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Linking smallholder farmers to modern agricultural value chains

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Abstract

Efforts to improve the welfare and livelihoods of smallholder farmers in developing and emerging economies hinge on economic strategies that boost agricultural production. This dissertation focuses on one such strategy: transitioning smallholders from traditional spot markets to modern agricultural value chains (or high-value markets [HVMs]). The modern agricultural value chain provides benefits to smallholders ranging from stable and high prices to exposure to agricultural inputs and technologies. However, the costs of meeting stringent food quality standards required of products sold in HVMs creates myriad barriers that limit the participation of smallholders in HVMs. Across three essays, this dissertation attempts to understand those conditions facilitating the participation of smallholders into HVMs especially sustained HVM participation.

The first essay conducts a systematic quantitative review of the empirical literature on participation patterns in HVMs to identify key determinants of HVM participation as well as contextual factors that moderate the effect of these determinants. These determinants affect smallholders' capabilities, which informs their ability to cope with the risks and costs of ex-post HVM participation. The results indicate access to credit and extension services, asset ownership and cooperative membership are key determinants. The importance of several determinants varies, depending on several factors that include the spatial location, the temporal dimension, the HVM channel supplied and the governance mechanism. Also, the effect size are shown to be affected by the econometric method employed in the original study.

The second essay uses the best-worst scaling objective case experiment to understand the perception of horticultural smallholders in Kenya on the relevance of constraints that limit their entry into HVMs. The results show that poor access to high quality inputs, poor access to credit, missing cooperatives, high cost of meeting food standards and exploitative market intermediaries were the most relevant constraints. Insufficient labour, small farmlands and

weak land tenure security were the least relevant constraints. The relevance of these constraints vary based on the location of smallholders, household income, age and gender of smallholder and years of education of the smallholder.

The third essay also focuses on horticultural smallholders in Kenya. The essay employs the best-worst scaling profile case experiment to elicit smallholders' preferences for different market transactional attributes (or market conditions) and identify vertical coordination mechanisms promoting sustained smallholder participation in HVMs. A unique feature of this essay attempts to understand smallholders' best or worst choice selections to further gain insights into their perception of the best or worst conditions important to their sustained HVM participation. The results demonstrate that smallholders were more consistent in selecting the worst conditions, suggesting a better awareness of conditions that induce leaving than remaining in HVMs. The results also show that smallholders place value on resolving various risks emanating from output market uncertainties. Smallholders expressed preference for an incentive based pricing regime relative to a fixed pricing regime, immediate payments as against partial or delayed payments and long-term formal relationships with their buyers compared to spot transactions or informal relationships. In terms of vertical coordination, smallholders prefer inputs supplied by buyers, technical assistance provided by farm NGOs and decision-making by cooperatives.

Based on the results, this dissertation demonstrates that efforts to promote entry and sustained participation of smallholders in HVMs require different set of policy interventions. The dissertation discusses the contours of these interventions focusing on their relevance to different segments of smallholders, and value chain stakeholders better positioned to introduce, minimise the costs and maximise the benefits of such interventions, while highlighting research questions and gaps for consideration in future studies.

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1.0   Introduction

1.1   Background information and research questions

In the past few decades, the agricultural food sector of developing economies in Asia, Latin America and Africa have undergone several changes that transformed its processes, structures and institutions. In the period between the 1950s and 1980s, public sector efforts to transform agriculture from subsistence to commercial sector consisted of government commodity boards, input and output subsidies, and government established processing, wholesale and retail firms (Reardon & Timmer, 2007). The period after that (the 1980s to present) was characterised by the entry of private sector players into the agri-food sector, most notably in the retail industry. This period was marked by the liberalisation of the agri-food sector with governments taking a backseat to private sector firms, and increased globalisation (Reardon, Timmer, Barrett & Berdegué, 2003; Reardon, Barrett, Berdegué & Swinnen, 2009).

The participation of private sector actors induced changes in the production, procurement and distribution system of agricultural products. Processing of commodities gave rise to differentiated products (Reardon & Timmer, 2007). The global share of global agricultural trades for commodities such as grains fell, and was replaced by increases in trade and consumption of fruits, vegetables, fish and meat, helped on by increasing consumer preferences for healthy foods (Reardon & Timmer, 2007; Reardon et al., 2003). These changes favoured the rise of supermarkets, which tend to sell more processed products and fresh produce (Dolan & Humphrey, 2000). Private sector investments especially in processing and retail industries growing household incomes, urbanisation and foreign direct investments further encouraged the proliferation of supermarkets engendering the modern agricultural food value chain (henceforth high-value markets [HVMs]) in developing economies (Farina & Reardon, 2000; Barrett, Bachke, Bellemare, Michelson, Narayanan & Walker, 2012). The changes in the production, procurement and distribution system coincided with the rise of private food quality

standards, which came to define and distinguish food products sold in modern agricultural value from traditional spot markets (Berdegué, Balsevich, Flores & Reardon, 2005; Barrett et al., 2012). These quality standards were informed by product differentiation, consumer food preferences, as well as food safety, environmental, labour and welfare concerns (Reardon et al., 2009).

Producing food products that meet HVMs standards require investments in agricultural technologies and access to extension services, entailing substantial entry barriers and recurrent costs (Reardon et al., 2009; Barrett et al., 2012). Consequently, farmers who are unable to make the necessary investments are left out of HVMs, disproportionately affecting smallholder farmers who cultivate less than 2 hectares of farmland and account for 70-80% of farms in developing economies (Henson, Masakure & Boselie, 2005; Reardon & Huang, 2008; Lowder, Skoet & Raney, 2016).

The integration of smallholders from traditional spot markets (TMs) into modern agricultural value chains is of significant interest to policymakers. Food products sold in TMs do not adhere to the quality standards in comparison to similar products sold in HVMs and are less costly to produce (Neven, Odera, Reardon & Wang, 2009; Minten, Randrianarison, & Swinnen, 2009). However, prices are often low and volatile, leaving smallholders with thin margins (Neven et al., 2009). Evidence indicates farmers supplying HVMs benefits from higher prices, and gain access to agricultural inputs and technology, which improves household income and farm productivity (Wang, Wang & Delgado, 2014; Bellemare & Bloem, 2018; Ton, Vellema, Desiere, Weituschat & D'Haese, 2018). As a result, policymakers regard the transition from TM to HVMs as providing a sustainable medium for enhancing smallholders' welfare and rural economies (Barrett et al., 2012).

Contract farming, farmer cooperatives and intermediary trade organisations (e.g., farm nongovernmental organisations [farm NGOs]) are coordination mechanisms, which connect

smallholders to HVMs (Key & Runsten, 1999; Reardon and Huang, 2008). While effective in specific settings, these mechanisms entail some problems for smallholders. Retailers' procurement strategies typically favour peri-urban areas with good infrastructure, which raise questions about the availability of contracts for smallholders who reside in rural areas with poor infrastructural facilities (Rosch & Ortega, 2019; Barrett et al., 2012). Contract enforcement issues and contracts as exploitative tools also casts doubts on the effectiveness of contract arrangements especially given the weak legal systems in developing economies (Singh, 2002; Rosch & Ortega, 2019; Barrett et al., 2012). The latter problems have mainly been singled out as being responsible for hold-up problems and smallholders reluctance to enter contractual agreements with retailers and vice-versa (Porter & Phillips-Howard, 1997; Singh, 2002; Saenger, Qaim, Torrero & Viceisza, 2013; Saenger, Qaim & Torrero, 2014). Cooperative groups and farm NGOs also face several issues that threaten their ability to operate as well as stay relevant for smallholders. For example, cooperatives and farm NGOs often exclude smallholders and are more accommodating to well-to-do farmers (Fischer & Qaim, 2012). Cooperatives and farm NGOs also face horizon problems (high startup costs), require high operating costs or experience free-rider problems and often become ineffective or collapse after a few months or years of operation (Bernard & Spielman, 2009; Ashraf, Giné & Karlan, 2009; Fischer & Qaim, 2012).

Consequently, entering HVMs remains a challenge for smallholders. These challenges point to an unclear understanding of the incentives provided by the coordination mechanisms, including the relevance of the various constraints smallholders face when deciding to participate in HVMs.

Besides, recent empirical evidence indicates that smallholders often exit HVMs upon entry due to higher than anticipated ex-post entry risks and costs (Andersson, Chege, Rao & Qaim, 2015; Michelson, 2017; Lambrecht & Ragasa, 2018; Romero Granja & Wollni, 2018). On the one

hand, several market transactional attributes inherent to HVMs (e.g., investment in farm assets, higher post-harvest operations and costs, higher costs from meeting food quality standards among others) entail high costs and risks for smallholders, leading smallholders to exit and return to TMs (Swinnen, Colen & Maertens, 2013). On the other hand, the ability to cope with these risks and costs depends on the capabilities of smallholders (Neven et al., 2009; Reardon et al., 2009). Gereffi, Humphrey & Sturgeon (2005) argue that the capabilities of producers in value chains inform their ability to understand the complex transactions and product specifications that characterise modern value chains. This translates to smallholders possession of the necessary technical skills and farm assets needed to supply products that meet the expected quality standards and quantity requirements of HVMs (Reardon et al., 2009). These capabilities are determined by various socio-economic and institutional factors of participation (or determinants) in HVMs (Altenburg, 2006; Neven et al., 2009; Barrett et al. 2012).

From the preceding paragraphs, the following questions are pertinent to efforts to facilitate the entry of smallholders into HVMs:

1. Which determinants are relevant to participation in HVMs?
2. How do different contextual factors (or moderators) moderate the relevance of these determinants?
3. What constraints and factors discourage and encourage smallholders entry into HVMs?
4. Which market transactional attributes (or market conditions) support sustained participation of smallholders in HVMs?

This dissertation intends to answer these questions. As stated by Timmer (1988), agricultural policy objectives are informed by academic discourse and findings, which in turn guide policy objectives and measures. In answering these questions, this dissertation pursues a holistic approach to understand market conditions that promote participation, particularly long-term

participation, in HVMs. The aim is to provide insights informing policymakers and value chain stakeholders on the design of policy initiatives aimed at improving the capabilities of smallholders,' alleviating constraints to entering HVMs and promoting sustained participation in HVMs.

1.2   Organisation of the dissertation

In section 2, I review the literature. The section begins by describing the theoretical foundation supporting the structure of HVMs, namely Transaction Costs Economics (TCE) and Global Value Chain (GVC) theories. Afterwards, I review the empirical literature to draw attention to contemporary empirical findings to highlight the dissertation's contribution to the literature. I combine insights from TCE and GVC theories to construct an analytical framework forming the foundation for the experiments conducted in this dissertation.

In section 3, I describe the systematic review process. In subsequent subsections, I provide a brief overview of my data collection area; specify the data collection procedures and the designs for the two experiments I conduct in this dissertation. I also present the different data analytic techniques I used to analyse the data collected from the literature search and the systematic review process. Finally, I describe the econometric model specifications for the experiments I conduct in this dissertation.

