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Understanding Coffee Certification Dynamics: A Spatial Analysis of Voluntary Sustainability Standard Proliferation

Janina Grabs [Ⓐ], Bernard Kilian ^ᵇ, Daniel Calderón Hernández ^ᶜ, and Thomas Dietz ^ᵈ

^ᵃ *Research Associate, Institute of Political Science, University of Münster,
Scharnhorststrasse 100, 48151 Münster, Germany*

^ᵇ *Professor, ᶜ* *Research Associate, INCAE Business School, P.O. Box: 960-4050, La Garita, Alajuela, Costa Rica*

^ᵈ *Professor, Institute of Political Science, University of Münster, Scharnhorststrasse, 100, 48151 Münster, Germany*

Abstract

Third-party Voluntary Sustainability Standards (VSS) have emerged as an increasingly popular strategy to guarantee sustainability in the coffee value chain. Yet, knowledge of the population characteristics of certified farmers, and of the influence of transnational and local supply chain actors on the uptake of VSS at the producer level, is still scarce. Using expert interviews, a comprehensive database of certificate holders and spatial mapping analyses, this paper adds to present knowledge concerning the effectiveness of VSS in the coffee sector in three ways. First, it showcases the structural, geographical and socio-economic tendencies toward VSS adoption in Guatemala, Colombia and Costa Rica, and allows first insights in the additionality and effectiveness of certification schemes derived from these indicators. Second, it contributes to an up-to-date understanding of the coffee supply chain, a sector of great economic importance both to producing and consuming countries that is in constant flux and reorganization, and it explains how current VSS interact with this type of global supply chain. Finally, through the construction of a comprehensive population of certified farmers, it enables better evaluation of existing case studies, generalizability, possible biases and provides valuable information for the preparation of future impact evaluation projects.

Keywords: Voluntary Sustainability Standards, standard take-up, coffee, sustainable value chains

[Ⓐ]Corresponding author: Tel: +49 251 832 53 42

Email: J. Grabs: Janina.grabs@uni-muenster.de B. Kilian: Bernard.kilian@incae.edu

D. C. Hernández: Daniel.calderon@incae.edu T. Dietz: Thomas.dietz@uni-muenster.de

Introduction

In the last twenty years, third-party voluntary sustainability standards (VSS) have emerged as an increasingly popular strategy to guarantee sustainability in global value chains (Auld et al. 2007). VSS schemes can be conceptualized as non-state, market-driven governance approaches that aim to improve the economic, environmental and social sustainability of production through the establishment and enforcement of specific norms of behavior (Cashore et al. 2004). Due to their voluntary nature, scheme buy-in and long-term commitments by firms and NGOs are an essential success factor for the spread of VSS. Hence, much academic attention has been focused on explaining standard uptake and adaptation decisions by these stakeholders (Cashore et al. 2004; Auld et al. 2007; Nadvi 2008; Levy et al. 2016; Pattberg 2006; Fransen and Burgoon 2012). Yet, there has been comparatively little analysis of how these supply chain actors influence the proliferation of sustainability standards at the producer level. Furthermore, there exists a lack of aggregated knowledge about the current supply base of certified products and the characterization of participating farmers (with the notable exception of Guedes Pinto et al. (2014)). Our paper aims to fill this research gap through a combination of qualitative and geographical research in a cross-section of coffee-producing countries in Central America.

Ensuring sustainability is of particular importance in the coffee industry. Changing climates, exacerbating price volatility, and recurring disease outbreak threaten the continued global supply, while consumption demand is projected to increase (ICO 2014). Simultaneously, the coffee sector is at the forefront of VSS adoption (Panhuysen and Pierrot 2014) and the academic evaluation of their impact (KPMG 2013). Yet, few studies address the representativeness of the certified entities they are evaluating (Arnould et al. 2009; Bolwig et al. 2009; Kuit et al. 2013). Comprehensive country-level data on the population of certified farmers are difficult to obtain and suffer from fragmentation and poor quality. Yet, location-specific insights on the total population of certified producers are crucial for understanding the true effectiveness of VSS in improving sustainability. If mainly above-average producers—in terms of farm size and, relatedly, wealth—are the only ones that can achieve certification, the scheme's impact on economic development is minimal. Equally, if certified producers are scattered across uncertified landscapes, their effect on overall ecosystem sustainability will be suboptimal.

