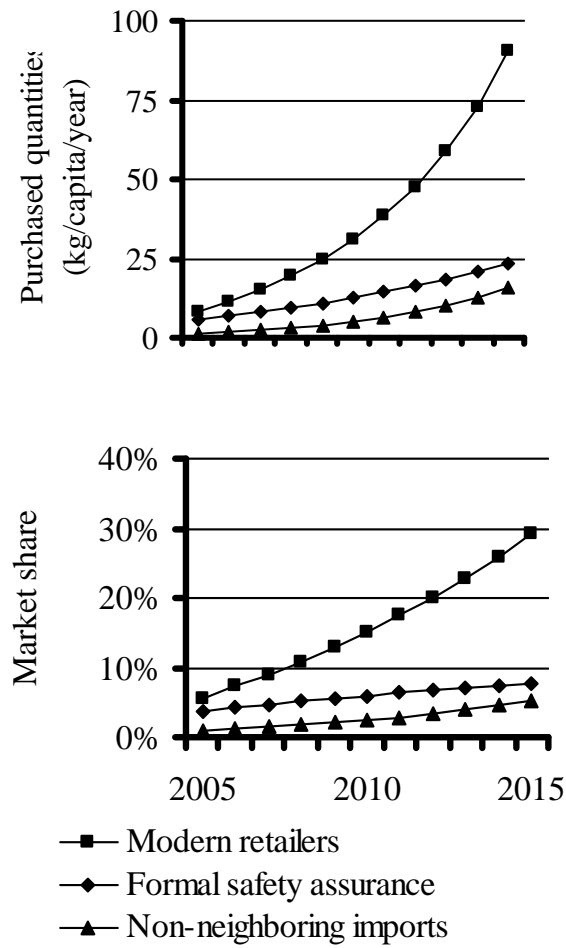
Figure 2. Projected market shares from modern retailers differentiated by expenditure, price, and distance effects
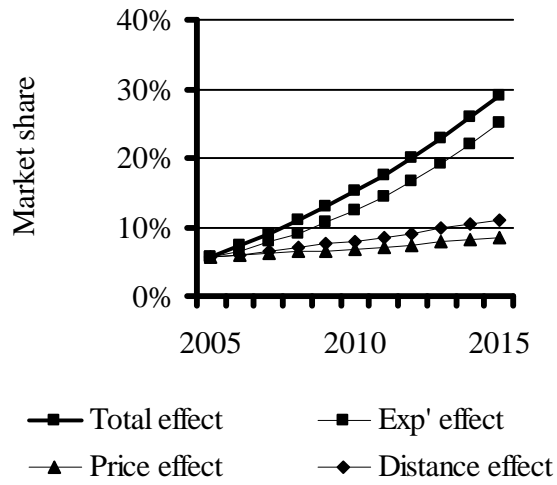
CHAPTER IV

CONSUMER VALUATION OF FOOD QUALITY AND FOOD SAFETY ATTRIBUTES IN VIETNAM

Marcus MERGENTHALER, Katinka WEINBERGER, Matin QAIM

ABSTRACT

Food systems in developing countries are currently undergoing a profound transformation towards high-value products. Appropriate policies are needed to guide this transformation, presupposing good understanding of consumer preferences. We analyze consumers' valuation of different vegetable attributes in metropolitan areas of Vietnam, using contingent valuation techniques and a mediation framework for two specific examples. Consumers are willing to pay an average price premium of 60% for Chinese mustard that is free of chemical residues and of 19% for different convenience attributes of potatoes. Income levels and media have positive impacts on the willingness to pay, partly mediated through consumer perceptions.

Keywords:

contingent valuation, convenience, food quality, food safety, mediation framework, transformation of food systems, Vietnam

Consumer Valuation of Food Quality and Food Safety Attributes in Vietnam

Food systems in many developing countries are currently experiencing a profound transformation, which is driven by globalization, urbanization, and rising living standards. This transformation is characterized by the emergence and expansion of modern retailers and integrated supply chains within new institutional setups (Reardon et al.). Food quality and food safety are becoming ever more important, which poses new challenges for supply chain actors to adapt to emerging trends in consumer demand. Products with a bundle of specific attributes are required that are directed to satisfy consumers' needs (Henson and Reardon). Understanding consumers' valuation of these attributes is essential for designing effective policies. While a number of willingness to pay (WTP) and similar valuation studies have been carried out recently (e.g. Florax, Travisi, and Nijkamp; Batte et al.; Poole, Martínez, and Giménez), most of them focus on industrialized countries. Since the results cannot simply be transferred, specific research in developing countries is needed, particularly in metropolitan areas, which usually have a leading role in the food system transformation for the rest of the country (Pingali).

We use contingent valuation (CV) methods and household survey data to analyze the determinants and mechanisms of consumer WTP for food quality and food safety attributes in metropolitan areas of Vietnam. A mediation framework (Baron and Kenny) is employed, which was recently applied in an analysis of consumer attitudes towards agrobiotechnology (Moon and Balasubramanian). This approach allows us to get a more functional understanding of processes involved in food attribute valuation. Also, it facilitates the identification of indirect effects (Holmbeck). Thus, valuable information on the role of consumer perceptions is

provided. Such information is relevant to policy makers, as perceptions are not solely determined by socio-demographic characteristics, but can be influenced and changed, for instance, through media campaigns.

Given its rapid economic development and recent policy reforms, Vietnam is an interesting developing country to study valuation of food product attributes. Restructuring of food supply chains in Vietnam is observed in the context of ongoing economic liberalization (Maruyama and Trung). New demand patterns are emerging, entailing a growing importance of food quality and food safety at the retail level (Mergenthaler, Qaim, and Weinberger). The horticultural sector is affected in particular (Cadilhon et al.), making it an interesting case for a more thorough investigation. Attributes of fresh horticultural products considered here are food safety in terms of low agrochemical residues and different convenience characteristics.

The article proceeds as follows: some background information on food safety and convenience in Vietnam is given in the following section. Then, we introduce the contingent valuation method, describe the survey data, and present first estimation results. Subsequently, the analysis is extended to consider mediated and indirect effects more explicitly. Finally, mean WTP for the specified product attributes is discussed, before the last section concludes.

Food Quality and Food Safety Attributes

In the course of Vietnam's rapid economic development, changing lifestyles and new food consumption patterns are emerging. Especially among the urban middle and upper classes, demand for food quality and food safety is growing. Here, we analyze

consumer valuation of a reduction in agrochemical residues and of convenience characteristics as two typical examples of product attributes that are gaining in importance.

Food Safety

As a consequence of the intensification process in agriculture (Jansen et al.; Dung et al.), high intakes of agrochemical residues from consumption of food have been reported in Vietnam (e.g. Kurunthachalam et al.). Due to a number of acute poisonings reported in the mid-1990s, use of some highly toxic pesticides was restricted. Nonetheless, Kim reports that incidents of food-borne diseases are still a problem in Vietnam, even though most are never detected. In 2001, 245 registered outbreaks of food-borne diseases were attributed to microbiological, agrochemical, or natural toxic contamination, and other unknown sources. Fresh vegetables are still the most important source of food risks (Sy, Vien, and Quang). Consumers are particularly worried about chemical residues (Figuié).

Already in 1995, the Vietnamese government launched a 'safe vegetables' program ('*rau sach*' or '*rau an toan*') to counteract food safety problems in horticultural produce. In this context, the Ministry of Agriculture and Rural Development issued a temporary regulation on the production of 'safe vegetables', which adopted maximum residue levels from Codex Alimentarius as a benchmark in 1998. Since then, the government has fostered the development of vegetable production with improved food safety. In cooperation with local authorities, the 'safe vegetable' label is promoted in annual fairs for farmers and in advertising programs for retailers and consumers.

Within the program, training and technical support is given to farmers to improve management of irrigation water, fertilization, and application of pesticides. Produce is marketed through specialized supply chains in a limited number of 'safe vegetable' shops and supermarkets. The municipal health care service is meant to work closely with responsible agencies to control regularly the quality and hygienic conditions in vegetable production and marketing. However, quality controls are mostly organized internally in participating cooperatives. Furthermore, awarding the 'safe vegetable' label is not authenticated by a standardized certification process, and no formalized sanction mechanisms exist in case of non-compliance (Moustier et al.). Laboratory analyses are hardly conducted or can detect only few types of pesticides (Tam). The lack of standard enforcement mechanisms involves asymmetric information and distrust between producers and consumers (Hoan, Mergenthaler, and Breisinger). In addition to the 'safe vegetables' program, there are also different private standards and labels, for which farmers often cultivate under contract schemes and follow tight technical specifications, or they receive other incentives to secure food safety. So far, fruits and vegetables with formal public or private food safety assurance are still a niche market in Vietnam, including in metropolitan areas. Growth seems to be mainly hampered by lax control, lack of sanction mechanisms, and hence limited consumer trust (Hoang and Nakayasu).

Convenience

While food safety has gained a more prominent role within the food system transformation in Vietnam, convenience in terms of short distances to retail outlets has traditionally been an important aspect for consumers in Vietnam (Cadilhon and Tam). More recently, demand for products with special convenience attributes has

also been growing (IFPRI). Convenience often implies pre-processed products, such as vegetables that are already washed and peeled, in order to reduce the time of meal preparation at home. From the supplier side, processing vegetables into convenience foods is interesting, because this can potentially improve market outreach to different consumer segments, particularly in urban areas (Maruyama and Trung). Nevertheless, hardly any research has been carried out so far on quantifying related consumer preferences. We hypothesize that especially high-income consumers in Vietnam are willing to pay extra for convenience attributes.