In section 4, I summarise the three essays, which constitutes the main body of the dissertation. Essay 1 answers research questions one and two through a systematic review of the existing empirical literature on determinants of participation in HVMs. By employing descriptive statistics and weighted least squares regression models, the essay aims to identify the key participation determinants, the various contexts where these determinants are relevant and the moderating factors that affect the relevance of the determinants. Essay 2 answers research question three by analysing smallholder perceptions of the constraints preventing entry into HVMs to understand the importance of various constraints to HVM participation. I conduct a

best-worst scaling object case choice experiment with horticultural sector smallholders in Kenya to achieve this task. Essay 3 elicits smallholders' preferences for various market transactional attributes to tease out conditions that promote sustained participation of smallholders in HVMs. From smallholders' preferences, I identify vertical coordination arrangements that could alleviate the risks of smallholders remaining in HVMs. I conduct a best-worst scaling profile case choice experiment to carry out these objectives.

In section 5, I discuss the results of the essays, highlight the novelty of my findings in relation to previous literature, and provide recommendations for policymakers and future research.

2.0   Literature review

2.1   Theoretical background

2.1.1   Agricultural Value Chains

The modern agri-food sector is often described in terms of agricultural chain networks or value chains of actors and activities. Kaplinsky & Morris (2001) defines agricultural value chains as maps containing the actors and outlining the flow of agricultural goods and services within a chain and between chains. Porter (1985) introduced the concept of value chains to describe activities entailing the production, processing, and marketing of a product. In agriculture, this includes input purchase, cultivation, harvesting, sales of a product, marketing, logistics, product upgrading, process upgrade, technology upgrades, and efficient management of capital and human resources. Porter notes that these activities are not isolated, but are linked in a value system.

Globalisation has brought together producers, wholesalers, retailers, processors and consumers of agricultural products operating in distant locations in the modern agricultural value chain. This connection has allowed producers and retailers to gain access to new markets and suppliers respectively and fostered the transmission of agricultural technology from developed to developing economies (Minten et al., 2009; Reardon et al., 2009). But the connection has also increased the complexity as well as the risks of value chain transactions and interactions between these actors (Minten et al., 2009; Barrett et al., 2012). Food products originating from developing economies that are sold in developed economies must meet stringent food quality standards demanded of food products in the latter economies. This has led to an increase in the cost of harmonising food standards and coordination among the actors operating in different spatial locations (Barrett, Browne, Harris & Cadoret, 2002; Muradian & Pelupessy, 2005). Agricultural value chains actors adopt various measures to reduce production costs, costs of coordinating business transactions (i.e., transaction costs), consistently produce and supply

high-quality products (Kaplinsky, 2000; Reardon & Timmer, 2007). These measures are more common in the retail sector, typically dominated by supermarket outlets.

The first measure is the tendency to centralise the procurement of food products, with supermarkets building distribution centres to increase efficiency, reduce transaction costs, especially coordination costs (Boselie, Henson & Weatherspoon, 2003). The second measure is the increasing use of specialised and trusted suppliers, e.g., direct relationships between supermarkets and commercial farmers, smallholders or market intermediaries (Berdegué et al., 2005; Reardon & Timmer, 2007). The third measure involves the use of agricultural contracts to codify these relationships (Reardon & Timmer, 2007). The fourth measure concerns the rise of private food quality and safety standards. Supermarkets have implemented these standards partly because of missing public standards to safeguard food quality (Asfaw, Mithhöfer & Waibel, 2010), but also to differentiate their products from their rivals' products and reduce information asymmetry by signalling the quality of their products to consumers (Reardon & Farina, 2002; Fulponi, 2006).

The use of private food quality standards allowed the retail sector to set the tone for production, processing and marketing activities and increased the need for coordination among all actors in agricultural value chains (Sykuta & Cook, 2001; Reardon et al., 2009). Farmers who fail to meet these standards are often unable to tap into these procurement systems and sell their products to supermarkets (Henson & Reardon, 2005).

Despite the market liberalisation and private sector investment, several market failures persist, especially in developing economies (Stiglitz, 1989; Sheahan & Barrett, 2017). Market failures related to imperfect input and credit markets affect the functioning of agricultural value chains since lack of access to quality inputs and credit reduces smallholders' competitiveness compared to larger commercial farmers (Reardon et al., 2009; Sheahan & Barrett, 2017). These market failures, together with poor physical infrastructure and weak legal institutions, further

raise the costs of operating in modern agricultural value chains in developing economies (Barrett et al., 2012).

Several economic theories provide analytical frameworks for examining the effect of market failures on the development and the competitiveness of agricultural value chains. The idea of institutions, both market and non-market, as vehicles with which to understand and resolve market failures to promote economic development spurred the development of the New Institutional Economics approach (Fafchamps, 2004; Reardon & Timmer, 2007). The New Institutional Economics approach (NIE) argues that institutions are central to the proper functioning of markets, and such institutions can be analysed (Williamson, 1998). When applied to modern agricultural value chains, this translates to a belief that the weak institutional environment in developing economies creates high transaction costs in input, output and credit markets (Dorward, Kydd, Morrison & Urey, 2004). The branch of NIE concerned with the analysis of institutions to reduce transaction costs and ensure markets function without distortion is the transaction costs economics.

2.1.2   Transaction Cost Economics

Transactions are the unit of analysis in markets (Williamson, 1998; Joskow, 2008). This belief forms the core foundation of transaction cost economics. In TCE, market transactions yield non-production related costs crucial to the proper functioning of such markets known as transaction costs (Williamson, 1985). Transaction costs include search, screening, negotiation, monitoring and enforcement costs (Williamson, 1996). In agricultural value chains, these relate to the informational asymmetry costs, cost of searching for potential suppliers and buyers, drawing up contracts and contract monitoring and enforcement to ensure adherence to contract terms.

TCE works through the discriminant alignment hypothesis (Williamson, 1998; Joskow, 2008). The hypothesis stipulates that 'transactions, which differ in their attributes, are aligned with

governance structures, which differ in their cost and competence' to minimise transaction costs (Williamson, 1998: 75). Central to minimising costs is an understanding of market transactional attributes, the various governance structures as informed by these transactional attributes, and how to achieve cost economising outcomes (Williamson, 1998; Joskow, 2010).

Market transactions are based on three main attributes in TCE: frequency of transaction, uncertainty and asset specificity (Williamson, 1979, 1985). Transactional frequency refers to one-time, occasional or continuous transactional interactions between buyers and sellers. Transactional frequency is especially relevant when reputational effects and set-up costs are concerned (Williamson, 2005). For example, cheating and other forms of opportunistic behaviour are advantageous in short-term transactions but disadvantageous in the long-term because it creates a bad reputation for actors who engage in such activities. Market actors are forced to screen potential partners to avoid bad actors, which creates additional costs. Uncertainty is the various disturbances and unforeseen circumstances affecting agricultural market transactions, e.g., weather uncertainties, pest and diseases attack (Biswanger and Rosenzweig, 1988). Asset specificity refers to investments in assets that support a specific business transaction and cannot be used for alternative business transactions without loss in value (Williamson, 1985). The latter statement is why asset specificity plays a crucial role in TCE because it creates a mutual dependency between business partners since using the asset for alternative use results in value loss thereby injecting additional risks and uncertainty into market transactions (Williamson, 1979, 1991). Specific assets include site, physical asset, human asset, temporal and brand name specificities (Williamson, 1991). An example of a physical asset is a poultry processing facility built near poultry farms.

Governance structures, on the other hand, refer to the institutional arrangement within which market transactions are organised (Williamson, 1979, 1998). In TCE, three generic governance structures exist: market, hybrid and hierarchy (Williamson, 1979, Joskow, 2010). On one end,

there is the market governance structure capturing case-by-case transactions between buyers and sellers reliant on prices as its primary coordination mechanism. On the other end, hierarchy structures represent complete forms of vertical integration, where firms internalise all production, processing and marketing operations. In between these two opposites are hybrid structures. Hybrid governance structures include different forms of long-term contracts, share governance, sourcing from multiple suppliers and public companies (Joskow, 2008). The governance structures are organised and distinguished based on the different transactional attributes and coordinating mechanisms whose properties reflect their adaptability to various disturbances, incentive structure and administrative control (Williamson, 1991). TCE priorities contracts as its main coordination mechanism (Williamson, 1991).

Tables 1 and 2 illustrates these governance structures with respect to the transactional attributes and different contract arrangements. Market structures are characterised by low levels of transactional frequency, uncertainty and investment in specific assets. A robust legal and regulatory system is essential to guide against opportunistic behaviour by actors in this structure (Ménard, 2008). Buyers and sellers in market governance structures act autonomously (Williamson, 1988). The actions of each actor are strongly linked to their market outcomes; therefore, the actors are incentivised to adapt efficiently to benefit from changing market conditions, since market prices dictate those conditions (Williamson, 1991, 1988).

However, hybrid and hierarchy governance structures are more suited for situations characterised by increasing transactional attributes and complex transactions (Williamson, 2008). Transactions requiring investments in specific assets, create bilateral relationships between market actors (Key & Runsten, 1999). In hybrid structures, bilateral contracts support these bilateral relationships (Key & Runsten, 1999). When contract enforcement systems are weak, market actors turn to relational contracts to organise their business transactions. Relational contracts rely on reputational effects to incentivise actors to honour contract

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agreements (Banerjee & Duflo, 2000; Levin, 2003; Ajwang, 2020). If asset specificity is especially high, hierarchical governance structures, marked by vertical integration, are most-suited to reduce opportunism and contractual hazards due to its strong administrative controls and cooperation (Ménard, 2008; Williamson, 1985). Cost of adapting to uncertainty is lower in hierarchical structures compared to hybrid structures because of easy communication among already integrated firms, and tight administrative controls save time and resources (Williamson, 1991).

Table 1: Governance structures and transactional attributes

Governance structure	Transactional attributes		
	Asset specificity	Uncertainty	Frequency
Market	Low	Low	Low
Hybrid	High	High	High
Hierarchy	High	High	High

Source: modified from Williamson (1991) and Key & Runsten (1999)

Table 2: Governance structures and contract arrangement

Governance structure	Relevance to contracts		Properties of contract as a coordination mechanism			
	Contract law	Contract arrangement	Administrative controls	Autonomy	Cooperation	Incentive intensity
Market	Strong	Legal	Weak	Strong	Weak	Strong
Hybrid	Semi-strong	Bilateral/ Relational	Semi-strong	Semi-strong	Semi-strong	Semi-strong
Hierarchy	Weak	Internal	Strong	Weak	Strong	Weak

Source: modified from Williamson (1991) and Ajwang (2020)

2.1.3 Global Value Chain Approach

Another approach to understanding HVMs is the global value chain approach. GVC was developed in response to increasingly interconnected, globalised value chains for products, the implications of such interconnectedness and the various governance structures it engendered (Gereffi et al., 2005). The approach combines ideas from TCE, technology capability, firm capabilities and learning, and production networks theories to propose five types of governance structures (Gereffi, 1994; Gereffi, Humphrey, Kaplinsky & Sturgeon, 2001; Gereffi et al., 2005). These are market, modular, relational, captive and hierarchy. Gereffi et al. (2005)

highlight three key variables that determine these governance structures: the complexity of transaction activities and information, ability to codify and convey information between chain actors at minimal cost, and the capability of producers in the chain.