This paper adds to the knowledge base on the effectiveness of voluntary sustainability standards in the coffee sector in three ways. First, it showcases the structural, geographical and socio-economic tendencies toward standard adoption in three important origin countries and allows first insights in the effectiveness of VSS schemes derived from these indicators. Second, it contributes to an up-to-date understanding of the coffee supply chain, a sector of great economic importance both to producing and consuming countries that is in constant flux and reorganization, and explains how current VSS interact with this type of global supply chain. Finally, through the construction of a comprehensive population of certified farmers, it allows to better evaluate existing case studies' generalizability and possible biases and provides valuable information for the preparation of future impact evaluation projects.

Objectives and Research Questions

Beyond anecdotal evidence, little is known about the drivers and determinants of VSS adoption. In addition to individual farm-level interest and motivation, other factors – such as pre-existing business relations, buyer interest, or location – may be determinants of certification success (Bitzer et al. 2013; Valkila et al. 2010). The necessity of being embedded in a fully certified supply chain further limits farmers' self-determination of choosing whether and which sustainability schemes to participate in. In particular, the crucial role of external agents—roaster-led programs, in-country exporters, governments, coffee institutions and NGOs—has not yet been sufficiently examined. As the first link of farmers to export markets, they take on a central interface position between local supply and global demand. This paper investigates this demand-driven decision-making process using supply chain analysis as well as geographical meta-data to identify the main pathways toward coffee VSS adoption in Guatemala, Costa Rica and Colombia. Furthermore, the compilation of a database of all certificate holders of four main VSS (FLO, Fair Trade USA, Rainforest Alliance and UTZ Certified) allows a first characterization of the countries' respective producers of certified coffee. Through a combination of qualitative and spatial research, this paper aims to answer the following research questions:

What are the main pathways toward participation in Voluntary Sustainability Standards in the coffee sector? Are there major structural (geographical and institutional) determinants of participation connected to these pathways?

On the basis of a literature review of supply chain and governance-related publications as well as semi-structured expert interviews we inductively construct a classification of VSS adoption pathways, their characterization and determinants of participation. The model is then tested using the construction of a comprehensive database of the certified producers of four VSS schemes in three coffee-producing countries with differing institutional arrangements. The following Sections three and four present the literature review and introduce the country-specific settings. Section five discusses the methods in more detail, Section six provides both qualitative and quantitative results, and Section seven concludes the analysis.

Literature Review

The coffee sector has been a popular subject for case studies on the impact of VSS, particularly regarding Fair Trade and organic certification (such as summarized in Potts et al. (2014) and KPMG (2013)), as well as larger systemic impact analyses (e.g. Fransen 2011; Lambin et al. 2014; Kalfagianni and Fuchs 2015). Additionally, first attempts at integrating supply chain management and VSS research have found it to be a promising field with much remaining research potential (Karjalainen and Moxham 2013; Forrer and Mo 2013; Howard and Jaffee 2013; Moxham and Kauppi 2014). Yet, sector-encompassing analyses of farm-level determinants of standard adoption have been scarcer. From a theoretical perspective, the global commodity chain analysis (Gereffi 1999) and governance cost (Dietz and Auffenberg 2014) approaches add insights for the construction of a framework that can be supplemented by evidence from empirical case studies and interviews.

Gereffian global supply chain analysis views global commodity chains as either producer-driven—where large manufacturing companies coordinate production network—or buyer-driven—which are dominated by end-buyers that set up decentralized networks of atomic, small-scale producers (Gereffi 1999). Kaplinsky and Fitter (2004) and Raynolds (2009) identify the coffee supply chain as a typical buyer-driven commodity chain, where retailers, roasters and traders set the standards that isolated producers have to fulfill. Indeed, the buyer's end is increasingly consolidating (Elder et al. 2014). In 2013, the ten largest roasters controlled more than 40% of total world coffee sales (Panhuysen and Pierrot 2014). After recent mergers and acquisitions, the two leading firms (Nestlé and JAB Holding Company) alone now account for that share, with 22.7% and 21% of global sales, respectively (Boyle 2014; Cohen 2015). Similarly, the green coffee trading sector is highly concentrated: three companies trade more than 50% of the global green coffee volume (Panhuysen and Pierrot 2014). In this type of industry, the vertical integration of supply chains, including of certified products, is common, and inclusion in these chains fundamental for the survival of smallholder farmers (Raynolds et al. 2004). It is thus likely that downstream actors play an important role in farmers' decisions whether to get certified. Indeed, Bolwig (2009) notes that organic coffee production schemes in Uganda frequently resemble contract farming in their design.