Direct Valuation of Food Quality and Food Safety Attributes

Contingent Valuation

In contingent valuation, WTP approaches draw on stated preferences to estimate the value people place on non-market goods. Like analysis based on revealed preferences, WTP analysis is based on utility maximization theory. WTP has traditionally been used for the valuation of public goods (e.g. environmental services). More recently, it has also been applied in market research for private goods (cf. Lusk and Hudson). In our context, WTP can be interpreted as an indicator of demand for vegetables with low agrochemical residues or convenience attributes. Apart from assessing market potentials for specific products, WTP analysis can help to better understand general market trends and identify appropriate policy responses.

Our choice of valuation scenarios was based on several criteria. Elicitation of stated preferences is more reliable for objects that respondents are familiar with. A frequently encountered problem in WTP studies is hypothetical bias, particularly for public goods like environmental services. This is of lesser relevance in our context of

marketable private goods. Yet, concrete products and product attributes had to be determined. To value food safety, Chinese mustard (*Brassica rapa* var. *chinensis*) – a close relative of Chinese cabbage – was chosen. This leafy vegetable, which is locally called pakchoi, is an integral component of Vietnamese diets. The edible parts of pakchoi are usually exposed to frequent pesticide applications. Furthermore, due to the vegetable's high perishability, supply for the metropolitan areas mainly comes from peri-urban production that is characterized by very high input intensities (Khai, Ha, and Oborn). This puts the issue of chemical residues high on the agenda. Against this background, we developed a hypothetical scenario in which – through assumed changes in production technology – there would be zero agrochemical residues in the product. Half of the respondents were confronted with a slightly different scenario, in which there was only a partial reduction in agrochemical residues. This was to see if a slight variation in the valuation scenario would impact on WTP.

A second scenario was constructed in which consumers valued convenience attributes of potatoes (*Solanum tuberosum*). Though potatoes are not consumed as widely as leafy vegetables, they are expected to have a bigger potential to be sold with convenience attributes. Respondents were asked for their WTP for fresh potatoes which are washed, peeled, pre-cut, packed, and cooled. For half of them, the cooling attribute was intentionally omitted, with the same intention of slight scenario variation as in the safety scenario.

Price premiums were chosen as payment vehicle within a double bounded discrete choice format to elicit consumers' WTP. This approach draws on the incentive properties of discrete choices and the efficiency of open-ended questions (Haab and McConnell). Based on results of a pre-survey, respondents were first confronted with a random incremental price bid between 15% and 100% above the

current market price; for the second bid, the range was 0-200%. In order to make price bids more comprehensible to respondents, they were first asked how much they currently pay for pakchoi and potatoes, so that the enumerators could translate the percentage price bids into absolute monetary values. For the analysis, absolute increments (the absolute difference between the price bids and the current market price) were used to represent the premium consumers are, or are not, willing to pay for more food safety and convenience. These transformed first and second bids are used in an interval-censored model. We assume that a consumer has a true *WTP* of

(1) $WTP^* = \beta x + \varepsilon$

where *x* is a vector of explanatory variables described further down, *β* is a vector of coefficients to be estimated, and *ε* is a normally distributed random error term.

WTP^* is not observed, so we have to rely on the range that can be identified from observations in the survey. As explained, two sequential price bids were proposed to respondents. The second bid was higher than the first bid for an initial "yes" response, and lower for a "no" response. The first bid is denoted with P^*, and the second bid with P^H if it was higher, and with P^L if it was lower than P^*. Hence, four possible groups of responses can be observed: (*R*1) respondents answering "yes" to both valuation questions, so that $WTP \geq P^H$; (*R*2) those responding "yes" to the first, and "no" to the second bid, so that $P^* \leq WTP < P^H$; (*R*3) those replying "no" to the first, but "yes" to the second bid, so that $P^L \leq WTP < P^*$; and finally (*R*4) those who said "no" to both sequential bids, so that $WTP < P^L$. The following log-likelihood function can be specified to estimate *WTP*:

$$\ln L = \sum_{R1} \ln\left[1 - \phi\left(\frac{P^H - \beta x}{\sigma}\right)\right] + \sum_{R2} \ln\left[\phi\left(\frac{P^H - \beta x}{\sigma}\right) - \phi\left(\frac{P^* - \beta x}{\sigma}\right)\right]$$

(2)

$$+ \sum_{R3} \ln\left[\phi\left(\frac{P^* - \beta x}{\sigma}\right) - \phi\left(\frac{P^L - \beta x}{\sigma}\right)\right] + \sum_{R4} \ln\left[\phi\left(\frac{P^L - \beta x}{\sigma}\right)\right]$$

whereby ϕ is the standard normal cumulative distribution function. The estimated coefficients β can be directly interpreted as marginal effects. Mean *WTP* is calculated as

(3) $E(WTP) = \hat{\beta} \cdot \bar{x}$.

Data

For the empirical analysis, an interview-based survey of households in Vietnam's two big cities, Hanoi and Ho Chi Minh City (HCMC), was conducted between August and October 2005. In total, 499 households were covered in almost all administrative districts of both cities, including urban and peri-urban areas. The sample is a random sub-sample of the nationally representative Vietnam Living Standard Survey 2002 (VLSS2002) for Hanoi and HCMC. Therefore, the sample does also cover households located in the suburbs and villages surrounding the inner city districts. These peri-urban districts are characterized as more rural, so the sample represents a broad picture of different types of consumers. Per capita expenditure levels in peri-urban districts are around 40% lower than those in the urban districts on average.

Selected household characteristics used in the estimation of WTP for the food product attributes are shown in table 1. A comparison of some variables of our sample with the full sample of the VLSS2002 for Hanoi and HCMC reveals that households in both samples are very similar. Average annual per capita household expenditures, which we use as a reliable measure of income, amount to around 9.8 million

Vietnamese Dong (VND). This corresponds to US$ 615 based on official exchange rates, and US$ 2,960 based on purchasing power parity in 2005. Female labor force participation, often referred to as an important demand-side driver of the food system transformation, is included as a dummy. It takes the value of one if the respondent is female and employed. The educational level of the respondent is measured in years of schooling. Household composition is included with the number of household members and a dummy for the presence of children under the age of five. Also the age of the respondent is included. Geographic location is captured by two dummies, one for households located in Hanoi (with HCMC as reference), and the other for households located in urban areas (with peri-urban areas as reference).

(table 1 about here)

Apart from these socio-demographic variables, media are hypothesized to influence WTP of consumers. A general impact of media is captured by the number of media regularly used by the respondent, whereby TV, radio, newspaper, and internet were specifically asked for. On average, respondents regularly use two of these media, with TV and newspaper being the most important ones. For a more specific impact of media we distinguish between food safety and convenience valuation. Vietnamese media frequently report about cases of negative health impacts (including lethal effects) caused by spoiled and contaminated food. More than 90% of respondents in our sample indicated that they have heard or seen such reports in different media, particularly on TV. This possible impact on WTP is captured by a dummy in the safety valuation. In the convenience model, a different dummy is included that captures whether respondents have heard or seen advertisements for processed horticultural products in the different media.

Consumer perceptions are expected to impact on food safety and quality valuation as well. For safety valuation, knowledge about pesticide use, food safety concerns, trust in the 'safe vegetable' certification, and price consciousness are considered. In the case of convenience, we test openness towards new food products, preferred food shopping time in the evening, and price consciousness. All these perception variables are represented as dummies,[1] as shown in table 1.

Finally, appropriate controlling variables have to be determined. Since we varied each scenario slightly for half of the respondents, dummies are included to test for the impact of these variations. Furthermore, actual experience with purchases of vegetables with safety and convenience attributes might influence consumer's WTP, so that previous experience dummies are introduced in the models. In spite of their increasing importance, horticultural products with special quality or safety attributes still play a relatively small role in Vietnam. While products with some form of formal safety assurance account for less than 4% of fresh fruit and vegetable markets in metropolitan areas, the share of products with convenience attributes is still lower at around 2%. To take account of a possible starting point bias in the CV format, the first price bid is included in the estimation procedure (for a similar approach cf. Boyle, Bishop, and Welsh). And, the price which consumers normally pay for purchased products is added as an independent variable, to take account of unobserved quality preferences.[2]

Direct Impacts on WTP

The estimation results of the WTP models with the above described independent variables are displayed in table 2 (model 1.1 and 2.1). The dummies for the scenario variations are not statistically significant. A possible explanation is that respondents

find it difficult to notice and differentiate between relatively small nuances in scenario descriptions. Therefore, the exact numerical results should be interpreted with some caution. Previous experience with similar products plays a role in both scenarios, indicating that the markets for these new attributes have been partially exploited already. The first price bid is significant in all models, indicating a starting point bias. We will deal with this issue further down when deriving mean WTP. Normally paid vegetable prices are not significant.

Considering consumer perceptions, general food safety concerns have the highest marginal impact on WTP for zero agrochemical residues: on average, concerned consumers are willing to pay 1,632 VND/kg (around 60%) more than their unconcerned counterparts. The coefficient of knowledge is somewhat lower but also significant. Trust in the 'safe vegetable' label and price consciousness do not directly impact on WTP for food safety. However, price consciousness significantly reduces WTP for convenience, with a marginal effect of -843 VND/kg (around 50%). Openness, in turn, increases WTP for convenience attributes by 996 VND/kg (around 55%).

Per capita household expenditure is a highly significant determinant of the value consumers attach to food safety and convenience. Each additional million VND of expenditure increases WTP by 62 and 74 VND/kg for the two attributes, respectively. For convenience, age and residence in Hanoi have significantly negative impacts on WTP. Surprisingly, also female labor force participation reduces WTP for convenience. An explanation could be that with the additional income generated and an increase in the opportunity cost of time, meal preparation is delegated to older generation family members rather than used to buy convenience products; this is a typical arrangement of intra-household labor sharing in Vietnamese cities. Urban

residence positively influences WTP for food safety, probably reflecting a lack of market transparency. The other socio-demographic variables are not significant in these model specifications.