Similar to TCE, at the heart of these variables is asset specificity. But GVC diverges from TCE by considering the costs of coordinating chain activities termed 'mundane' transaction costs (Gereffi et al., 2005: 84). Mundane transaction costs increase when value chains produce time-sensitive products, e.g., products with short shelf life or non-standard products (Gereffi et al., 2005). Also emphasised in GVC is the power relations and asymmetry between actors in value chains. In contrast to TCE, which calls for complete vertical integration in the face of increasing asset specificity, GVC contends that firms out-source some activities and technologies to manage asset specificity and coordination costs. The approach leans on firm capabilities and learning, and production network theories to support this contention. The former theory shows acquiring the necessary competence to carry out certain activities in-house is costly and time-consuming, forcing companies to outsource such activities to firms with the requisite competence (Gereffi et al., 2005). The latter theory argues that mutual dependence, trust and reputation can alleviate coordination costs and permit inter-firm coordination (Powell, 1990; Gereffi et al. 2005). Table 3 shows the governance structures based on the three key variables.

Table 3: Governance structures in Global Value Chains

Governance structure	Transaction complexity	Ability to codify information	Supplier capability	Power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	↑
Relational	High	Low	High	
Captive	High	High	Low	↓
Hierarchy	High	Low	Low	High

Source: Gereffi et al. (2005)

Lee, Gereffi & Beauvais (2012) modified the GVC framework to specifically show how smallholders can gain access to and benefit from the globalised modern agricultural value chain.

They argue that transactions in HVMs are becoming increasingly complex due to rising private food quality standards. The proliferation of food standards has affected the activities and outcomes of those actors participating in agricultural value chains. For example, retailers have accumulated immense market power; smallholders are burdened by ever-increasing food quality standards and are unable to comply with those standards to compete in HVMs.

They propose four governance structures based on the nature of 'lead firms' in the chain, market concentration, and chain actors incentives and ability to adapt to rising food quality standards. These governance structures are buyer-driven, bilateral oligopolies, producer-driven chains and traditional markets. Highly concentrated retailers who set food quality standards and other activities prevalent in such value chains dominate buyer-driven structures. A good example is horticultural value chains. Food manufacturers and processors dictate terms of transactions and quality standards in producer-driven structures. These manufacturers interfere in the activities of small producers to ensure commodities are of good quality and adhere to social and environmental standards. Bilateral oligopolies entail highly comprehensive food standards as they involve both concentrated retailer and producers who set their quality standards. These firms compete by using food labels to differentiate their products from that of their rivals.' Traditional markets are characterised by numerous producers and retailers, with minimal adherence to public quality standards and undeveloped private standards. These actors are small-scale and transact based on price and quantity.

The revised GVC framework draws attention to the influence of intermediaries such as cooperatives, traders and exporters such as farm NGOs on smallholders. Intermediaries play a particularly strong role in buyer-driven chains where they implement and enforce food standards set by retailers, connect smallholders to retailers and provide essential services, e.g., agricultural inputs and technical assistance to smallholders. In buyer-driven chains, intermediaries are continually adapting to stay in touch with increasing food standards and have

more reason to support smallholders (Dolan & Humphrey, 2004; Lee et al., 2012). This is because, despite the presence of commercial farms, smallholders are responsible for producing the majority of food products in buyer-driven chains (Lee et al., 2012). Intermediaries are highly consolidated and mostly involved in processing in producer-driven chains and play little to no roles in bilateral oligopolies and traditional market governance structures (Lee et al., 2012). The framework specifies functions for public institutions in setting up supportive legal and regulatory institutions regulations, especially for agricultural products sold in export markets.

2.2 Analytical framework

The concepts and ideas espoused in TCE and GVC form the basis for the analysis conducted in this dissertation and the ensuing policy recommendations. I adopted the notion of transactions as the unit of analysis from TCE. In addition to contracts, which TCE centres as its coordination mechanism, I examine market transactions in relation to other potential coordination mechanisms such as cooperatives and farm NGOs. My characterisation of cooperatives and farm NGOs as coordination mechanisms rely on their depiction as key intermediaries providing essential value chain services in GVC. The structure of these mechanisms also reflects the properties of coordination mechanisms: incentive intensity, administrative control and adaptation (i.e., cooperation and autonomy) proposed by Williamson (1991) in TCE. For example, the economic success of farm NGOs depend on continued transactions between the NGOs, smallholders and retailers, meaning there are economic incentives and benefits for the NGOs from these relationships (see Ashraf et al., 2009; Maertens & Vande Velde, 2017).

I propose a vertical coordination-based approach based on the core-competency, trust and mutual dependency principles advanced in GVC to identify areas where the coordination mechanisms alleviate the costs and risks of HVM participation. To tease out those areas, I rely on the discriminant alignment hypothesis from TCE. The hypothesis states that 'transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence' to minimise transaction costs (Williamson, 1998: 75). I outline various market

transactional attributes (or market conditions) inherent to transactions in HVMs (and traditional markets). Instead of identifying governance structures and the appropriate contractual arrangement, I focus on pinpointing areas where various coordination mechanisms might facilitate efficient vertical coordination of activities in HVMs. Compared to previous empirical literature that employs TCE as the foundation of their analysis, I apply this approach for the following reasons.

One, TCE conceptually separates transaction costs from production costs. Production costs depend on the production technology and inputs, while transaction costs depend on the organisation of transactions. However, production and transaction cost equally rely on the production technology and inputs, and organisational strategies since both affect the efficiency of firms (Milgrom & Roberts, 1992). As an example, in the face of increasingly strict food quality standards, complete vertical integration would be the most efficient production and organisational strategy for retailers to ensure food products that reach their shelves conform to quality standards. In developing economies, retailers often set up their farms, but also outsource or second source their supply of agricultural products to intermediaries, which would be considered inefficient and generate more production and transaction costs. Milgrom & Roberts (1992) argue firms often sacrifice efficiency in production costs by outsourcing or second sourcing to attract competition and allay monopoly fears (see also Farrell & Gallini, 1988). The separation of production and transaction costs represents another limitation of the TCE approach. In my framework, I assume that production and transaction costs are interrelated. Consequently, I specify market transactional attributes considering the interconnectedness of production and transaction costs, e.g., the provision of production inputs and technical assistance entails both production and transaction costs.

In addition to the three dimensions of transactional attributes in TCE (i.e., uncertainty, transaction frequency and asset specificity), another dimension of transactional attributes is the

connectedness of transactions (Milgrom & Roberts, 1992). For example, in HVMs, the type of production inputs and technology, as well as access to technical assistance affects the quality of products supplied by farmers, which in turn influence the pricing scheme agreed upon between farmers and market intermediaries and retailers. Interdependent transactions further raise the complexity of interactions and costs in value chains, which calls for increased coordination among various value chain stakeholders. See table 6 in section 3.3.2.1 for the transactional attributes.

Two, empirical evidence already shows cooperatives, and farm NGOs can facilitate access to HVMs (Ashraf et al., 2009; Maertens & Swinnen, 2009; Michelson, 2013; Lambrecht & Ragasa, 2018). Three, contracts are not readily available to smallholders, and due to asymmetric power relations between retailers and smallholders, contracts can become exploitative instruments. Consequently, farmers are often reluctant to commit to contractual agreements. Four, it is difficult to point to one specific governance structure as prevalent in agricultural value chains in developing economies and the appropriate contract arrangement relevant to that governance structure. For example, legal contracts stemming from market governance structures are infeasible due to weak smallholders' capabilities and legal systems, creating concerns about contract enforcement. Relational contracts are useful in this regard, but reputation and trust necessary for relational contracts to work are time-consuming and costly to build (Machiavello, 2010). Drafting adequate bilateral contracts can be hindered by bounded rationality and information asymmetry, which raises the cost of writing the second-best contract (Williamson, 1985, 2002). Vertical integration might not be feasible as smallholders might be reluctant to cede control over their farms. Moreover, retailers already outsource several activities, e.g., purchasing food products from specialised traders or turning to third party agencies to monitor their suppliers instead of full vertical integration (Dolan & Humphrey, 2000; Okello & Swinton, 2007).

Finally, to tease out areas where the coordination mechanisms are most effective, I must analyse a wide range of market transactional attributes. Therefore, I specify a larger number of transactional attributes than previous studies. The attributes encompass asset specificity, transactional frequency, output and input market uncertainty, product quality specifications, trading relationships and the state of physical infrastructure where the market transactions occur. Previous studies employ traditional discrete choice experiments method, which due to experimental design and respondent fatigue issues limits the number of attributes they could analyse. To overcome this limitation, I conduct our analysis using another choice experiment method called best-worst scaling (see section 3.3).

2.3 Empirical review

The TCE framework underpins much of the empirical analysis of modern agricultural value chains in developing economies. Hence, the majority of empirical studies focus on contract farming as the vehicle towards smallholder participation in modern agricultural value chains. Their analysis focus on contract design, determinants of participation, welfare effects and enforcement issues surrounding contract farming. A significant body of literature exists on the welfare effects of participating in contract farming. However, that is not the focus of this dissertation, which is more interested in understanding participation patterns in modern agricultural value chains to tease out policy entry points to facilitate the participation of smallholders. The literature that examines this issue can be placed under four categories.

The first category examines the socioeconomic, demographic and institutional determinants of participation in contract farming (see Reardon et al., 2009; Barrett et al., 2012; Wang et al., 2014 for a systematic review of studies).

The second category investigates how different contract designs inform participation in HVMs (Abebe, Bijman, Kemp, Omta & Tsegaye, 2013; Ochieng, Veetil & Qaim, 2017). These studies uses choice experiments to tease out smallholders' preferences for contract attributes that

motivate or discourage smallholder entry into HVMs. Their findings show that smallholders expressed concerns about several supermarket practices, notably product rejections and payment delays (Ochieng et al., 2017). Their results also show that smallholders prefer buyer provided inputs and technical assistance over inputs and technical assistance provided by the state and farm NGOs (Abebe et al., 2012). These studies show that various socioeconomic characteristics of smallholders inform preference heterogeneity for different contract attributes.

A third literature category analyses smallholders' preferences for attributes of market channels (Blandon, Henson & Islam, 2009; Schipmann & Qaim, 2011). These studies show that while smallholders expressed preference for attributes synonymous with both HVMs and traditional spot market channels, they were more supportive of traditional spot market attributes. The studies argued that efforts to establish trust between smallholders and retailers are needed to ensure transactional attributes found in HVMs are acceptable to smallholders.