In addition to existing market linkages, the governance cost approach suggests that a certain minimum size, accessibility and regional location are important for VSS roll-out. Dietz and Auffenberg (2014) argue that, in view of stable per-unit payoffs in terms of price premiums, rational market actors prefer to engage in sustainability schemes with low implementation and enforcement costs. Generally, VSS schemes exhibit large economies of scale, since the main costs of infrastructure adaptation and auditing are unitary, whereas the economic benefit accrue per unit of output (Kuit and Waarts 2014; Gibbon and Ponte 2005). Thus, larger-scale farms and groups with greater membership should derive greater net benefit from VSS participation than independent smallholder farmers. In Peru, for instance, Bitzer et al. observe that “already existing inter-organizational relationships with the partnership initiator were the most influential factors for being chosen as beneficiaries. Most of these were large, well-known producer organizations that were relatively easy to access in terms of road infrastructure” (2013, 11). Indeed, pre-existing infrastructure, such as good road access or the existence of schools and public hospitals in the vicinity, and stringent public regulatory standards can decrease implementation costs and might facilitate VSS roll-out (Bitzer et al. 2013; Vogel 2008). This is particularly the case for schemes that explicitly include the provision of health and education services.

Furthermore, the cost-benefit analysis for industry actors to engage in certified value chains is more beneficial in product lines with high mark-ups and consumer willingness-to-pay (Kolk 2005). Hence, it might make more sense for high-quality coffee to bear a sustainable label, which, in turn, requires a sourcing strategy that is region-specific. In Colombia, Vellema et al. highlight that “differences in certification rates between regions are not explained by easily observable farm characteristics. Rather, they appear to be driven primarily by the region in which farms are located” (2015, 15).

Finally, Bitzer et al. (2013), Bolwig (2009), and Raynolds et al. (2004) all stress the importance of donor support in achieving and sustaining certification over time and report high levels of dependency, particularly on financial assistance.

Such observations on VSS adoption pathways and special characteristics of certified farms, though recurring, are often made as an aside and have not yet been the focus of sufficient academic research. We intend to contribute to this knowledge gap by constructing and analyzing the comprehensive population of certificate holders in three origin countries.

Country-Specific Settings

When analyzing the supply chain linkages of producers to export channels, it is imperative to understand the surrounding institutional and structural settings producers find themselves in. These conditions diverge strongly between coffee-producing countries, driven by the historical development of institutions, land tenure, and coffee-related legislation. This section will characterize the coffee sectors of Colombia, Costa Rica and Guatemala respectively.

Colombia

With an output of 750,000 tons of green coffee beans in 2014, Colombia is the third-largest global coffee producer after Brazil and Vietnam (USDA 2015). Though the coffee sector has shrunk in its economic significance (making up 4.5% of exports in 2014 as compared to 60% in 1970), it provides employment to more than half a million households and is an important backbone of rural development (USDA 2015).

The Federación Nacional de Cafeteros de Colombia (FNC), the national coffee federation, is one of the world's best-organized coffee institutions and provides an array of services to its members. Among others, it guarantees the purchase of all coffee at a local reference price, provides smallholders with credit, storage facilities and quality control, leads research and extension services, and supports rural development through education, infrastructure and value chain development (Roldán-Pérez et al. 2009). Historically, the government has also repeatedly provided direct income support and renovation subsidies schemes (OECD 2015); most recently and expansively during the outbreak of coffee rust in 2012/13, when more than US\$ 300 million were spent on direct transfers to coffee farmers alone (MADR 2013).

Thanks to its high level of organization, Colombia is an attractive country of origin for sustainably certified products. According to the Coffee Barometer 2014, more than 60% of Colombian production is either certified or verified as sustainable (Panhuysen and Pierrot 2014). This allows Colombia to be the second-largest source of standard-compliant coffee worldwide after Brazil, providing 17% of the world supply (Potts et al. 2014). Indeed, in 2011–2012, 28% of global Fair Trade certified supply came from Colombia, 11% each of Rainforest Alliance and UTZ Certified coffee, and 15% of global 4C supply. After Peru, Colombia is the country with the second-largest share of multiple-certified farms, which leads to a significant oversupply especially of UTZ Certified coffee (of which only 12% is sold as certified) (Potts et al. 2014).