Interesting to observe is the impact of general media use on WTP for food safety but not on convenience. The specific media variable is not significant in both cases: evidently, having heard or seen information specifically related to the attributes valued does not impact on WTP. Yet, this variable and also some socio-demographic predictors might be associated with indirect effects, which cannot be identified with these particular models. Nor are the mechanisms through which the socio-demographic and media variables impact on WTP clear yet. These aspects are analyzed in the following.

(table 2 about here)

Mediation and Indirect Effects through Consumer Perceptions

Mediation Framework

As described, we use consumer perceptions as explanatory variables in addition to socio-demographic and media variables in the WTP models. This is a common approach in empirical valuation studies (e.g. Loureiro, McCluskey, and Mittelhammer). However, there are also studies estimating the impact of socio-demographic variables on consumer perceptions themselves (e.g. Nayga Jr; Knight and Warland). In fact, both of these approaches alone may neglect that consumer perceptions mediate or channel indirect effects of socio-demographic and media variables. The potential to gain a more functional understanding of food attribute valuation and the underlying psychological process is missed out when such effects are not considered explicitly. For this reason, we adapt a mediation framework, which

was first developed within psychological research (Baron and Kenny) and recently applied in an analysis of consumer attitudes towards agrobiotechnology (Moon and Balasubramanian).

In this framework, we consider consumer perceptions as potential mediators between socio-demographic and media predictor variables and the value consumers attach to improved food quality or safety. Whereas predictors (socio-demographics and media) are external influences that determine the content and way of information processing by the individual, mediators are the result of this information processing. We hypothesize that there is a causal flow from socio-demographic consumer characteristics and media (predictor variables) to consumer perceptions (mediators) and/or to valuation of food attributes (dependent variable), as shown in figure 1. The question we address is whether the predictor variables affect consumer perceptions and food attribute valuation individually or combined. For example, consumers in households with more media usage might be more knowledgeable and more concerned about pesticides, and in this way they might value food safety higher. Similarly, older consumers might be less open towards new food products, and in this way they might value convenience attributes less. The main advantage of the mediation framework is that it can detect indirect and mediated effects, which would go unrecognized in a conventional valuation study.

(figure 1 about here)

The terms *mediated* and *indirect* effects are at times used interchangeably, though a distinction should better be made. A mediated effect is understood as a special case of an indirect effect, which requires that the direct impact of a predictor on the dependent variable is significant (path A in figure 1). For the assessment of indirect effects, this assumption is not required. It is therefore possible to identify

indirect effects, when the direct effect is not significant (Holmbeck). Estimation results for the WTP models with separate specifications for paths A and C (cf. figure 1) are shown in table 2, next to the full models already discussed, which combine paths A and C.

Most mediation studies use a causal steps approach to identify mediation, as first described by Baron and Kenny. This involves comparison of marginal effects across different model specifications. We refrain from doing so, because, this method lacks statistical power. The Sobel test is a direct and more statistically rigorous method to test mediation hypotheses; it was also proposed by Baron and Kenny, but has hardly been applied in empirical studies so far (Dearing and Hamilton). The Sobel test is fairly conservative (MacKinnon, Warsi, and Dwyer), so that for small samples bootstrapping has been suggested as a more efficient approach (e.g. Shrout and Bolger). For relatively large samples (n > 400), however, the Sobel test is recommended as the best approach (Dearing and Hamilton), so that we employ this method here.

The Sobel test is conducted by assessing the strength of the indirect effect. As in figure 1, the path from the mediators to the dependent variable is denoted as C, the respective marginal effect as c, and s_c denotes the corresponding standard error (models 1.2 and 2.2 in table 2). The path from predictors to mediators is denoted as B. For the estimation of these different perception models, we employ the following probit specifications with a binary representation of consumer perceptions P:

(4) $P = \gamma z + \mu$

where z is a vector of explanatory variables consisting of the socio-demographic and media predictors, γ is a vector of coefficients to be estimated, and μ is a random error term. The marginal effect for the respective variable is denoted as b, and the standard

error as s_b. Results are displayed in table 3.[3] They are used to calculate indirect effects and to conduct the Sobel test.[4]

<center>*(table 3 about here)*</center>

Under the assumption of multivariate normality, the indirect effect of *b* and *c* can be calculated as:

(5) $x_{bc} = b \cdot c$

and the standard error of the indirect effect as:

(6) $s_{bc} = \sqrt{c^2 s_b^2 + b^2 s_c^2 + s_c^2 s_b^2}$.

In order to conduct the Sobel test, the indirect effect x_{bc} is divided by s_{bc} to yield a critical ratio that can be judged against a value from the standard normal distribution appropriate for a given significance level.

Indirect and Mediated Impacts on WTP

Summary results of the magnitude and significance of indirect and mediated effects based on the Sobel test are presented in table 4. For food safety valuation, the effects of socio-demographic variables are not mediated through consumer perceptions, although indirect effects occur for education and Hanoi. For both variables, the indirect effect is through knowledge. Residents of Hanoi are less likely to know about pesticide use in vegetables, which indirectly reduces their WTP for products that are free of agrochemical residues. Better education, in turn, increases knowledge levels and thus also WTP for food safety. The indirect effects of media are also interesting. Consumers who use more media channels on a regular basis are more concerned and less price conscious, thus influencing WTP for food safety positively. Having heard or seen specific media reports increases knowledge, thereby also increasing WTP for

residue-free products. Even though having heard or seen media reports about food safety issues undermines trust in the 'safe vegetable' label, a significant indirect effect on WTP through the trust variable cannot be established.

(table 4 about here)

For the valuation of convenience, more mediated and indirect effects can be observed. The effect of household expenditure levels on WTP for convenience is positively mediated through higher levels of openness and lower levels of price consciousness. Opposite effects are detected for consumers in Hanoi. Residence in urban districts impacts positively and age negatively on WTP for convenience, in both cases through different levels of openness. Household size has a positive indirect impact through openness, which however is counteracted by a negative indirect effect through price consciousness. The media variables also have different indirect effects on WTP for convenience attributes. General media use positively impacts on WTP through higher levels of openness and lower levels of price consciousness. On the other hand, having heard or seen food advertisements has a negative impact through less openness. The latter effect is somewhat unexpected. A possible explanation is that these advertisements are not appealing to consumers and cause them to be less open towards new food products in general.

Mean WTP

Based on models considering socio-demographic and media predictors (models 1.1 and 2.1 in table 2), we estimate the mean WTP for the food safety attribute to be 74% and for convenience to be 28% higher than the current market price of the respective vegetables (see table 5). Controlling for the starting point bias, mean WTP comes

down to 60% and 19% for food safety and convenience, respectively. In the Vietnamese context, it is not surprising that WTP for food safety is higher than for convenience, because average income levels are still relatively low, but awareness of food safety issues is widespread.

(table 5 about here)

How do our estimated values for mean WTP compare with previous results from other studies and countries? In rich countries, mean WTP for products that are free of agrochemical residues is often somewhat lower than what we found here, when comparisons are made in percentage terms relative to the market price of conventional products (cf. Florax, Travisi, and Nijkamp). This should not surprise, however, because food regulations in poor countries are usually less strict or less strictly enforced, so that the chemicals used are often more toxic and residue levels much higher. The few results that are available for other low and middle income countries are more similar to ours. For instance, Fu, Liu, and Hammitt found price increments between 46% and 75% for a leafy vegetable with low pesticide residues in Taiwan. Schmidt and Vanit-Anunchai estimated mean WTP to be almost 100% for 'environmentally friendly' produced Chinese cabbage in Thailand, while Krishna and Qaim found a WTP for residue-free vegetables of 57% in India. In Vietnam, certified organic products, of which supply is very limited so far, reaches prices two to three times higher than conventional vegetables in the market (Moustier et al.). At those high price levels, the organic market caters to a very limited segment of Vietnamese consumers. Our results suggest that the range of customers for residue-free vegetables could increase considerably at somewhat lower prices.[5] We are not aware of any previous studies that have estimated WTP for convenience attributes in a developing country context.

The importance of considering consumer perceptions in the valuation of food attributes becomes evident when comparing WTP estimates for different consumer segments. For example, table 5 shows that price consciousness reduces WTP for residue-free products only to a small extent, while the impact of general food safety concerns is relatively large: on average, non-concerned consumers are willing to pay a much lower premium of only 20%. For convenience, price consciousness has a much more pronounced effect: compared to the average household, price conscious consumers are only willing to pay about half the premium for convenience attributes. Likewise, less openness towards new products reduces WTP for convenience.

Conclusions

Food systems in many developing countries are currently undergoing a profound transformation, with food quality and food safety aspects growing in importance. Against this background, we have analyzed consumers' valuation of food safety and convenience in metropolitan areas of Vietnam. A contingent valuation approach has been employed in a mediation framework to estimate consumers' WTP for residue-free Chinese mustard and pre-cut potatoes as specific examples. It was found that socio-demographic and media variables influence WTP indirectly, and partly mediated, through different consumer perceptions – a finding which deepens our understanding of processes involved in valuation of food attributes. Furthermore, while contingent valuation studies have been carried out in several developed countries, only very few studies are available for developing countries, so that our results add to the existing body of literature.

In terms of food safety, we have found that Vietnamese consumers on average are willing to pay 60% more for vegetables that are free of agrochemical residues. In terms of convenience, we have analyzed potential demand for vegetables that are pre-processed so to reduce preparation times within the household, and found a mean WTP of 19%. WTP for both attributes is positively related to household expenditure levels, so that further income growth will fuel demand for safe and convenient food products.