More recently, a fourth category focuses on the behaviour of market actors, especially opportunistic behaviours and how these behaviours affects market relationships, contract monitoring and enforcement (Saenger et al., 2014; Gelaw, Speelman & Huylenbroeck, 2016; Michelson, 2017; Kunte, Wollni & Keser, 2017; Fischer & Wollni, 2018; Romero Granja & Wollni, 2019; Rosch & Ortega, 2019; Ajwang, 2020). Findings from these studies suggest that contract enforcement problems affects the willingness of farmers to enter HVMs. Relational contracts are necessary to prevent opportunistic behaviour among market actors as well as ensure smallholders remain in HVMs. To summarise, these studies find that social dynamics such as reputation, trust gained from personal transactions with buyers or peer experiences with buyers, influence smallholders opinion of contract attributes and decision to participate in HVMs.

The case studies in the first literature category offer mixed results concerning the determinants of HVM participation. This is because different factors moderate the relevance of the

socioeconomic, demographic and institutional determinants and are responsible for the heterogeneity in empirical results. Results from the second literature category focus on understanding contract attributes that promote smallholder entry into HVMs, not on supportive conditions and coordination mechanisms that are well suited to facilitate sustained participation in HVMs. Results from the second literature category also offer little insight into the relative importance of the different constraints that limit entry into HVMs. While they provide useful information on smallholder preferences for different levels embedded in contract attributes, inferring the relative importance of each constraint from such preferences would be misleading (see Carlsson, Frykblom & Lagerkvist, 2007; Brooks & Lusk, 2012). For example, these studies often discover that smallholders might prefer inputs supplied by cooperatives to inputs provided by buyers or the state, or prefer to deliver their products to a nearby market as against delivery to a buyers collection centre. However, these insights do not provide information on the importance of access to inputs as a constraint or its relative importance to other constraints limiting HVMs participation.

Findings from the third and fourth category show social dynamics are central to HVM participation. However, these findings reveal nothing about the importance of these dynamics relative to other economic aspects of interactions between buyers and sellers, especially in scenarios where sustained participation in HVM are concerned. The questions I have posed in this dissertation capture and address these issues.

3.0   Research Methodology

I conduct a systematic quantitative review of the existing empirical literature to investigate the first and second research questions. Between September and November 2018, I conducted a field survey with various stakeholders in the horticultural value chain in Kenya. The survey included two different sets of experiments. Experiment one, modelled after best-worst scaling (BWS) object case, allowed me to estimate the relevance of various constraints that limit smallholder entry into HVMs and answer research question three. In the second experiment, I used best-worst scaling profile case to elicit smallholders' preferences for market transactions that promote sustained participation in HVMs. As part of a field survey, I also conducted expert interviews with farmers, market intermediaries, farm NGOs and supermarkets in the horticultural value chain. Expert interviews helped me to gain a comprehensive understanding of the inner workings of the horticultural value chain. In the following subsections, I expound on these methods.

3.1   Systematic review

I searched the ISI Web of Knowledge^{TM}, ScienceDirect^{R}, and the FAO online databases for empirical case studies on the determinants that facilitate participation in coordination mechanisms linking smallholders to HVMs. These mechanisms include agricultural contracts, farmer cooperatives, certification and organic schemes, and farm NGO projects. I explicitly focused my search on keywords used to describe these governance mechanisms, for example, 'contract farming'; 'producer organisations'; 'cooperatives'; 'farmer organisations;' 'outgrower schemes'; 'farm NGOs'; 'nucleus farming'; 'estate farming'; 'value chains'; and 'sharecropping'. I also snowballed the reference list of articles in our literature search for relevant studies I was yet to come across. I included studies based on two criteria. For the first criterion, studies must compare HVM and TM farmers in terms of their socio-economic and institutional characteristics as well as market incentives in their descriptive statistics or t-tests. I used this information to draw a profile of smallholders supplying HVMs. For the second

criterion, studies must employ econometric models to analyse the determinants of HVM participation. From these models, I extract the estimated coefficients' of the determinants, their standard errors, and t or p-values. This information is relevant for identifying key determinants relevant to HVM participation. Smallholders often self-select into contract farming, cooperatives and other coordination mechanisms that facilitate access to HVMs (Barrett et al., 2012). This means the selection process is not random and is subject to statistical endogeneity. Failure to control for this self-selection bias will produce biased coefficients that do not reflect the true effect of those determinants. As a result, I include only the estimated coefficients from studies that controlled for selection bias in our meta-regression dataset. In the end, 62 and 45 studies met my first and second inclusion criteria, respectively. I stopped the literature search in May 2018.

3.1.1 Data analysis and econometric specification

I utilised three approaches to analyse the dataset. The first approach compares HVM and TM farmers based on their socio-economic, institutional and contextual characteristics reported in the descriptive statistics or t-test of the original studies. To facilitate comparison, I constructed three categories. One, the value of the reported characteristic is statistically significant and higher for HVM farmers. Two, the reported value is not statistically significant. Three, the value is statistically significant and higher for TM farmers. I tallied the numbers to compare HVMs to TM farmers. I used this approach because the original studies employed different measurement scales when reporting the characteristics; rendering direct comparison impossible. Ton et al. (2018) employed a similar approach to compare contract farmers to non-contract farmers in terms of their assets.

For the second approach, I counted and categorised the beta coefficients from the econometric models analysing the determinants of HVM participation. The categories were positive and statistically significant (SS) coefficients; positive and non-SS; negative and SS; or negative and non-SS. Wang et al. (2014) employed a similar approach to observe the distribution of

coefficients depicting the welfare impacts of contract farming participation. I further disaggregated the distribution across continents and different regions within each continent to see how spatial differences influence the distribution of the coefficients. This approach allowed me to identify key determinants based on the distribution of positive to negative coefficients as well as regions where each determinant are most especially relevant.

In the third approach, I conducted a meta-regression analysis (MRA). MRAs are quantitative regression analysis of estimated coefficients from empirical studies and are useful for identifying the extent to which various moderators drive heterogeneity in empirical results (Nelson & Kennedy, 2009). The dependent variable in the MRA model is the estimated beta-coefficients' of the econometric models analysing determinants of HVM participation in the original studies. I converted the coefficients' to elasticities to standardise the coefficients' and ease interpretation by multiplying the coefficients' with the mean ratio of the independent and dependent variables in the original studies (Tellis, 1988; Bell, Chiang & Padmanabhan, 1999; Bahadir, Bharadwaj & Parzen, 2005). The moderators served as the independent variables and are shown in Table 4 below. I estimate the model using Weighted Least Squares MRA with the inverse of variance calculated from each estimated coefficients' standard error as the weights. I cluster the standard errors based on the study, study author, and country of the original study to control for autocorrelation (Nelson & Kennedy, 2009) and used p-values from the wild-bootstrap method as a robustness check (Oczkowski & Doucouliagos, 2014). Finally, I conducted a Spearman rank correlation test to check for correlation among the moderators.

Table 4: List of independent variables

Variable	Purpose and definition	Description
Standard error	To check for publication bias. I multiplied the standard errors with the mean ratio of the independent and dependent variables in the original studies to ensure compatibility with the elasticity (Bahadir et al. 2005)	The standard error of the beta coefficient
Method	Refers to the econometric strategy employed by the original study to control for selection bias moderates the determinants	Instrumental variable approaches =1, others =0[a]
Time	To observe how the relevance of each determinant has changed with time	Year original study collected its data
Region	Refers to the continent where the original study was conducted	Africa =1, Asia and South America = 0[b]
Product type	Refers to the agricultural product investigated in the original study affects the relevance of the determinants	Perishable products =1, non-perishable products = 0
Market type	To understand how the type of HVM channel investigated by the original study	Domestic HVMs =1, export HVMs = 0
Coordination mechanism	The coordination mechanism that facilitates entry into HVMs	Contracts =1, Cooperatives and farm NGOs = 0
Levels of service provision	Refers to the services and assistance provided by the mechanism	If the mechanism offers at least three services =1, provision of fewer than three services =0[c]

[a] Others include propensity score matching and panel data methods. The ideal categories would be on methods that control for selection bias based on observable vs unobservable characteristics. But I did not have enough observations for the former category to conduct a reasonable analysis.
[b] I had only four observations from South America and decided to combine the observations from Asia and South America.
[c] Each mechanism offers a maximum of 5 services: inputs, credit, extension, agrochemicals and transportation services.

3.2 Study background and data collection

This study is set in Kenya, which has become a major exporter of horticultural crops to the European Union and the Middle East in sub-Saharan Africa (Minot and Ngigi, 2004; KNBS, 2018). The horticultural sector in Kenya is private sector driven, robust and highly developed (Minot and Ngigi, 2004). On the domestic front, increased tourism activity coupled with a growing middle class has stimulated the growth and expansion of domestic supermarkets and hotels (Rischke, Kimenju, Klasen & Qaim, 2015; Ochieng et al., 2017). In recent years, Kenya has witnessed the spread of supermarkets and hotels from large urban areas to smaller towns and purchase fresh fruits and vegetables through contract arrangements with smallholders,

cooperatives or various market intermediaries (Rischke et al., 2015; Ngenoh, Kurgat, Bett, Kebede & Bokelmann, 2019). Smallholders in Kenya are responsible for a moderate to a large volume of horticultural crops cultivated for export markets and domestic markets in Kenya compared to other African countries (Henson, Jaffee & Masakure, 2013; Ngenoh et al., 2019). This, in addition to export and domestic HVMs and TM markets existing side-by-side, makes Kenya an excellent case study.