Costa Rica

In comparison to Colombia, Costa Rica is a marginal player in the international coffee market. Its economy is dominated by the service sector and it cannot compete either on quantity or on comparative costs. Instead, it has focused on quality and has become an important origin for specialty coffees (Bamber et al. 2014). Nevertheless, the number of coffee farmers is steadily dropping (by almost one-quarter between 2004 and 2014) as lower-altitude farms that cannot reach peak quality tend to succumb to urbanization pressure (ICAFFE 2014).

Due to the crop's historical significance and the country's democratic tradition, the coffee sector is extremely well regulated. The Coffee Law of 1961 (Ley 2762) regulates the production process in minute detail, including quality control at processing, profit margins of mills and exporters, price-setting mechanisms and even credit provision (Costa Rica 1961). Since 1989, the government only allows Arabica coffee to be grown in order to protect the Costa Rican reputation for quality (Chacón Sánchez 2008). Furthermore, several laws regulate the environmental effects of coffee production and processing, most importantly the water pollution linked to wet-milling, and many mills upgraded their technologies in the 1990s (ICAFFE 2015a). The historical focus on wet milling also streamlined the production process, since all coffee cherries are brought to mills which then leverage their size to sell the green coffee beans to exporters. Indeed, the 10% largest mills process around 70% of all coffee (Coricafe 2012). A strictly regulated liquidation process allows farmers to get a minimum price upon delivery, followed by trimestral payments and a final premium once all processed coffee has been sold to international markets (ICAFFE 2015b). This smoothing of cash flows has noticeably benefitted farmers' investment possibilities (ResponsAbility 2013).

In 2011–2012, Costa Rica produced 4% of global Rainforest Alliance-certified coffee, 6% of Fair Trade volumes and 0.25% of UTZ Certified coffee. 24% of Costa Rica's production was Fair Trade certified, with Rainforest Alliance making up another 13% of production. Overall, in 2011–2012 Costa Rica was among the countries with the highest share (32%) of certified national production (Potts et al. 2014), though industry representatives report that producers are moving away from VSS adoption in order to focus on high-quality specialty coffee.

Guatemala

Guatemala's history has been equally dominated by coffee production, though these structures have also contributed to many of its problems. The development of coffee estates—which dominate its sector—led to the expropriation of many indigenous communal lands and forced its former residents into more marginal plots higher up in the mountains. Only recently has a renaissance of smallholder agriculture taken place as high-quality coffee is being developed in exactly those altitudes where indigenous families settled after their expropriation. In response to this shift in demand, the coffee institution ANACAFE which traditionally advocated for the preferences of estate holders and coffee barons is starting to support smallholders more (Fischer and Victor 2014). A further difference to the previous two cases is that state involvement in the coffee business is minimal. Those programs that do exist are marred by corruption and misappropriation; for instance, almost half of the funding to overcome the coffee rust crisis in 2012–2013 was used for roads and other infrastructure projects before it could be allocated to

coffee farmers (Luxner 2015). In contrast, some coffee areas of Guatemala such as Huehuetenango have had access to ample development assistance by both private NGOs and foreign ODA such as USAID's Rural Value Chains Program that targets over 12,000 people in total (USAID 2016). In addition, for its size Guatemala is an important sourcing country for several certification schemes. In 2012, it provided 7% of Rainforest Alliance and 2% of UTZ Certified coffee. Overall, around 13% of Guatemalan coffee output is certified (Potts et al. 2014).

Based on these characteristics, and the associated differences in power structures, institutional support and the involvement of external actors, we expect to find significant differences in the adoption of voluntary sustainability standards across the three countries.

Methods

In a first step, we conducted nineteen anonymous semi-structured expert interviews of forty-five to sixty minutes each with representatives of international roasters, multinational and regional traders, and local cooperatives, institutions and non-profit organizations in the three countries under analysis (Guatemala, Costa Rica and Colombia) and tested our hypotheses about the relative importance of relational, institutional and geographical determinants of certification in the particular country contexts. Furthermore, we identified clear and distinct pathways toward certification and gauge their respective importance across different VSS.