Particular emphasis has been put on the potential role of consumer perceptions as mediators of the effects of socio-demographics and media. It was found, for instance, that education of survey respondents, as well as location variables, can significantly affect consumer perceptions, which leads to indirect effects on WTP for food safety and convenience. In addition, the influence of public media on WTP is mediated or partly channeled indirectly through consumer perceptions. A more widespread and regular use of different media channels is likely to increase consumer demand for new product attributes. While consumer concerns have a large impact on the valuation of food safety, WTP for convenience attributes is mostly channeled through perceptions such as price consciousness and openness.

What are the implications for the food sector as a whole? Supply chains should be ready to respond to the increasing demand for food quality and food safety. Relatively high WTP for new attributes indicates that there is a lot of potential for value added – value that could positively contribute to economic and social development, if captured domestically and shared equitably. This is a challenge for public policy. Convenience characteristics are mostly search attributes, so that markets for convenience products will develop automatically, when living standards rise. For food safety this might be different, since safety characteristics are credence

attributes, which easily lead to market failures. Direct public intervention might be necessary in terms of establishing credible standards and certification systems.

A better understanding of consumer preferences and demand patterns for high-value products is crucial for successfully establishing food policies aimed at efficient and equitable development of supply chains in rapidly changing environments. Therefore, our results should also be of interest to other developing countries experiencing similar trends as those observed in Vietnam.

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[1] Consumer perceptions were partly measured on a five point Likert-scale in the survey. Though recoding as dummies leads to a loss of information, the interviews showed that delimitation between the different levels was not always clear-cut among respondents. Use of a threshold level therefore seems justified. Furthermore, we found that due to the distribution of answers, a better split between the different categories of the independent variables was thus achieved. In this approach we follow Knight and Warland.

[2] An instrumental variable (IV) approach was used to avoid a potential endogeneity problem. Place of purchase dummies were used as instruments to predict the prices of pakchoi and potatoes, which were then included in the WTP estimations.

[3] Note that the magnitude of the marginal effects in tables 2 and 3 cannot be compared directly. While table 3 shows the influence of explanatory variables on the probability to observe certain consumer perceptions, table 2 presents effects on WTP measured in VND/kg.

[4] The specification of paths A, B, and C (figure 1) suggests that the marginal effects for the perception variables shown in table 2 might potentially suffer from an endogeneity bias. This does not affect the accuracy of the Sobel test, however (cf. Dearing and Hamilton).

[5] To add further plausibility to our estimated WTP, it can be compared to total household expenditures. If the average household would switch from conventional pakchoi to pakchoi which is free of agrochemical residues priced at mean WTP, annual per capita expenditures would increase by 14,120 VND (US$ 0.89), which only constitutes 0.14% of total expenditures. Numbers for the convenience attribute are even lower: switching to conveniently pre-processed potatoes priced at mean

WTP would increase per capita expenditure by 7,387 VND (US$ 0.47 or 0.08% of total per capita expenditure).

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Figure 1: Valuation of food safety and convenience in a mediation framework
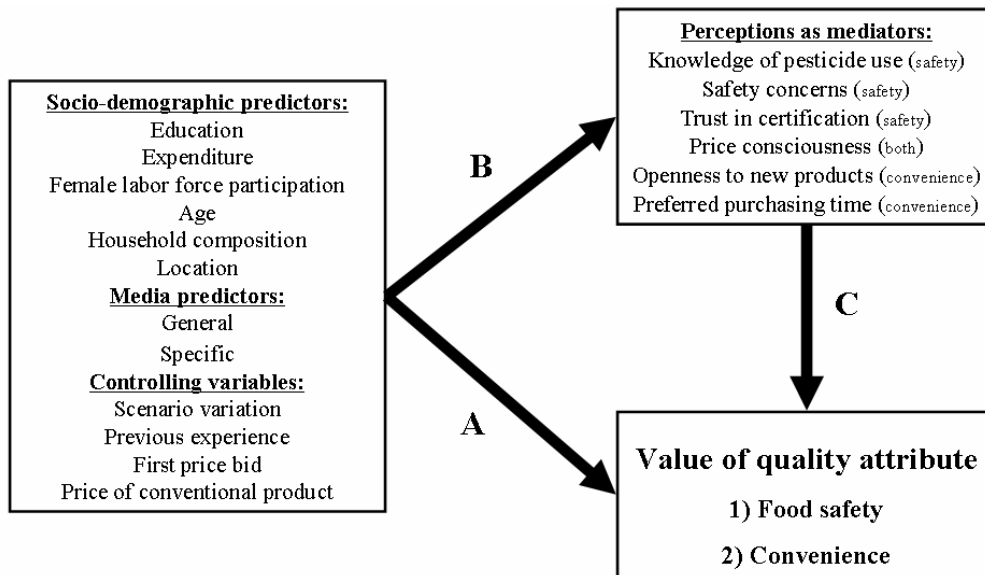
Source: Adapted from Baron and Kenny .

Table 1: Sample statistics

	Variable	Description	Scenario	Own survey	VLSS2002
Media	General	Number of media regularly used	both	2.0 [0.8]	-
	Specific	Heard or seen specific reports in media (dummy)	safety	90.2%	-
		Heard or seen advertisements in media (dummy)	convenience	80.3%	-
Socio-demographics	General	Number of General regularly used	both	2.00 0.82	
	Specific	Specific of General reports (dummy)	safety	0.90	
		Specific of advertisments (dummy)	convenience	0.80	
	Education	Years of schooling	both	8.7 [4.5]	-
		Household head with 12 years of schooling or more	not included	38.5%	35.3%
	Expenditures	Annual per capita expenditures (million VND)	both	9.8 [6.4]	9.2 [6.1]
	F-empl	Purchase person is female and employed (dummy)	both	22.4%	-
	Age	Age of respondent (years)	both	50.4 [13.4]	-
		Age of household head in years	not included	52.4 [13.6]	53.6 [14.1]
	HH-size	Household size (heads)	both	4.8 [7.2]	4.2 [1.9]
	Children	Household with children under 5 (dummy)	both	23.3%	22.2%
	Urban	Households located in urban districts (dummy)	both	73.0%	73.8%
	Hanoi	Households located in Hanoi (dummy)	both	36.7%	36.2%
Mediators	Knowledge	Knowledge on pesticide use (dummy)	safety	75.8%	-
	Concern	Concerns about food safety (dummy)	safety	93.4%	-
	Trust	Trust in the 'safe vegetable' label (dummy)	safety	33.4%	-
	Price	Price consciousness (dummy)	both	37.7%	-
	Openness	Openness for new products (dummy)	convenience	19.6%	-
	Time	Food purchases in the evening (dummy)	convenience	3.5%	-
Controlling variables	Scenario	Scenario without guaranteed safety (dummy)	safety	49.4%	-
		Scenario without cooling (dummy)	convenience	49.5%	-
	Experience	Previous experience with formal labels (dummy)	safety	9.6%	-
		Previous experience with convenience (dummy)	convenience	7.0%	-
	Bid	First price bid (% above market price)	safety	47.6 [32.9]	-
		First price bid (% above market price)	convenience	48.0 [33.0]	-
	Pr. price	Predicted price for conventional pakchoi (VND/kg)	safety	3,877.8 [373.3]	-
		Predicted price for conventional potatoes (VND/kg)	convenience	6,434.5 [1035.9]	-

Notes: The table shows mean values and standard deviations in brackets. Data from the VLSS2002 was adjusted by the official consumer price index for expenditure and by time for age.
'Safety' means the variable was used in the estimation of WTP for food safety and 'convenience' in the estimation of WTP for convenience.

Table 2: WTP models for food product attributes

	Safety			Convenience		
	Model 1.1 **Path C**	**Model 1.2** **Path A**	**Model 1.3** **Path A&C**	**Model 2.1** **Path C**	**Model 2.2** **Path A**	**Model 2.3** **Path A&C**
Media predictors						
General		382.07***	270.29*		403.45*	211.1
		[141.07]	[141.47]		[223.45]	[227.24]
Specific		9.35	-338.24		-185.03	-48.11
		[361.58]	[367.28]		[451.24]	[446.51]
Socio-demographic predictors						
Education		0.20	-29.54		35.51	46.11
		[32.09]	[32.51]		[49.08]	[48.59]
Expenditure		69.67***	61.97***		98.67***	74.02***
		[22.40]	[21.72]		[27.68]	[27.84]
F-empl		-422.40	-342.37		-659.82	-754.66*
		[283.43]	[278.16]		[433.52]	[433.03]
Age		-5.45	-4.29		-31.19**	-27.39*
		[8.98]	[8.90]		[14.20]	[14.12]
HH-size		-24.15	3.03		71.36	75.32
		[57.41]	[57.89]		[87.24]	[86.72]
Children		431.36	239.96		17.88	-33.63
		[273.08]	[269.04]		[425.15]	[420.65]
Urban		488.18*	508.91*		761.98	671.1
		[295.81]	[288.55]		[465.70]	[460.68]
Hanoi		180.60	260.05		-1,612.38***	-1,484.27***
		[252.54]	[261.47]		[405.07]	[401.23]
Mediators						
Knowledge	628.67**		671.69**			
	[262.03]		[268.60]			
Concerns	1,933.50***		1,632.44***			
	[448.77]		[457.98]			
Trust	-182.96		-151.43			
	[227.44]		[238.69]			
Price	-501.38**		-358.51	-1,235.13***		-842.68**
	[219.62]		[219.67]	[364.18]		[347.85]
Openness				1,956.89***		996.22**
				[439.63]		[440.86]
Time				782.33		841.54
				[963.94]		[894.86]
Controlling						
Scenario	-33.04	52.59	19.67	-194.82	-29.63	-139.03
	[216.27]	[213.43]	[212.32]	[356.00]	[335.56]	[332.73]
Experience	1,226.38***	988.77**	1,028.82**	1,290.30*	1,094.11*	1,092.66*
	[403.92]	[416.26]	[417.42]	[695.64]	[636.65]	[638.41]
First bid	12.00***	11.82***	11.95***	10.42*	12.27**	11.76**
	[3.42]	[3.40]	[3.36]	[5.64]	[5.32]	[5.28]
Pr. price	0.84***	0.49	0.48	0.58***	0.15	0.15
	[0.26]	[0.31]	[0.31]	[0.16]	[0.18]	[0.18]
Constant	-2,895.66***	-1,063.17	-2,239.44	-1544.78	370.7	831.59
	[1,117.85]	[1,328.06]	[1,380.14]	[1,077.95]	[1,444.37]	[1,442.27]
Log likel.:	-552.73	-555.22	-541.57	-714.81	-699.92	-694.07
Chi2:	74.09	69.10	96.42	60.61	90.38	102.10

sample means. Standard errors are shown in brackets. Results are based on 499 observations.