I collected data in four counties in Kenya: Kiambu, Meru, Siaya and Kakamega (see figure 1 below). These four counties are located in different geographic regions of Kenya. Agriculture is the primary labour employer in these counties, and the majority of agriculture cultivation occur on smallholder farms. I purposely selected the four counties (and sub-counties within the counties) because they cultivate horticultural crops for export markets, domestic HVMs and traditional spot markets. Data collection occurred in three waves. In the first wave, I conducted focus group discussions with horticultural farmers in the study areas to gain insight into their production and marketing activities. I was also able to refine the language of my survey and experiment. In the second wave, I administered the survey to horticultural crops cultivating households in our study counties. In total, I surveyed nine hundred, and ninety-five randomly selected farmers from clusters of the leading fruit and vegetable producing areas within each sub-county supplying both HVMs and TMs. I estimated the sample size drawn from each county and sub-county using the probability proportional to size technique based on census population figures obtained from local county office sources. I collected information on the socioeconomic characteristics as well as the production and marketing activities of the households. Examples of horticultural products cultivated and marketed by these farmers include kales, tomatoes, avocado, French beans, broccoli and snow peas. I also conducted the two experiments with the respondents. From the total sample, 992 respondents completed the first experiment, while 995 completed the second experiment. The survey and experiments were

conducted in-person and in the Swahili language by well-trained enumerators from the University of Nairobi. In the third wave, I conducted expert interviews with two market intermediaries, two county government officials, four farmers including a commercial farmer, four supermarkets, two hotel procurement managers, two processors, one wholesaler and two farm NGOs. The expert interviews allowed me to understand the structure and interactions between these actors and contextualise my quantitative findings.
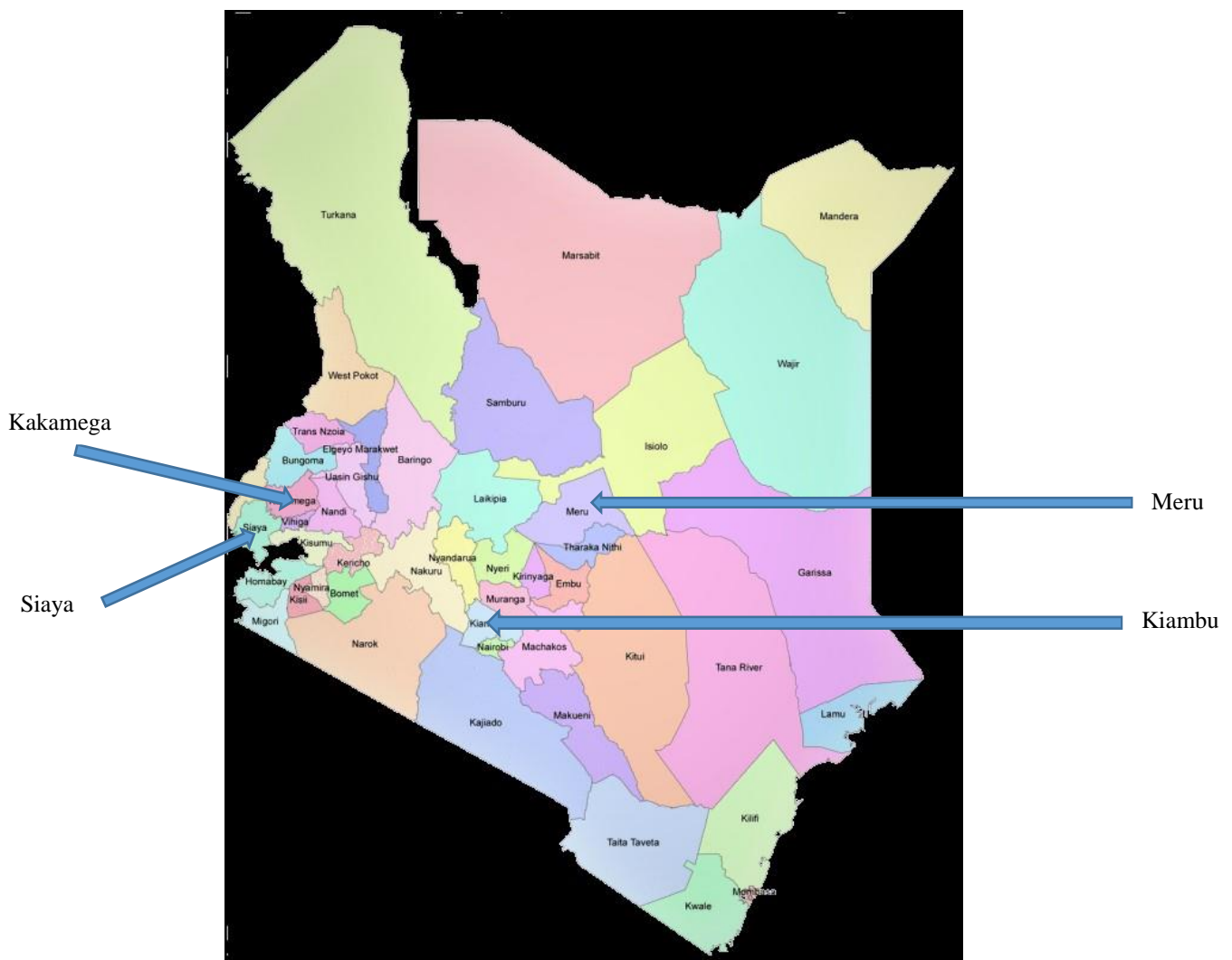

Figure 1: Map of Kenya showing the study locations
Source: Wikimedia

3.3 Experimental design

I use two experimental choice models to (i) measure smallholders' perceptions of the constraints that limit their entry into HVM. (ii) elicit smallholders' preferences for various market transactional attributes that promote sustained participation in HVMs. Choice

experiments are used to evaluate the attitudes of respondents towards hypothetical products and services by estimating respondents preferences for attributes of that products or services (Hensher, Rose & Greene, 2005). In choice experiments, researchers show respondents alternative descriptions in the form of attributes of a product, which then select the best option among the alternatives. Choice experiments are stated preference methods. Revealed preference methods typically capture actual decisions made by market actors, but often fail to observe the underlying variables informing that decision. Choice experiments, on the other hand, can be deployed to include the variables that are difficult to observe, simulate currently unavailable market scenarios and calculate trade-offs among the specified attributes of a product or service (McFadden, 2001).

However, for choice experiments to be effective, it is essential first to identify the attributes of interest. This is carried out typically through an ex-ante engagement with the literature, local experts and forums where the experimental target group can weigh in on the experiment (Lancsar & Louviere, 2008). I established the constraints and market transactional attributes employed in our experiment by consulting previous literature sources. I had extensive discussions with researchers from our partner institution in Kenya, conducted focus group discussions with farmers and a pilot survey to test the survey instrument and experiment.

In this dissertation, I employed the best-worst scaling choice experiment method. BWS requires respondents to select best and worst items (depending on the experimental question framing) from a list of other items in a choice set. The choice of best and worst option in a choice set leverages human inclination for identifying extreme choices instead of jointly evaluating all the options available in a choice set or ranking single options on a Likert scale of importance (Marley & Louviere, 2005). This is how, in comparison with traditional ranking and discrete choice experiment (DCE) methods, BWS reduces respondent fatigue during choice experiments or ranking exercises (Flynn, Louviere, Peters & Coast, 2007; Louviere, Flynn & Marley, 2015).

BWS is commonly used in health economics (see Cheung et al., 2016 for a review) and has been used in food economics to analyse various food attributes of value to consumers (Lusk & Briggeman, 2009). To the best of my knowledge, this method is yet to be applied in agricultural development literature.

BWS comprises of three cases: object case, profile case and multi-profile case. The latter two cases are similar to traditional discrete choice experiment methods in that they specify attributes and corresponding levels for the hypothetical product or service of experimental interest (Louviere et al., 2015). In this study, I employ the object case and the profile case. I describe each method and their experimental design in the following subsections.

3.3.1   Best-worst scaling object case

I use the BWS object case to evaluate the relative importance of constraints that prevent smallholder entry into HVMs. I selected the BWS object case because it allows respondents to assess the relative importance of a constraint to other constraints on a common scale. BWS object case is similar to ranking methods but is cognitively less demanding compared to ranking methods (Louviere et al., 2015). It also permits respondents to make trade-offs, hence its qualification as a choice experiment method (Louviere et al., 2015). I present choice sets containing different combinations of the constraints to our respondents. Respondents select the two constraints they perceive to pose the biggest and smallest barrier to entering HVMs, respectively. From an extensive literature search, I identified 12 constraints to entering HVMs in developing economies (see table 5 below). The consultations with local partners, focus group discussions, and pilot survey helped to ensure that the constraints were distinct, relevant in the study area and written in language familiar to the respondents.

Table 5: List of constraints and description

Constraints	Description
Poor roads and means for transporting farm produce to the market	Refers to the absence of transportation infrastructure or that the existing infrastructure is very poor. This creates an access gap that investments in physical infrastructure must bridge
Distrust of agribusiness firms	Smallholders suspect agribusiness firms operate without considering the interests of farmers, and they distrust those firms. For example, there may be subjective product rejections based on vague grading processes and delayed or late payments
Insufficient labour to help on the farm	Smallholders lack sufficient labour for the planting and necessary post-harvest operations needed for horticultural crops. Smallholders are forced to rely on their labour, which raises opportunity costs.
Weak land rights	Smallholders do not possess complete access to their farmlands, which prevents them from deciding whether to supply HVMs
Missing cooperatives and farmer organisations	Means collective groups such as cooperatives and farmer organisations are absent, and farmers are unable to organise to benefit from the economies of scale provided by collective action
Cost of meeting quality standards required by HVMs	The costs of meeting quality standards are too high. Examples include the cost of certification, cost of reducing the use of agricultural chemicals on farmlands and the cost of acquiring information about the use of those chemicals
Unaware of efficient cultivation techniques	Inadequate human capital know-how, exemplified by lack of access to extension services and the latest agronomic techniques needed to cultivate high-quality crops
Poor access to high-quality inputs	Poor access to high-quality seeds, fertiliser and chemicals
Poor irrigation facilities	Lack of access to irrigation facilities, or existing irrigation facilities that are poor quality and inadequate for maintaining production
Lack of access to credit and capital	Inability to secure loans or insurance to expand business operations, invest in necessary farm equipment and take more risks
Exploitative middlemen	Market intermediaries, e.g., wholesalers, traders or dealers, exploit smallholders, and smallholders are disinclined to trust them
Small farmlands	Smallholders operate on small farmlands inadequate to meet the output quantities required by HVMs continually

Source: Ola and Menapace (2020b)

To design the choice sets, I used the Balanced Incomplete Block Design experimental design tool (BIBD) to create two blocks containing items occurring and co-occurring equally throughout each block (Louviere et al., 2015). The two main blocks were divided into four smaller blocks, and respondents were randomly assigned to each block. Creating blocks improves response efficiency by reducing the mental effort needed by respondents to complete choice experiments (Johnson et al., 2013). Each smaller block comprises six columns and six rows where each row corresponds to a choice set. Using BIBD ensured the experimental design

fulfilled the requirements for optimal choice experimental design: frequency balance, orthogonality, connectivity and positional balance (Sawtooth software, 2013). Frequency balance means each constraint appears equally in the design, while orthogonality means each constraint is paired at the same frequency with another constraint. Connectivity ensures that the constraints are interconnected and well-paired. Well-paired constraints provide room to infer reasonably on the relative importance of each constraint. Positional balance means the constraints appear equally on the left and right-hand side of the design. I used the JMP®, Version 14 for student software to construct the blocks (JMP® Version 14, 2018).

3.3.1.1 Econometric model specification

The theoretical foundation of analysing BWS lies in The Random Utility Theory (Louviere et al., 2015). Following Lusk & Briggeman (2009), I assume that respondents will select the biggest-smallest constraint combination that maximises the difference in importance on a common utility-scale, i.e., the combination that are far apart on a utility-scale of importance in a choice set. The model consists of an observable systematic utility component and error component. The systematic utility component is expressed as the probability that the distance between the selected biggest-smallest constraint combination is greater than the distance for other possible combinations in the choice set. The error component is assumed to be independent and identically distributed; the model, therefore takes a conditional logit form. In the dataset, the selected biggest-smallest combination is the dependent variable and is coded 1. Other combinations in a choice set are coded zero. The independent variables are the individual constraints, which was coded 1 for each constraint appearing in a choice set and 0 otherwise.

The coefficients' from the model are reported on an ordinal utility-scale meaning the coefficients' can only be interpreted in ranked order of preference. However, in addition to the ranking, I am interested in the magnitude of preference for one constraint over another constraint. To remedy this problem, I calculated a share of preference score (SOP) from each coefficient (Lusk & Briggeman, 2009). To calculate the SOP, I first estimate the exponent of

all the coefficients.' The SOP of an individual constraint is the ratio of that constraint's exponent value to the total sum of exponents for all constraints. The score represents the probability of how important a constraint is relative to another constraint. I adjust the standard errors by clustering based on individual respondents and also on counties and sub-counties to check for spatial autocorrelation.

I use conditional logit latent class modelling (LCM) to estimate preference heterogeneity. LCMs account for choice heterogeneity by creating segments of smallholders with similar choice selections and characteristics. I estimate membership in a segment as a function of the respondents choice selections and characteristics simultaneously in a latent class conditional logit model using the expectation-maximisation (EM) algorithm (Pacifico & Yoo, 2013). I also estimate a mixed logit model to check for the robustness of the LCM model coefficients. Mixed logit models provide estimates that control for error variance in choice models (Hess & Train, 2017).

3.3.2   Best-worst scaling profile case

I employ the BWS profile case to elicit smallholder preference for market transactional attributes that facilitate sustained participation in HVMs. The BWS profile case specifies and estimates product attributes and their levels, and is thus similar to traditional DCEs. However, BWS profile case tasks are cognitively less demanding than traditional DCE as well as the BWS multi-profile case (Louviere et al., 2015; Flynn et al., 2007).[1] As a result, I was able to analyse more attributes compared to previous studies. Another significant advantage BWS profile case has over traditional DCEs is that it permits direct estimation of the utility weights of attributes since all attribute-levels are measured on a common ratio scale (Flynn et al., 2007). I identified

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[1] The BWS multi-profile case is identical to traditional DCE in that respondents compare two or more profiles containing different combinations of attribute-levels.

12 market transactional attributes and their levels from an extensive literature search, which I refined during the focus group discussions and pilot survey (see table 6 below).

In BWS profile case, different combinations of the levels of each attribute (attribute-levels) are presented to respondents in a single choice set called a profile. These combinations ($2 \times 3^8 \times 4^3$) yields 559,872 possible combinations. Moreover, the attributes are unbalanced, i.e., the attribute-levels are not equal across all attributes. For example, eight attributes had three levels, while three attributes had four levels. Unbalanced designs reduce the efficiency of an experimental design since not all attribute-levels will appear equally and be available for selection. Consequently, I employed a resolution 3 fractional factorial design to design the profiles to minimise the inefficiency. Resolution 3 fractional factorial design is an orthogonal array method that attempts to produce efficient estimates that achieve orthogonality and balance (Kuhfield, 2010). The design generated 36 profiles representing main effects, optimised for orthogonality and balance (Louviere et al., 2015).[2] The 36 profiles yielded six blocks, and I randomly assign each respondent to a block. I used the JMP®, Version 14 for student software to construct the blocks (JMP® Version 14, 2018).

Before I started both experiments, I explained the meaning of each constraint, attribute and attribute-level to every respondent. I printed the profiles on cue cards to reduce dependence on memory. I asked each respondent to examine the available options in a profile, and select the best and worst transactional attribute-level listed in that profile encouraging (and discouraging) sustained participation in HVMs.

3.3.2.1 Econometric model specification

I construct a marginal sequential BWS model to estimate respondents' preferences (Marley & Louviere, 2005). In this model, respondents first select the best attribute-level in a profile and

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[2] The diagnostics from our experimental design reveal D-efficiency scores of 93.8%. Experimental designs with D-efficiency scores close to 100 are regarded as efficient (Johnson et al., 2013)

then select the worst attribute-level from the remaining attribute-levels. The primary assumption is that the respondents will select the attribute-level that maximises their utility, i.e., the attribute-level that alleviates the risks and costs of remaining in HVMs. The selected worst attribute-level is more likely to pose more risks, forcing our respondents to exit HVMs. The utility model consists of a deterministic component and the stochastic error term.

I allow for heteroscedasticity in the stochastic error term based on the assumption that error variances are not constant in choice models across respondents or choices, which can confound model estimates (Louviere & Eagle, 2006). I assume the heteroscedastic scale factor to be inversely proportional to the standard deviation of the error component to control for error variance based our respondents' best and worst choices (Vermunt, 2013). This unique feature of this study allowed me to examine consistency in our respondents' best and worst selection. I also assume that the stochastic error term is independent and identically distributed; therefore, the model takes a heteroscedastic conditional logit model. The underlying assumption of the conditional logit model specification (both heteroscedastic and latent class) is that the probability of selecting an attribute-level is conditional on the other options in the profile or choice set and not its availability for selection (Louviere, Hensher & Swait, 2000). This model specification allowed me to alleviate the effects of the unbalanced design further.

In the dataset, the dependent variable is coded 1 for the selected best and worst attribute level and zero for the attribute-levels in a profile. The independent variables are the individual attribute-levels, which were effects-coded, instead of dummy coding, to ensure the coefficients are uncorrelated with the constant term (see Bech & Gyrd-Hansen, 2005). I adjust the standard errors by clustering based on individual respondents. I also calculated a share of preferences scores for the coefficients to be able to compare the relative importance of the attribute-levels. Following similar procedures outlined in subsection 3.3.1.1, I use conditional logit latent class modelling (LCM) to estimate heterogeneity in preferences. To check for the robustness of the

LCM model, we specify a generalised multinomial logit model (GMNL). GMNLs are hybrid

models comprising of scale heterogeneity and mixed logit models.

Table 6: Attributes and levels[3]

Meta-attribute	Attributes	Level 1	Level 2	Level 3	Level 4
Uncertainty concerning the output market	Pricing option	Fixed price	Variable price depending on the quality	Variable price depending on quantity	
	Form of relationship	Spot relationships	Long-term, informal relationships	Long-term, formal relationships	
	Timing of payment	Payments immediately after harvest	Delayed payments after harvest	Part-payment before harvest	
Uncertainty about product quality	Quality of product	Fixed quality requirement for all deliveries	Variable quality deliveries		
	Sales location	Product sold at farmgate	Product delivered to a nearby market	Product delivered to the buyer collection centre	
	Production decisions	The farmer makes all production-related decisions	Buyer firm makes all production-related decisions	NGO makes the production-related decisions	Cooperatives make the production-related decisions
	Form of product	Product sold after harvest	Product cleaned and sorted before selling	Product stored before selling	
Input market uncertainty	Technical assistance (TA)	Buyer provides TA	NGO provides TA where needed	Cooperatives provide TA	Smallholder seeks TA on their own
	Credit supply	Buyer provides credit	NGO provides credit	Cooperatives provide credit	The farmer applies for credit independently
	Input supply	Inputs supplied by buyer firm	The farmer buys inputs from input suppliers	Farmers procure inputs from cooperatives	
Characteristics of buyer and market	Familiarity with buyer	Farmers know the buyers personally from previous business transactions	Buyer is a stranger	The farmer knows buyers through social networks	
	Investment cost	No investments needed to enter the market	Minimal investments needed to enter the market	Major/significant investments needed to enter the market	

Source: Ola and Menapace (2020c). Adapted from Masakure and Henson (2005), Abebe et al. (2013), Ochieng et al. (2017), Blandon et al. (2009) and Gelaw et al. (2016).

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[3] In the profiles, I specified what fixed quality requirement means. Retailers and traders are classified as buyer firms, seeds, inputs refer to fertilisers and chemicals, technical assistance refers to provision of extension services and information about current agronomic techniques and agricultural technologies, investment costs refer to investment in new farm equipment, irrigation facilities, transportation means, processing equipment and storage facilities

4.0 Publications[4]

4.1 A meta-analysis understanding smallholder entry into high-value markets

In this article, I review the empirical literature on the determinants of smallholder participation in HVMs. I use quantitative descriptive statistics and meta-regression analysis to answer two key questions. Which determinants are especially central to HVM participation? Which contextual factors (or moderators) influence these determinants and drive heterogeneity in empirical results? I find that asset ownership, access to credit, access to extension services and cooperative membership are crucial determinants. I also find that these determinants are more relevant in specific spatial locations, for example, credit access, extension services, additional sources of income and gender in Africa, and membership in cooperatives and access to irrigation facilities are essential in Asia. Several moderators, most notably the time factor, the econometric estimator employed by the primary study, the coordination mechanism and type of HVM channel moderate the efficacy of these determinants. Based on my findings, I highlight methodological issues for consideration in future studies on participation patterns and welfare effects of HVM. I discuss appropriate policy interventions to promote smallholder HVM participation. I frame the discussion around which public and private sector value chain stakeholders can minimise the costs and maximise the benefits and sustainability of introducing such interventions.

Publication:

Ola, O., Menapace, L. (2020a). A meta-analysis understanding smallholder entry into high-value markets.

Status: Accepted, World Development.

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[4] To avoid plagiarism or dual publication charges, the full versions of the publications is missing in this version of the dissertation, but was included in the copies sent to the examiners for grading.

Authors' contribution: Oreoluwa Ola developed the research questions, conducted the literature search, built the econometric model, analysed the data and wrote the manuscript. Luisa Menapace provided supervisory support at every stage of developing the research questions, literature search, model specification, data analysis, and reviewed the manuscript upon completion.

4.2 Revisiting constraints to smallholder participation in high-value markets: a best-worst scaling approach

I adopt the choice experimental method BWS to study and update knowledge on constraints that limit smallholder entry into HVMs. Previous contemporary empirical literature typically pays attention to only economic constraints posed by input market failures and missing infrastructure. Unlike these studies, I also consider social-related constraints such as trust, reputational effects and buyer familiarity. Recent empirical literature show trust, reputation and buyer familiarity are influential to smallholders' marketing decisions. I contribute to the existing literature by ranking these constraints on a scale of relative importance. Smallholders rate weak access to high-quality inputs as the most relevant constraint followed by poor access to credit, the high cost of meeting food standards, missing cooperatives and exploitative intermediaries. Respondents select insufficient labour, small farmlands and weak tenure rights as the least relevant constraints. Age, location, gender, household income and education of the smallholders explain the importance placed on these constraints by different segments of smallholders. I discovered that low-income smallholders find economic constraints to be more relevant than social constraints. For high-income farmers, the high costs of meeting food standards and distrust of agribusiness retailers were their biggest constraints. Counterintuitively, rural smallholders perceive the constraint posed by poor transportation network as weak compared to peri-urban smallholders. I argue for policy initiatives aimed at reforming input markets in sub-Saharan Africa. I show that initiatives promoting HVM entry need to be tailored to different segments of smallholders. I also demonstrate how policymakers in developing economies can obtain insights from using the BWS to rank agricultural, health and development policy priorities.