*, **, *** Significant at the 10%, 5%; and 1% level, respectively.

Table 3: Probit models to explain consumer perceptions

	Model 1.4 Knowledge	Model 1.5 Concerns	Model 1.6 Trust	Model 1.7 Price	Model 2.4 Openness	Model 2.5 Time	Model 2.6 Price
Media predictors							
General	-0.0317	0.0140*	-0.0089	-0.1190***	0.0995***	0.0012	-0.1234***
	[0.0237]	[0.0076]	[0.0302]	[0.0304]	[0.0249]	[0.0094]	[0.0306]
Specific	0.2079***	0.0134	-0.1737**	0.000	-0.1357**	-0.0032	0.0497
	[0.0783]	[0.0158]	[0.0877]	[0.0776]	[0.0642]	[0.0192]	[0.0579]
Socio-demographic predictors							
Education	0.0303***	0.0018	0.0161**	0.0011	-0.0072	-0.0013	0.0003
	[0.0055]	[0.0012]	[0.0067]	[0.0068]	[0.0055]	[0.0020]	[0.0068]
Expenditure	0.0027	0.0012	-0.0019	-0.0080**	0.0112***	0.0008	-0.0081**
	[0.0031]	[0.0010]	[0.0033]	[0.0039]	[0.0027]	[0.0009]	[0.0039]
F-empl	-0.0643	0.0046	-0.1376***	0.0879	0.0792	0.0419	0.0855
	[0.0524]	[0.0068]	[0.0509]	[0.0591]	[0.0505]	[0.0271]	[0.0591]
Age	0.0002	-0.0003	-0.0076***	-0.0009	-0.0044***	-0.0003	-0.0008
	[0.0015]	[0.0003]	[0.0019]	[0.0019]	[0.0016]	[0.0006]	[0.0019]
HH-size	0.0111	-0.0021	0.0092	0.0254**	0.0178*	-0.0025	0.0250**
	[0.0092]	[0.0017]	[0.0115]	[0.0115]	[0.0092]	[0.0040]	[0.0116]
Children	0.019	0.0148*	-0.0212	-0.1043*	-0.0365	-0.0101	-0.1050*
	[0.0430]	[0.0087]	[0.0564]	[0.0535]	[0.0458]	[0.0165]	[0.0536]
Urban	-0.0427	0.0029	0.0229	-0.0082	0.1394***	-0.0218	-0.008
	[0.0408]	[0.0078]	[0.0612]	[0.0583]	[0.0419]	[0.0231]	[0.0583]
Hanoi	-0.1869***	-0.0017	-0.3483***	0.0987*	-0.0837**	0.0168	0.1091**
	[0.0437]	[0.0067]	[0.0436]	[0.0513]	[0.0414]	[0.0174]	[0.0528]
Log likelihood :	-218.49	-68.82	-274.62	-307.27	-219.29	-67.35	-306.92
Chi2:	68.13	69.03	95.33	41.48	97.6	10.01	42.19
Pseudo R2:	0.13	0.33	0.15	0.06	0.18	0.07	0.06

Notes: Coefficients can be directly interpreted as marginal effects on the probabilities to observe individual perceptions, valued at sample means. Standard errors are shown in brackets. Results are based on 499 observations.

*, **, *** Significant at the 10%, 5%, and 1% level, respectively.

Table 4: Socio-demographics' direct and indirect impacts on WTP

	Safety					Convenience			
	Direct	Indirect through				Direct	Indirect through		
		Knowledge	Concerns	Trust	Price		Openness	Time	Price
Media predictors									
General	270.29*	-19.93	27.07*	1.63	59.66*	211.10	194.71***	0.94	152.42**
	[141.47]	[18.15]	[16.34]	[9.04]	[30.98]	[227.24]	[66.39]	[11.73]	[59.77]
Specific	-338.24	130.7*	25.91	31.78	0.00	-48.11	-265.55*	-2.50	-61.39
	[367.28]	[76.23]	[31.93]	[47.08]	[42.48]	[446.51]	[141.91]	[24.03]	[76.72]
Socio-demographic predictors									
Education	-29.54	19.05**	3.48	-2.95	-0.55	46.11	-14.09	-1.02	-0.37
	[32.51]	[8.78]	[2.52]	[4.15]	[3.73]	[48.59]	[11.48]	[2.78]	[8.76]
Expenditure	61.97***	1.70	2.32	0.35	4.01	74.02***	21.92***	0.63	10*
	[21.72]	[2.23]	[2.06]	[1.06]	[2.76]	[27.84]	[7.32]	[1.36]	[5.82]
F-empl	-342.37	-40.42	8.89	25.18	-44.07	-754.66*	154.99	32.78	-105.6
	[278.16]	[39.47]	[13.65]	[34.64]	[37.67]	[433.03]	[107.10]	[52.57]	[82.23]
Age	-4.29	0.13	-0.58	1.39	0.45	-27.39*	-8.61**	-0.23	0.99
	[8.90]	[1.02]	[0.61]	[1.82]	[1.06]	[14.12]	[3.75]	[0.80]	[2.46]
HH-size	3.03	6.98	-4.06	-1.68	-12.74	75.32	34.83*	-1.96	-30.88*
	[57.89]	[6.91]	[3.50]	[3.96]	[8.41]	[86.72]	[20.04]	[5.52]	[17.49]
Children	239.96		28.62	3.88	52.29	-33.63	-71.43	-7.9	129.69
	[269.04]	[12.20]	[18.50]	[17.15]	[37.18]	[420.65]	[93.25]	[22.68]	[78.91]
Urban	508.91*	-26.84	5.61	-4.19	4.11	671.10	272.79***	-17.05	9.88
	[288.55]	[29.96]	[15.54]	[18.61]	[31.96]	[460.68]	[104.01]	[35.55]	[75.13]
Hanoi	260.05	-117.5**	-3.29	63.72	-49.49	-1,484.27***	-163.79*	13.14	-134.75*
	[261.47]	[57.31]	[13.32]	[80.23]	[35.47]	[401.23]	[90.82]	[27.00]	[78.75]

Notes: Coefficients are marginal effects on WTP (measured in VND/kg), evaluated at sample means. Standard errors are shown in brackets. Results are based on 499 observations.

*, **, *** Significant at the 10%, 5%; and 1% level, respectively, based on the Sobel test.

Table 5: Estimated WTP for food product attributes

	Food safety		Convenience	
	VND/kg	% of market price	VND/kg	% of market price
Median WTP	3,028	78%	2,550	40%
Mean WTP	2,885	74%	1,771	28%
Mean less starting point bias	2,316	60%	1,212	19%
Price conscious consumers	2,093	54%	687	11%
Not safety concerned consumers	792	20%		
Price conscious and not safety concerned consumers	569	15%		
Not open consumers			1,016	16%
Price conscious and not open consumers			491	8%

CHAPTER V

CONCLUSIONS

The food system transformation is progressing rapidly in many developing countries. Driven by changing consumer preferences and subsequently introduced new governance structures, actors at all stages in supply chains are exposed to new challenges. If actors cannot adapt to these new trends, they face the danger of marginalization in increasingly liberalized markets. On the other side, supply chain actors can potentially profit, presupposing that they are able to develop appropriate strategies do deal with these challenges. Against the background of observable general trends, this study has examined determinants and implications of the food system transformation in Vietnam. It answered the more specific research questions (1) how do changing international requirements impact on exports of fruits and vegetables from Vietnam, and what is the role of private quality assurance programs (QAPs) in sustaining international market access, (2) what are the determinants of domestic demand for fresh fruits and vegetables from modern supply chains at the household level, what is the magnitude of demand elasticities for such high-value products, and what future trends can be expected, and (3) what is the role of consumer perceptions in valuing food quality and food safety attributes, and what is consumers' willingness to pay for such attributes.

Emerging private sector regulations are increasingly perceived as market entrance barriers for developing country exporters. Results of different logistic regression models showed that QAPs in the Vietnamese horticultural sector are market specific. Processing firms with international private QAPs have a higher probability of

exporting to countries of the Organization for Economic Co-operation and Development (OECD). For exports to non-OECD countries, national QAPs facilitate international market participation. Domestic market sales decrease the probability of being an OECD exporter and increase the probability of being a non-OECD exporter, suggesting certain market segmentation between high-value exports on the one hand and domestic sales and lower-value exports on the other. This suggests new export strategies for processing companies in developing countries: It will be advisable to not exclusively focus on high income countries but also to take into consideration the middle income countries with lower food safety and food quality requirements.