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4.3 Smallholders' perceptions and preferences for market attributes promoting sustained participation in modern agricultural value chains

Despite multiple efforts to link smallholder farmers to high-value markets (HVM), sustained HVM participation remains elusive. Participation in HVMs is of significant interest to policymakers because it represents a credible pathway to improving the welfare of farmers in developing countries. In this essay, I conduct a choice experiment with horticultural smallholder farmers in Kenya to understand their perceptions and preferences for market transactional attributes (or market conditions) promoting sustained participation in HVMs. A unique aspect of this essay examines smallholders' choice consistency to gain insights into the underlying thought process informing smallholders' selections. The results reveal that smallholders generally place value on resolving output market uncertainties for sustained participation in HVMs. More specifically, smallholders expressed preference for an incentive-based pricing system, immediate payments, and long-term formal relationships with their buyers. Smallholders losing their independence, delayed payments, and high investment requirements were the worst market conditions chosen by smallholders. Preference heterogeneity was driven by the farming experience, gender, income and location of the smallholders. I find that smallholders were more consistent in selecting the worst market attributes indicating an awareness of conditions motivating exit from HVMs relative to conditions facilitating participation in HVMs. The findings demonstrate the key conditions central to sustained participation in HVMs and discuss the various coordination roles retailers, cooperatives and farm non-governmental organisations can play in facilitating sustained smallholder participation in HVMs.

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5.0   Discussion and conclusion
5.1   Summary of findings and contribution to the literature

This dissertation aimed to provide a comprehensive understanding of factors connecting smallholder farmers to modern agricultural value chains. The dissertation investigated the determinants, constraints, coordination mechanisms and governance arrangements that allow smallholders to enter and remain in HVMs across three essays. Results from essay one relate to general trends observed across case studies on HVM participation in Africa, Asia and Latin America. In contrast, results from essay two and three pertain to the horticultural sector in Kenya. The results and contribution of each essay are summarised in the following paragraphs.

In the **first essay**, I review the empirical literature on HVM participation patterns to profile farmers that supply HVMs, identify key determinants relevant to HVM participation, and uncover different contextual factors (henceforth moderators) moderating the importance of these determinants and informing heterogeneity in empirical results. The findings show that access to credit and extension services, asset ownership and joining a cooperative are especially central to HVM participation. The essay contributes to the literature by demonstrating where the determinants are more relevant. I discovered that access to credit and extension services, multiple income sources, and gender are more relevant for HVM participation in Africa relative to Asia and South America. While joining cooperatives and access to irrigation facilities are essential in Asia.

Similarly, I also discovered several moderators notably temporal factor, the type of econometric estimator employed by the primary study, the market coordination instrument and type of HVM channel moderate the determinants. I found that large household sizes have become essential as a determinant in more recent studies. Larger households provide cheap labour needed for time-consuming post-harvest activities such as cleaning and sorting of products supplied to HVMs. Given that food products sold in HVMs require appealing cosmetic appearance, it is reasonable that larger household size has become valuable with time to HVM participation.

Using instrumental variables methods underestimates the importance of gender and asset ownership as determinants relative to matching methods. Agricultural contracts farming are more accommodating to smallholders compared to cooperatives. This result suggests that smallholders are likelier to participate in HVMs via contracts relative to cooperatives. This quietens concerns that smallholders are unable to participate in agricultural contract schemes. Participation in domestic HVMs channels requires additional sources of income relative to export HVM channels. A possible reason for this is that prices offered in domestic HVM channels are insufficient to cover the costs of supplying such channels, which forces smallholders to turn to other income sources to sustain their livelihood. Indeed, prices for similar agricultural products tend to be higher in export markets than in domestic HVMs (Maertens & Swinnen, 2009; Narayanan, 2014). Previous studies examining HVM participation patterns were qualitative studies, which limited their ability to explore the different contexts and moderators influencing the relevance of these determinants. This essay was, therefore, the first study to apply quantitative descriptive statistics and meta-regression techniques to tease out patterns and determinants of HVM participation.

In the **second essay**, I investigate smallholders' perceptions of the relative importance of various constraints that discourage entry into HVMs. I find that the most relevant constraints to entering HVMs concern access to high-quality inputs and credit, the high cost of meeting food-quality standards and missing cooperatives. Trust and reputation also feature as a barrier, as smallholders expressed distrust towards market intermediaries who connect them to HVM retailers. Insufficient labour, small farmlands and weak land tenure rights were the least relevant constraints perceived by smallholders. This essay updates knowledge on the various constraints that limit smallholder entry into HVMs. Past literature focuses on constraints related to the economic aspects of HVM participation, i.e., input and output market failures and poor infrastructure. However, essay two considers constraints related to both economic and social

aspects of market transactions between smallholders and retailers such as trust and familiarity. Furthermore, I show that income and location were significant predictors of heterogeneity in smallholder perception of the constraints. Economic constraints are more relevant for low-income smallholders than social constraints. Meanwhile, high-income smallholders rank the high-cost of meeting food quality standards and distrust of agribusiness firms as their most relevant constraints. Rural smallholders rank poor irrigation facilities and exploitative intermediaries as their most relevant constraints and surprisingly rate poor transportation means as unimportant compared to peri-urban smallholders. About 75% of rural smallholders sell their products to intermediaries at the farm-gate and as a result, are less likely to rate poor transportation means as a relevant constraint. The final contribution of this essay demonstrates how policymakers and researchers in sub-Saharan Africa can employ the best-worst scaling object case methodology to estimate agriculture, health and development policy priorities. I show the assumptions underlying best-worst selections, experimental design, the data output and analytical techniques for analysing best-worst scaling data.

The **third essay** uses a choice experiment to examine smallholder preferences for various market transactional attributes that are conducive to sustained smallholder participation in HVMs. From their preferences, I also identified various coordination mechanisms that are essential to vertical coordination and sustained HVM participation. The theoretical foundation of the analysis conducted in this essay was informed by merging ideas and concepts drawn from TCE and GVC. This contrasts to previous studies, which only examine this issue strictly from the TCE perspective by focusing on smallholder preferences for contract attributes that promote entry into HVMs.

A unique aspect of the essay examines consistency in smallholders' selection. I find that smallholders were more consistent in selecting the worst market attributes than best market attributes that promote sustained HVM participation. Hence, while smallholders might be

unsure of market conditions encouraging sustained participation in HVMs, they are cognizant of market conditions that encourage HVM exits. This finding disproves an explanation offered in a previous BWS study that respondents are more inclined to select best than worst options (see Rigby et al., 2015). In the case of my experiment, the findings are intuitive since the worst selected attributes entail significant personal risks to smallholders. As an example, smallholders consistently selected delayed payments, transactions with strangers and investments in assets as the worst conditions. These selections point to smallholders' preference for other value chain actors to shoulder the majority of risks of continually supplying HVMs. This preference might be an acknowledgement of smallholders' inability to secure loans to invest in their business, risk aversion or a strategic ploy to prevent hold-up problems. Regardless, this finding suggests that smallholders need continued support to stay in HVMs beyond current efforts that aim to facilitate smallholder entry into HVMs.

My results show that, in general, smallholders place value on resolving output market uncertainties for sustained participation in HVMs. Surprisingly, I find that smallholders prefer a flexible, incentive-based pricing system based on product quality instead of a fixed pricing system. Fixed pricing systems insure smallholders against price volatility; hence I expected smallholders to select a fixed pricing system over variable pricing system. Anecdotes from interviews reveal smallholders want to take advantage of higher prices offered by retailers for high-quality products as well as during lean periods, which would not be possible in a fixed pricing system. Furthermore, it is common in agriculture for farmers to harvest products of different quality and cosmetic appearance. My findings show the ability to supply products of various quality matters to smallholders relative to supplying products of fixed quality. Smallholders also prefer immediate payments to partial payments or delayed payments. While past studies have shown smallholders are partial to non-contract options with their buyers, my results show they prefer formally codified long-term relationships with their buyers relative to

spot relationships or even long term, informal relationships. This result indicates an openness towards agricultural contracts. I find that smallholders prefer inputs supplied by buyer firms over inputs supplied by cooperatives or inputs purchased personally by the farmer. Smallholders expressed a preference for technical assistance provided by farm NGOs over technical assistance sourced personally by the farmer, or inputs provided by cooperatives or buyer firms. I also find that smallholders would prefer to remain autonomous, but would cede their decision-making only to cooperatives compared to buyer firms or farm NGOs to remain in HVMs. Smallholders perceive transactions with strangers as not conducive to sustained HVM participation.

I discovered differences in selections based on socioeconomic characteristics. A fixed pricing system matters to experienced smallholders compared to less experienced smallholders. Conversely, male smallholders prefer a flexible pricing system to a fixed pricing system compared to female smallholders. Rural smallholders emphasise the provision of inputs as necessary for their continued participation in HVMs. This result is unsurprising given the weak agricultural input markets in rural sub-Sahara Africa. I found smallholders already supplying HVMs prefer a fixed pricing system compared to non-HVM smallholders who prefer an incentive-based pricing system. In a broad sense, our results indicate smallholders might be unwilling to bear significant risks of supplying HVMs e.g., invest in assets needed for continued participation in HVMs. Still, a segment of smallholders are willing to invest minimally in assets and bear the risks of supplying HVMs personally. These smallholders belong to high-income household.

5.2   Policy implications of our findings

The policy implications of the findings across the essays are relevant for and addressed to agricultural value chain stakeholders, agribusinesses as well as the public sector policymakers. I show that entering and remaining in HVMs requires a different set of policy measures. Moreover, these policies must be tailored to or target different segments of smallholders to be

effective. Recommendations from essay one are general recommendations gleaned from empirical case studies in Africa, Asia and South America. Recommendations from essays two and three pertain to the horticultural sector in Kenya. However, I believe that the issues studied in both essays can apply to other countries and agricultural products in sub-Saharan Africa. Essay two concerns initiatives aiming to facilitate entry into HVMs, while essay three identifies market conditions and proposes vertical coordination arrangements that promote sustained HVM participation.

From essay one, I find that access to credit and extension services, membership in cooperatives, ownership of farm assets and irrigation facilities are critical determinants. Recommending policy initiatives aimed at easing access to credit, extension services and irrigation facilities, and establishing cooperatives would be logically relevant in this context and I propose public-private sector partnerships (PPP) to advance these policy initiatives. These initiatives and PPP propositions are not exactly novel in literature. However, I contribute to contemporary literature by demonstrating specific areas where public sector agents and value chain stakeholders might work collaboratively or individually to minimise the costs, maximise the benefits and sustainability of such initiatives. For example, private sector value chain stakeholders, including farm NGOs, can leverage the already existing extensive coverage of rural areas offered by the public sector to reach potential smallholders to reduce costs of searching for and negotiating with potential smallholders. The joint provision of extension services and the introduction of agricultural technologies such as irrigation facilities is another example of potential benefits from such partnership. The public sector can implement supportive legislation linking rural informal credit institutions with formal credit institutions. This arrangement is beneficial to both formal and informal financial institutions. Informal financial institutions are closer to and are familiar with smallholders, but often ration lending to rural smallholders because of their low capital base. Cooperating with formal financial institutions will expand

their capital base. At the same time, formal financial institutions benefit increased client base but can also shift the screening and monitoring activities to informal financial institutions.