Non-traditional supply chains gain in importance, as reflected in the increasing role of modern retailers, food safety and quality standards, vertical market integration, and international trade in high-value products. Although it is argued that the food system transformation is to a large extent demand driven, most of the studies available in the literature concentrate primarily on aspects of supply. For this reason, demand parameters were estimated in a systems framework, disaggregating by product and process attributes that characterize modern, high-value supply chains, i.e. (i) place of purchase, particularly considering modern retailers, (ii) food safety indications, with an emphasis on formal labels, and (iii) region of production, with a focus on imports. Estimation results demonstrated that consumers' purchase decisions to buy fresh fruits and vegetables from emerging modern supply chains are heavily driven by household income (expenditure). Income elasticities range between 1.2 and 2.6. Price elasticities were found to be between -1.5 and -1.1, and distance to supermarket elasticities between -0.6 and -0.3. Against the background of Vietnam's current rapid economic development – with incomes growing fast and supermarkets reaching higher

penetration rates – high-value agricultural products from modern supply chains will rapidly gain market shares at the expense of products from more traditional sub-sectors. This indicates a continued restructuring of the domestic food system in the further process of economic development.

In order to adapt to the restructuring in the horticultural sector, appropriate responses in supply chains are required. Such responses presuppose a good understanding of consumer preferences and valuation of new product attributes. Therefore, consumers' valuation of different vegetable attributes in metropolitan areas of Vietnam was analyzed, using a mediation framework and comprehensive household survey data. Consumers are willing to pay an average price premium of 60% for vegetables that are free of agrochemical residues, and of 20% for a set of convenience attributes, like peeled and pre-cut vegetables. Rising income levels, urbanization, and media usage all have positive impacts on the willingness to pay. These impacts are partly mediated through different consumer perceptions. From a policy perspective, public media can and should be used to promote the spread of objective information, especially with respect to health issues. At the same time, supply chain actors should be ready to respond to the increasing demand for food quality and food safety. From a policy perspective, convenience characteristics are mostly search attributes, so that markets for convenience products will develop automatically. For food safety this might be different, since safety characteristics are credence attributes, which easily lead to market failures. Direct public intervention might be necessary in terms of establishing credible standards and certification systems.

Increasing consumer demand for high-value agricultural products with new attributes offers new income earning opportunities, provided that the food system actors manage

to adapt properly to the new conditions. This is also a challenge for traditional retailers in domestic markets, who are directly confronted with new customer requirements. A critical question is how adaptable traditional retailers are to meet new consumer expectations. As observed in other developing countries, the traditional retail sector has an enormous adaptive capacity: retailers of different formats mimic certain supermarket features, like for instance self-service. On the other side, they focus on their comparative advantage in offering customer-tailored services, which large retailers with their standardized business model are not able to deliver. This refers for example to home-delivery services of street vendors or direct marketing of farmers in special farmer markets. Provided a supportive and facilitating legal framework is given, small retailers with their important employment generation function can persist in modern food systems.

The impact of the spread of supermarkets on supply chains will critically depend in how far modern retailers pursue a strategy of better integrating supply chains. Specific questions are in how far they will expand their own food quality and safety standards and if and how this can contribute to a strengthening of their market position. Referring to logistics an issue is how quickly they are going to establish centralized distributions centers. This will critically depend in how far cost savings in procurement can off-set an inevitable rise in transportation costs. This will in turn have an impact on traditional supply chains, which will – despite the rapid growth of modern retail formats – continue to be the major venue of fresh fruit and vegetable marketing. This finding sheds new light on the discussion of the rapid spread of supermarkets and highlights the opportunities that traditional supply chains offer for small farmers.

Different development paths for the Vietnamese food system can be imagined. As domestic food retail markets develop, processing firms, which have so far concentrated on exports to OECD countries, might increasingly find customers among more demanding supermarket chains in domestic markets. Processed fruit and vegetable products, like preserved fruit juices, that previously only occupied niches in domestic markets, might become more popular in Vietnam. For other products it can be imagined that they will become more interesting for exports, while at the moment they only play a role in domestic markets. Litchis with protected geographical indication developed in the domestic market, might penetrate international markets in the future. For some products, modern retailers in Vietnam had to rely on imports, like temperate fruits which have no tradition of being grown in Vietnam. As production technology improves and farmers in the more temperate highland areas reach out to new income generating opportunities, these products might be produced domestically in the future and partly substitute for imports. Other products are available on domestic markets, but as food quality and food safety requirements increase, they might be increasingly sourced from abroad, as it might be the case with grapes often affected by high levels of pesticide residues.

The challenges described have important implications for rural development strategies, as also upstream stages of the supply chain are affected. The horticultural sector in Vietnam, as in other developing countries, provides livelihoods for many of the rural poor. These actors depend on changes in domestic and international markets; either as farmers, as traders, or as wage-laborers in primary production and processing. Beyond the implementation of private QAPs at the level of processing firms, success in high-value markets requires comprehensive adjustments in supply

chains. This includes awareness creation, training, as well as appropriate organizational and technological innovation at all stages of value-adding.

Integration of small-scale farmers will likely require new institutional mechanisms to reduce transaction costs and facilitate access to necessary knowledge and production technology. Collective action in the form of producer associations, 'new generation cooperatives', or contract farming with private companies could be options at the primary production level. Governmental institutions could possibly play a decisive role to promote efficient linkages between farmer groups and downstream supply chain actors. Public private partnerships (PPPs) could constitute an appropriate framework.

The government's involvement in such institutions can be justified on the grounds of an equitable growth path, which channels economic growth in urban centers to the poor in rural areas. Particularly in a densely populated country such as Vietnam, with large numbers of small-scale farmers, a strategy with increased value-adding by the rural poor could be a viable venue to generate growth beyond the industrializing centers around the big cities. Despite problems of bad governance and corruption in some areas of Vietnam, the historically well developed state institutions could possibly contribute to functioning PPPs.

Important to mention is that growth cannot only be expected at the level of primary horticultural production but also at different stages of processing. Processing of horticultural products is commonly assumed to be labor intensive, thereby having an important employment generation functions in rural areas. These employment opportunities often have low skill requirements, which would be of particular benefit

to the rural poor, which are often characterized by low levels of education. As food safety and quality requirements are on the rise, however, training will become ever more important. Also in this area, state institutions can possibly play a crucial role in setting framework conditions in a way that provide incentives to invest in training and education.

The policy space to shape the future picture of the food system is a wide field despite strong commercial interests of private actors and more influence of transnational institutions like the World Trade Organization (WTO). Land planning and zoning policies can be used to influence the establishment and extension of actors in modern food systems, processors as well as large retailers. Also regulations on store opening hours and store size requirements can be used by national governments to shape the framework conditions in which supermarkets and other actors in food systems operate. In addition, the tax system provides opportunities to create publicly desirable incentives or disincentives for actors in supply chains. In this way, traditional supply chains can be provided with some protective space to adapt to new requirements at a lower pace – however not without possible costs for the consumers who will likely pay for this retardation by higher consumer prices than in a fully liberalized retail market.

With regard to food safety, some critical questions emerge: do private actors have the incentives to introduce reliable food safety assurance systems on a broad basis? Are public sector institutions strong enough to ensure a sufficient level of food safety? How do private and public regulations relate to each other? A lack of consumer confidence in public standards could constitute a serious constraint for further expansion of high-value markets. Experience with the 'safe vegetable' program in

Vietnam has shown that without a dedicated public sector to facilitate such kind of programs, they have difficulties to take roots on a broad basis and their growth potential will be limited. It seems as a tiered system of standards is conceivable to take account of consumer and producer heterogeneity in a developing country context.

Credible food safety standards should be established and enforced, which would not only promote market development, but would also reduce negative health externalities. Basic food safety assurance can only be successful if the public sector is strong enough to enforce legislation. Financial resources are necessary to establish control bodies and equip laboratories to conduct required analyses. If resources cannot be provided by the public sector, legislation has to be designed in a way to create incentives for the private sector – like strengthening liability – to invest in credible food safety assurance. While this would be difficult to enforce for traditional supply chains, the modern food sector would be more receptive to such an approach. This might however lead to undesired consequences: If modern retailers cannot succeed in domestic supply chains to ensure a desired level of food quality and food safety, they will increasingly rely on imports. In either case, it would not free the public sector from the obligation to provide basic food safety assurance also for those consumers, who are not able to buy food safety at higher product prices with possible public health externalities. These considerations are just some examples of how supermarket diffusion, food quality and food safety standards, and international trade are closely interlinked.

While the analysis here has focused on Vietnam, the wider implications are also relevant for other developing countries. But clearly, more research is needed in this direction, in order to better understand the linkages and outcomes and to develop

strategies how local food sectors should respond. Particularly supermarket induced international agricultural trade is an area that has not received much attention in research. As this kind of international exchange develops, it will have important implications for policy makers and all those being part of these trans-boundary supply chains.

Since new opportunities for South-South trade will open up, the question arises in how far private food quality and food safety standards will play a role in these emerging trade patterns. If private standards are becoming more important in emerging food trade, questions arise about their governance structures, their legitimacy, and integrity. It is not clear yet, if the public sector might be indispensable to ensure credibility and acceptance of these standards through s supervisory role at a meta-level. Linked to this is the question in how far private regulations developed as business-to-business (B2B) standards fall under the jurisdiction of the WTO, in which traditionally nation states have negotiated public sector regulations.

Of continued interest are questions related to the integration of and possible benefits for small-scale farmers and the rural poor in emerging supply chains. Besides idiosyncratic characteristics of farmers and institutional framework conditions, cluster and network effects could possibly play a role. These are questions that have not been addressed in this study but would merit further investigation.

ANNEX

SUMMARY

Food systems are in a process of profound changes on a global scale. Multinational food processing and retailing companies spread globally. This trend is driven by changing consumer demand for food with new safety and quality attributes and by liberalized trade and investment policies. While the influence of the public sector has gradually diminished, private companies bring about new approaches in supply chain governance including private food safety and food quality standards. These developments have important implications for all stakeholders involved in food supply chains, including small-holder farmers in developing countries.

A developing country which finds itself in the midst of the described processes is Vietnam. The national government pursues a policy to modernize the country's food system through planned and controlled integration in international markets. As a consequence, the number of supermarkets has been growing in metropolitan areas, and modern retailers are starting to extend their field of interest to smaller cities and towns. From the first supermarket that opened in 1993, the number grew to 104 in 2005. Modern retailers, particularly supermarkets, are starting to develop more specialized, more integrated, and shorter supply chains for efficiency gains as well as improved food safety assurance. This is of particular importance for highly perishable products like fresh fruits and vegetables. Already in the 1990s the public sector has made increasing attempts to improve food safety assurance mechanisms, which were often of limited success though. This has contributed to an increased supply of imported products on domestic markets in Vietnam – partly as a consequence of consumers not being able to purchase domestic products at expected levels of safety

and quality. Increased food imports are an important indicator of the food system transformation.

After a period of economic isolation, Vietnam's integration in world markets begun in 1986 with an economic reform process. In order to promote trade, Vietnam opened internationally in several steps, as it is shown by the accession to the Association of Southeast Asian Nations (ASEAN) in 1995, by the bilateral trade agreement concluded with the US in 2001, and by the accession to the World Trade Organization (WTO) in 2007. With the accompanying improvements in international market access, the number of firms in Vietnam's horticultural industry has risen significantly over time. These firms face increasing challenges, as food safety and quality issues are becoming ever more important. In international trade, governmental and private non-tariff regulations are often perceived as undue trade barriers by developing countries. While governmental requirements are addressed by the sanitary and phytosanitary agreement (SPS) of the WTO, handling of private sector standards is not addressed. This cumulative dissertation analyzes patterns of and industry responses to the food system transformation in Vietnam, as well as changing consumer preferences that are hypothesized to be major driving forces for future developments. The fruit and vegetable sector is used as an illustrative example.

The first article is entitled "Quality Assurance Programs and International Market Access: Empirical Evidence from the Vietnamese Horticultural Industry". It is based on a sample of 50 registered fruit and vegetable processing firms from allover Vietnam. With these firm survey data it is analyzed how private quality assurance programs (QAPs) in Vietnam's horticultural sector influence the access to international markets. Results of different logistic regression models show that QAPs

are critical determinants of international market access. However, the effect is market specific and depends on the type of program implemented. While international QAPs – like HACCP, GLOBALGAP, or ISO 9000 – notably improve access to countries of the Organization for Economic Co-operation and Development (OECD), national QAPs seem to be sufficient for exports to non-OECD countries. Domestic market sales decrease the probability of being an OECD exporter and increase the probability of being a non-OECD exporter, suggesting a certain market segmentation between high-value exports on the one hand, and domestic sales and lower-value exports on the other.

Although it is argued that the food system transformation is to a large extent demand driven, most of the studies available concentrate primarily on supply side aspects. For this reason, the second article entitled "Changing Consumer Buying Habits in Developing Countries: A Disaggregate Demand Analysis for Fruits and Vegetables in Vietnam" analyzes changing purchasing and consumption habits for fresh fruits and vegetables. The analysis is based on data from a comprehensive survey of almost 500 households in Vietnam's two major cities, Hanoi and Ho Chi Minh City. Demand parameters are estimated with an almost ideal demand system (AIDS), disaggregating by product and process attributes that characterize modern, high-value supply chains, i.e. (i) place of purchase, particularly considering modern retailers, (ii) food safety indications, with an emphasis on formal labels, and (iii) region of production, with a focus on imports. Estimation results demonstrate that consumers' purchase decisions to buy fresh fruits and vegetables from emerging modern supply chains are heavily driven by household income (expenditures). Income elasticities range between 1.2 and 2.6. Own-price elasticities were found to be between -1.5 and -1.1 and the elasticities

regarding distance to the nearest supermarket are between -0.6 and -0.3. Against the background of Vietnam's current rapid economic development – with incomes growing fast and supermarkets reaching higher penetration rates – high-value agricultural products from modern supply chains will rapidly gain market shares at the expense of products from more traditional sub-sectors. This indicates a continued restructuring of the domestic food system in the further process of economic development.

In order to adapt to the new requirements in the horticultural sector, appropriate responses in supply chains are required. Such responses presuppose a good understanding of consumer preferences and valuation of new product attributes. Therefore the third article entitled "Consumer Valuation of Food Safety and Quality Attributes in Vietnam" analyzes consumers' willingness to pay for different vegetable attributes, using contingent valuation techniques. In a mediation framework, special consideration is given to consumer perceptions. Comprehensive data from the above mentioned household survey in Hanoi and Ho Chi Minh City serve as the basis. Consumers are willing to pay an average price premium of 60% for vegetables that are free of agrochemical residues, and of 20% for a set of convenience attributes, like peeled and pre-cut vegetables. Rising income levels and media use have positive impacts on the willingness to pay. These impacts are partly mediated through different consumer perceptions. From a policy perspective, public media can and should be used to promote the spread of objective information, especially with respect to health issues. At the same time, supply chain actors should be ready to respond to the increasing demand for food quality and food safety. From a policy perspective, convenience characteristics are mostly search attributes, so that markets for

convenience products will develop automatically. For food safety this might be different, since safety characteristics are credence attributes, which easily lead to market failures. Direct public intervention might be necessary in terms of establishing credible standards and certification systems.

The results of the three articles have important implications for rural development strategies in poor countries. Increasing consumer demand for high-value agricultural products offers new income earning opportunities, provided that actors in the food systems manage to adapt properly to the new market conditions. This is not only a challenge for processors and traditional retailers in domestic markets, who both are directly confronted with new customer requirements. Also upstream stages of the supply chain are affected. The horticultural sector in Vietnam, as in other developing countries, provides livelihoods for many of the rural poor. These actors depend on changes in domestic and international markets – either as producers, as traders, or as wage-laborers in primary production and processing. Beyond the implementation of private QAPs at the level of processing firms, success in high-value markets requires comprehensive adjustments in supply chains. This includes awareness creation, training, as well as appropriate organizational and technological innovation at all stages of value-adding. It will likely require new institutional mechanisms to reduce transaction costs and facilitate access to necessary knowledge and production technology. Collective action in the form of producer associations, 'new generation cooperatives', or contract farming with private companies could be options at the primary production level. Governmental institutions could possibly play a decisive role to promote efficient linkages between producer groups and downstream supply

chain actors. Public private partnerships (PPPs) could constitute an appropriate framework.

ZUSAMMENFASSUNG

Der Nahrungsmittelsektor befindet sich global in einem grundlegenden Umbruch. Multinationale Unternehmen der Lebensmittelverarbeitung und des Einzelhandels expandieren weltweit. Angetrieben wird diese Entwicklung durch eine sich verändernde Verbrauchernachfrage nach Lebensmitteln mit neuen Sicherheits- und Qualitätseigenschaften und durch liberalisierte Handels- und Investitionspolitiken. Während der direkte Einfluss des öffentlichen Sektors abgenommen hat, führen Unternehmen neue Kontroll- und Steuerungsstrukturen in Wertschöpfungsketten ein, einschließlich privatwirtschaftlicher Standards zur Nahrungsmittelsicherheit und Nahrungsmittelqualität. Diese Entwicklungen haben maßgebliche Auswirkungen für alle in Wertschöpfungsketten beteiligten Akteure und betreffen damit auch die Kleinbauern in Entwicklungsländern.

Ein Entwicklungsland, das sich inmitten der beschriebenen Veränderungsprozesse befindet, ist Vietnam. Die Regierung verfolgt eine Politik der Modernisierung des Nahrungsmittelsektors, die durch eine kontrolliert-wachsende Einbindung in internationale Märkte erreicht werden soll. Als eine Auswirkung dieser Strategie, hat die Anzahl der Supermärkte in den Großstädten schnell zugenommen, und die modernen Einzelhändler haben begonnen ihren Interessenbereich auch auf kleinere Städte auszudehnen. Seit der Eröffnung des ersten Supermarktes im Jahre 1993, ist die Zahl der Supermärkte auf 104 im Jahre 2005 angestiegen. Moderne Einzelhändler, besonders Supermärkte, beginnen damit, spezialisierte, integrierte und kürzere Wertschöpfungsketten aufzubauen, um damit sowohl Effizienzgewinne als auch eine bessere Gewährleistung der Nahrungsmittelsicherheit zu erreichen. Dieses ist besonders für Produkte mit hoher Verderblichkeit wichtig, wie beispielsweise frisches

Obst und Gemüse. Bereits in den 1990er Jahren hat der öffentliche Sektor vermehrt Anstrengungen zur Gewährleistung der Nahrungsmittelsicherheit unternommen, die jedoch oft nur von begrenztem Erfolg waren. Das hat mit dazu beigetragen, dass zunehmend importierte Produkte auf den einheimischen Märkten in Vietnam angeboten wurden – teilweise als Folge davon, dass Verbraucher einheimische Produkte nicht mit dem erwarteten Grad an Sicherheit und Qualität kaufen konnten. Gestiegene Nahrungsmittelimporte sind ein wichtiger Indikator für Veränderungen im Nahrungsmittelsektor.