Legislation promoting the establishment of cooperatives or supporting already existing cooperatives are also essential. Our results show smallholders are unable to join cooperatives. Therefore, policymakers must take into consideration the inclusiveness of these cooperatives. Furthermore, my results show contracts are more favourable towards smallholders. A supportive regulatory and legal environment might provide more certainty that induces retailers to enter into contractual agreements with smallholders. Finally, policymakers should directly target female smallholders when introducing these initiatives since female smallholders might find it especially challenging to enter HVMs. Local NGOs with more local familiarity are well-suited to execute such initiatives.

From essay two, access to high-quality agricultural inputs is needed to facilitate smallholder transition into HVMs. More importantly, policymakers must pay special attention to the quality of inputs available to smallholders. High-quality inputs increase productivity and profitability (Duflo, Kremer & Robinson, 2008; McArthur & McCord, 2017). The use of quality inputs is especially vital in the context of producing and supplying high-quality food products to HVMs. Findings from studies conducted on the quality of agricultural inputs reveal inputs are lacking several essential nutrients leading farmers to distrust inputs sold in input markets in sub-Saharan Africa (Bold, Kaizzi, Svensson & Yanagizawa-Drott, 2017; Ashour, Billings, Gilligan & Karachiwalla, 2015). The latter might partially explain why, despite generous input subsidy programmes in sub-Saharan Africa, agricultural input adoption rates remain low (Michelson, Fairbairn, Maertens, Ellison & Manyong, 2018). Legislation aimed at reforming the input markets in sub-Saharan Africa to limit the sales of adulterated inputs could be useful for restoring confidence in input markets, boosting adoption rates and encouraging farmers to supply HVMs.

My findings highlight both the benefits and perils of market intermediaries. On the one hand, intermediaries alleviate the limitations posed by poor transportation infrastructure in sub-Saharan Africa by purchasing from smallholders at the farm-gate. On the other hand, these intermediaries exhibit several opportunistic and exploitative behaviour. In the short-term, reducing asymmetric power relations between smallholders and intermediaries is essential. The establishment of cooperatives might be crucial in this regard to improve smallholders' bargaining power. Reviews by Wanyama (2009) and Schwettmann (2014) revealed cooperative groups are growing in number in sub-Saharan Africa despite minimal technical support and protection from the state. Legislation is needed to support the formation and sustenance of cooperatives in sub-Saharan Africa. In the long-term, the development of a good transportation network is needed to connect smallholders directly to retailers.

Anecdotes from my interviews reveal that several practices smallholders label exploitative were risk management strategies employed by retailers to manage their risks of sourcing from smallholders. For example, product rejections, reluctance to sign contracts or commit to long-term relationships and supply inputs were implemented to ensure only good-quality products reach their shelves, reduce monitoring costs and guide against side-selling by smallholders. In essay three, I recommend a vertical coordination arrangement that involves the cooperation of all value chain stakeholders as a way to manage the risks of supplying HVMs and sourcing from smallholders. This arrangement creates a division of activities, ensures every stakeholder focus, and executes a value chain activity. First, retailers must develop a standardised and transparent system for assessing product quality. Farm NGOs can coordinate with retailers to develop standardised quality requirements while providing technical assistance and extension services to smallholders. Since smallholders are willing to cede their independence to cooperatives, retailers can negotiate contracts with cooperative groups at the behest of smallholders, instead of individual smallholders to reduce search and information costs. Our

findings show smallholders prefer buyer supplied inputs. Retailers can supply these inputs to cooperatives who are best-positioned to efficiently monitor the activities of their members to prevent opportunistic behaviour.

In summary, public sector interventions reforming agricultural input and credit markets, establishing good transportation infrastructure, strengthening regulatory systems and supporting cooperatives are essential for smallholder access to HVMs. Sustained smallholder HVM participation will, however, require coordination among the various stakeholders in value chain. The coordination will allow each stakeholder to carry out specific roles critical to ensuring value chains are accommodating to smallholders.

5.3   Limitations of research

Five main issues constitute the limitations of this dissertation. One, in essay one, the number of case studies in my meta-regression dataset was small. This is mostly due to the small volume of empirical studies examining the determinants of HVM participation. The small case studies affected the size and nature of moderators I could include or would have included in my MRA. I partially offset this limitation by employing the wild bootstrap method as a robustness check, which is recommended when dealing with small sample sizes in MRA (Oczkowski & Doucouliagos, 2014; Roodman et al., 2019).

Two, both essays two and three are choice experiment models, which are stated preferences methods. Much debate has occurred concerning the validity of results from stated preferences methods experiments in relation to findings from revealed preferences methods. The contentious issue centres on hypothetical bias. Hypothetical bias occurs when there are differences between actual economic behaviour as measured in revealed preference methods and stated behaviour provided by respondents in hypothetical studies. Hypothetical bias relates to incentive (in) compatibility since respondents have no incentive to provide useful answers in hypothetical scenarios. However, several meta-analytic reviews reveal that choice experiments

do produce reasonable results, results that are useful and less prone to hypothetical bias when the experiments are consequential to respondents – an assumption that certainly apply in the context of this study (Whittington, 2010; Penn and Hu, 2018; Quaife et al., 2018). A recommendation by McFadden (2017) to alleviate biases associated with stated preferences methods involves getting respondents to think of the competing options in a manner similar to their real-life market activities, including how those options are framed and presented to the respondent. This is another reason why I conducted focus group discussions, a pilot survey with smallholders, and trained my enumerators before administering the experiment to ensure that the constraints, attributes and attribute-levels are well framed and presented to the farmers in familiar language.

Three, in the third essay, I did not include a price attribute in the experiment. The experiment was designed to simulate and present a broad picture of a vertical coordination scenario among various value chains stakeholders to facilitate sustained smallholder participation in HVMs. Moreover, because I drew the sample from horticultural farmers who cultivate various horticultural crops sold at different price range, it was difficult to arrive at specific prices to include in a price attribute. Still, the absence of a price attribute means I cannot provide willingness-to-accept welfare estimates. However, future studies emulating the analytical framework and focusing on a specific case study and crop might benefit from adding a price attribute to provide a monetary valuation of the attributes.

Four, the experimental data, results and policy implications for essays two and three were collected from the horticultural sector. This limits their generalisability to other agricultural sectors e.g., cash crops such as tea, coffee or rice, actively cultivated by smallholders in developing economies who are also seeking to gain access to HVMs for these crops.

Five, the issue of smallholder participation in HVMs can be further explored via other perspectives apart from the choice experimental approach utilised in this study. Additional

insight could come from panel data collected in observational studies or randomised control trials to understand factors that drive sustained participation in HVMs over time while minimising subjectivity issues that might arise from employing choice experiments.

5.4 Recommendations for future research

Across the three essays, I highlight several research questions for consideration in future research. From essay one, there is suggestive evidence that public-sector agricultural initiatives and private-sector contract schemes have a substitutive relationship, i.e., participation in the former crowds-out the latter. However, most public-sector agricultural initiatives aim to provide essential agricultural inputs and extension services to farmers in rural areas to connect smallholders to HVMs. Therefore, the components of contract schemes and public-sector agricultural initiatives are often similar. The literature on the nature of the relationship between the schemes and initiatives is scanty. Are both interventions complementary, or are they indeed substitutive? Future research can clarify and highlight areas where crowding effects occur, where further PPP might maximise the benefits and sustainability of both interventions and address the practicability and outcomes of such partnerships.

My findings also show market-related variables, e.g., costs and prices, and behavioural characteristics such as self-efficacy and social networks are understudied as determinants of HVM participation in the empirical literature. Farmers' abilities and opinion of those abilities are central to their economic behaviour (Wuepper & Lybbert, 2017). Future research examining this issue will provide insights into smallholders' behavioural motivations for entering and remaining in HVMs, motivations for investing in needed assets to remain in HVMs, and general risk perception and aversion.

Results from our MRA show that different econometric methods can provide coefficients that overestimate or underestimate the effect of several determinants. The econometric strategy employed by empirical studies to account for statistical endogeneity is critical to show the

welfare effects of HVM participation. By showing which determinants are important in specific regions, I provide information for welfare studies concerning their research design and methodology. For studies employing matching methods to create treatment and control groups, I highlight those critical variables in specific regions that should be included in matching models to avoid omitted variable bias. These variables are also useful for randomised control trials when selecting observable, and unobservable characteristics with which to assign their respondents into treatment and control groups randomly. Finally, I propose that studies combine econometric specifications, e.g., IV methods and matching models to improve the internal validity of their results.

From essays two and three, I first demonstrate the efficacy of utilising best-worst scaling methods to estimate respondents' preferences and perceptions of policy priorities and product attributes. Compared to ranking methods and traditional DCEs, best-worst scaling can alleviate respondent fatigue, especially when respondents are required to rank or make trade-offs among a list of priorities. Second, more research on the quality of agricultural inputs available to smallholders in SSA is also essential. The adoption rates of agricultural inputs and technology in sub-Saharan Africa remains low despite generous input subsidy schemes (Jayne & Rashid, 2013; Sheahan & Barrett, 2017). Consequently, the current empirical literature has devoted significant attention to understanding the drivers of the low adoption rates of agricultural technology and inputs. Perhaps the low uptake can be explained by the poor quality of inputs. To the best of knowledge, only two recent studies have examined this issue with both studies showing mixed results (Bold et al., 2017 in Uganda and Michelson et al. 2018 in Tanzania). More studies are needed to shed light on the issue to understand and provide guidance for reforms aimed at improving input markets in sub-Saharan Africa.

Finally, issues pertaining to the costs of supplying domestic and export HVM channels emerge across all three essays. In essay one, I discovered that smallholders need additional income

sources to supply domestic HVMs compared to export markets hinting at higher than expected costs of supplying domestic HVM channels. In essay two, smallholders rank the high cost of meeting food quality standards, which are more pervasive in export markets, as a significant constraint. In essay three, I find that smallholders are reluctant to invest in major assets to supply export HVMs. This points to cost differentials among different HVM channels. As Bellemare & Bloem (2018) notes, the very thin literature on the costs of HVM participation and heterogeneity in costs across different contexts is surprising. My findings echo a similar sentiment. Current efforts to link smallholders to HVMs typically focus on how smallholders can supply export markets, even though the costs of supplying HVMs tend to be higher in export markets than domestic HVMs due to stricter food quality requirements.[5] Are smallholders better off supplying domestic HVMs than export markets? Which segments of smallholders are better suited to supply domestic HVMs? These questions are yet to receive adequate attention in the literature. Insights generated from answering these questions will provide a comprehensive understanding of the costs and benefits of supplying HVMs as well as which HVM channels are less costly for various segments of smallholders.

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[5] But the prices received in export HVMs are higher than domestic HVMs, which partially offsets the higher costs

6.0   References

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