Nach einer Zeit der wirtschaftlichen Isolation, begann die Einbindung Vietnams in die Weltmärkte im Jahre 1986 mit einem wirtschaftlichen Reformprozess. Um den Handel zu fördern, hat sich Vietnam in verschiedenen Schritten international geöffnet, wie beispielsweise durch den Beitritt zu dem Verband Südostasiatischer Nationen (ASEAN, Association of Southeast Asian Nations) im Jahre 1995, durch den Abschluss eines bilateralen Handelsabkommen mit den USA im Jahre 2001 und dem Beitritt zur Welthandelsorganisation (WTO, World Trade Organization) im Jahre 2007. Mit den sich daraus ergebenden Verbesserungen des internationalen Marktzugangs ist die Anzahl der Unternehmen im Obst- und Gemüsesektor mit der Zeit erheblich angestiegen. Diese Unternehmen stehen immer größer werdenden Herausforderungen auf internationalen Märkten gegenüber, da die Sicherheit und Qualität von Lebensmitteln heute eine zunehmende Bedeutung erfahren. Im internationalen Handel werden staatliche und privatwirtschaftliche nicht-tariffäre Handelsbestimmungen von den Entwicklungsländern zunehmend als unzulässige Handelshemmnisse wahrgenommen. Während staatliche Regulierungen bei der WTO im Rahmen des Abkommens über Sanitäre und Phytosanitäre Maßnahmen (SPS)

behandelt werden, bleibt die Behandlung der privatwirtschaftlichen Anforderungen außen vor. Diese kumulative Dissertation analysiert sowohl Muster und Reaktionsstrategien der Industrie im Rahmen der Veränderungen des Nahrungsmittelsektors in Vietnam, als auch sich verändernde Präferenzen von Verbrauchern, von denen angenommen wird, das sie die treibende Kräfte für die zukünftige Entwicklung darstellen. Der Obst und Gemüsesektor wird dazu als ein illustratives Beispiel herangezogen.

Der erste Artikel trägt den Titel "Quality Assurance Programs and International Market Access: Empirical Evidence from the Vietnamese Horticultural Industry" und basiert auf einer Stichprobe von 50 registrierten obst- und gemüseverarbeitenden Unternehmen aus ganz Vietnam. Mit den Unternehmensdaten aus der Erhebung wird analysiert, wie sich private Qualitätssicherungsprogramme (QSP) im vietnamesischen Obst- und Gemüsesektor auf den internationalen Marktzugang der Unternehmen auswirken. Die Ergebnisse aus verschiedenen logistischen Regressionsmodellen zeigen, dass QSPs entscheidende Bestimmungsgrößen für den internationalen Marktzugang sind. Der Einfluss ist jedoch marktspezifisch und hängt von der Art des Programms ab. Während international anerkannte Programme wie HACCP, GLOBALGAP oder ISO 9000 Zugang zu Ländern der Organisation für wirtschaftliche Zusammenarbeit und Entwicklung (OECD, Organisation for Economic Co-operation and Development) namentlich verbessern, scheinen nationale Programme für Exporte in nicht-OECD Länder auszureichen. Die Höhe der Umsätze auf dem einheimischen Markt verringert die Wahrscheinlichkeit für OECD Exporte and erhöht die Wahrscheinlichkeit für nicht-OECD Exporte. Dies legt eine gewisse

Segmentierung zwischen hochwertigen Exporten auf der einen Seite und inländischen Verkäufen mit eher niederwertigen Exporten auf der anderen Seite nahe.

Obwohl argumentiert wird, dass die Veränderungen im Nahrungsmittelsektor zu einem großen Teil vom Nachfrageverhalten bestimmt wird, konzentrieren sich die meisten bisherigen Untersuchungen auf die Angebotsseite. Aus diesem Grund analysiert der zweite Artikel mit dem Titel „Changing Consumer Buying Habits in Developing Countries: A Disaggregate Demand Analysis for Fruits and Vegetables in Vietnam" die sich verändernden Einkaufs- und Konsumgewohnheiten für frisches Obst und Gemüse. Die Untersuchung basiert auf Daten aus einer umfassenden Befragung von fast 500 Haushalten in den beiden größten Städten Vietnams, Hanoi und Ho Chi Minh Stadt. Parameter der Konsumentennachfrage werden mit einem AIDS-Modell (Almost Ideal Demand System) geschätzt, wobei nach Produkt- und Prozesseigenschaften disaggregiert wird, die moderne Wertschöpfungsketten von hochwertigen Agrarprodukten kennzeichnen. Ein besonderes Augenmerk gilt (i) dem Einkaufsort, wobei besonders moderne Einzelhandelskonzepte berücksichtigt werden, (ii) der Kenntlichmachung von Nahrungsmittelsicherheit, mit Heraushebung von formalen Kennzeichnungen, und (iii) dem Ursprungsort, mit besonderem Schwerpunkt auf Importen. Die Schätzergebnisse veranschaulichen, dass die Kaufentscheidungen für frisches Obst und Gemüse von den aufkommenden modernen Wertschöpfungsketten stark von der Einkommenselastizität (Ausgabenelastizität) abhängen. Die Einkommenselastizitäten reichen von 1.2 bis 2.6. Die Eigenpreiselastizitäten befinden sich im Bereich von -1.5 und -1.1, während die Elastizitäten bezüglich des Abstands zum nächsten Supermarkt zwischen -0.6 und -0.3 liegen. Vor dem Hintergrund Vietnams derzeit rasanter wirtschaftlicher

Entwicklung – bei der die Einkommen schnell wachsen und Supermärkte eine immer höhere Verbreitungdichte erreichen – werden modernen Wertschöpfungsketten für hochwertige Agrarprodukte sehr schnell weitere Marktanteile auf Kosten von Produkten der traditionellen Sektoren gewinnen. Das zeigt eine fortwährende Umstrukturrierung des einheimischen Nahrungsmittelsektors im weiteren Verlauf der wirtschaftlichen Entwicklung an.

Um sich den neuen Anforderungen im Obst- und Gemüsesektor anpassen zu können, sind geeignete Reaktionsstrategien in den Wertschöpfungsketten notwendig. Dies setzt ein gutes Verständnis von Verbraucherpräferenzen und von der Bewertung von neuen Produkteigenschaften voraus. Der dritte Artikel mit dem Titel „Consumer Valuation of Food Safety and Quality Attributes in Vietnam" analysiert deshalb die Zahlungsbereitschaft von Verbrauchern für verschiedene Qualitätsmerkmale von Gemüse mit kontingenten Bewertungsmethoden. Im Rahmen eines Ansatzes, der vermittelnde und indirekte Einflüsse identifizieren kann, wird besonderes Augenmerk auf die Sichtweisen der Verbraucher gelegt. Umfassende Daten der oben erwähnten Haushaltsbefragung in Hanoi und Ho Chi Minh Stadt dienen hierfür als Grundlage. Verbraucher sind dazu bereit, einen Preisaufschlag von durchschnittlich 60% für Gemüse zu bezahlen, das keine agrarchemischen Rückstände enthält und von 20% für eine Reihe von *Convenience*-Eigenschaften, wie geschältes und bereits zugeschnittenes Gemüse. Das steigende Einkommensniveau sowie die Mediennutzung tragen alle positiv zu einer höheren Zahlungsbereitschaft bei. Teilweise werden diese Einflüsse durch die Sichtweisen der Verbraucher vermittelt. Aus politischer Perspektive können und sollten die öffentlichen Medien genutzt werden, um objektive Informationen zu verbreiten, besonders mit Bezug auf

Gesundheitsangelegenheiten. Gleichzeitig sollten die Akteure in den Wertschöpfungsketten bereit sein, auf die zunehmende Nachfrage nach Lebensmittelqualität und Sicherheit zu antworten. Aus der Politikperspektive werden sich Märkte für Convenience Eigenschaften automatisch entwickeln, da es sich hierbei um Sucheigenschaften handelt. Für Nahrungsmittelsicherheit kann das aber anders sein, da Sicherheit von Lebensmitteln Vertrauenseigenschaften sind, bei denen leicht Marktversagen auftreten kann. Direkte öffentliche Eingriffe könnten notwendig sein, indem vertrauenswürdige Standards und Zertifzierungssystemse aufgebaut werden.

Die Ergebnisse der drei Artikel haben für ländliche Entwicklungsstrategien in armen Ländern wichtige Implikationen. Die steigende Nachfrage der Verbraucher nach hochwertigen Agrarprodukten bietet neue Möglichkeiten zur Einkommenserzielung, vorausgesetzt, dass die Akteure des Nahrungsmittelsektors sich entsprechend an die neuen Marktbedingungen anpassen. Das ist nicht nur eine Herausforderung für verarbeitende Betriebe und traditionelle Einzelhändler in einheimischen Märkten, die beide mit neuen Kundenanfoderungen sehr direkt konfrontiert werden. Ebenso betroffen sind die dazu vorgelagerten Stufen der Wertschöpfungskette. Der Obst- und Gemüsesektor in Vietnam stellt, wie auch in anderen Entwicklungsländern, die Existenzgrundlage für viele der Armen in ländlichen Gegenden dar. Diese Akteure hängen von den Veränderungen auf den einheimischen und auf den internationalen Märkten ab; entweder als Produzenten, als Händler oder als Arbeiter in der Primärproduktion oder der Verarbeitung. Jenseits der Einführung von privaten QSPs auf der Verarbeitungsstufe, erfordert ein erfolgreiches Agieren in Märkten für hochwertige Agrarprodukte umfassende Anpassungsmaßnahmen in den Wert-

schöpfungsketten. Dies beinhaltet sowohl eine Bewusstseinsschaffung und konkrete Fortbildungsmaßnahmen, als auch geeignete organisatorische und technologische Innovationen auf allen Stufen der Wertschöpfung. Dazu werden neue institutionelle Regelmechanismen notwendig sein, die Transaktionskosten senken können und den Zugang zu entsprechendem Wissen und Produktionstechnologien fördern. Gemeinsame Anstrengungen in der Form von Produzentenvereinigungen, neuartigen Kooperativen oder Vertragslandwirtschaft mit privaten Unternehmen könnten Lösungsmöglichkeiten auf der Ebene der Primärproduzenten darstellen. Staatliche Einrichtungen spielen möglicherweise eine entscheidende Rolle, um effiziente Verknüpfungen von Produzentenorganisationen mit nachgelagerten Akteuren in Wertschöpfungsketten zu fördern. Öffentlich-private Partnerschaften könnten einen entsprechenden Rahmen dafür bilden.