In a second step, we tested whether the qualitative results can be quantitatively observed. We constructed a database of certificate holders of the four most prominent sustainability labels in the coffee sector (Fairtrade Labeling International, Fair Trade USA, Rainforest Alliance and UTZ Certified) in three leading countries regarding certification volume, namely Guatemala, Costa Rica, and Colombia. Our baseline dataset is an up-to-date map of the geographical location of certificate holders based on the certification organizations' online maps (FLOCERT 2016; Fair Trade USA 2016; Rainforest Alliance 2016; UTZ Certified 2016). To this, we added size information (number of farmers and/or certified coffee hectares, as available), altitude, information about multiple certification, and coded the certificate holder information according to their most probable pathway to certification¹. Using these maps, we tested our hypotheses on the importance of location as well as of the presence of infrastructure. We also compared regional volumes of certified products with regional production information (MAGA 2015; INEC 2015; FNC 2015) to identify whether certified producers are over- or underrepresented in certain regions, and compared the average farm size of certified farmers with country-level means. Using the VSS adoption pathway information, we examined which pathway contributes most to certified volume. We finally tested whether the pathways are significantly different in the total area and area per producer that is certified, as well as in the altitude of production which correlates with greater quality, through the use of ANOVA analysis.

¹ This was approximated by using the certificate holder's name and/or openly available information on the certification pathway.

Results

Qualitative Analysis

The expert interviews yielded five alternative, and in some cases complementary, pathways toward VSS adoption that are schematized in the following chart. First, they can be differentiated by their main motivating force: increased demand for certified products stemming from downstream supply chain actors (the demand-driven pathway) or increased supply provided by upstream producers (the supply-driven pathway). Increased demand can be managed either by green coffee exporters that source more certified coffee, or directly by the roasters through a vertically integrated supply chain. On the other hand, upstream producers' motivation to participate in a certified value chain can be stimulated by national- and regional-level institutions with clear political goals, or have emerged organically in cooperatives and coffee estates.

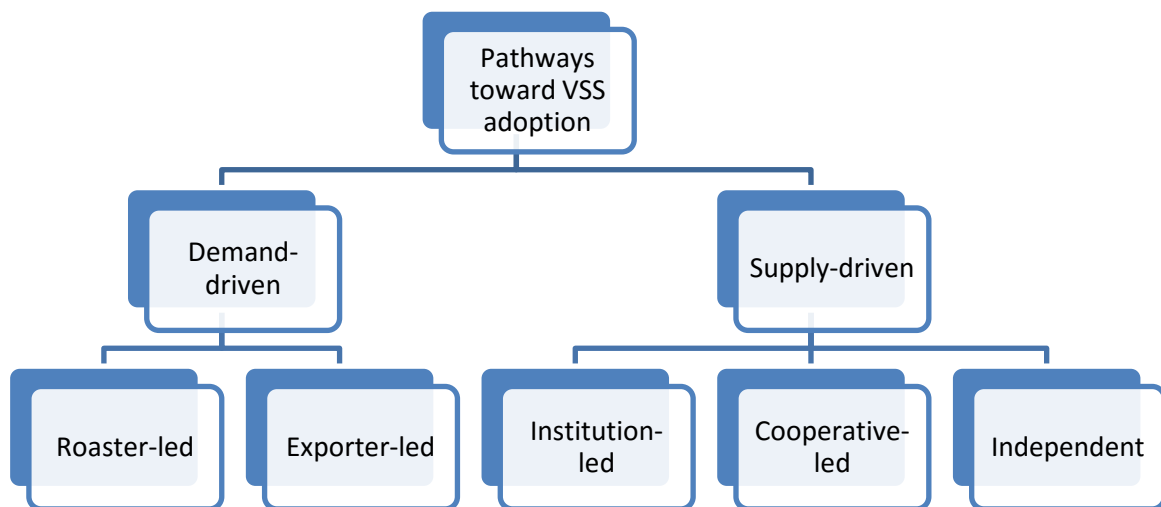


Figure 1. Pathways toward certification

The following describes the identified types in more detail, based on information gathered in the anonymous interviews.

Roaster-Led Initiatives

The high-priced, specialty coffee segment is the fastest growing market in high-income countries where demand is otherwise saturated (ICO 2014). Hence, recently more emphasis is put on sourcing sustainable coffee directly from select geographical regions whose flavor profiles match certain expectations. Whether through official collaborations between roasters and third-party VSS, or the use of VSS as a reputation management tool, increasingly roasters take more direct control for this high-quality segment of their supply chain. The local cup quality and flavor profile is key in selecting suppliers, and maintaining and improving these aspects is the main priority for buyers. Thus, excessive farm management changes—such as large changes in shade cover—are discouraged, even if they were to enhance sustainability. Participation in the schemes

is contingent on farm location, strict quality controls and compliance with the certification requirements. Typically, the roaster commissions technicians to assist farmers with achieving these criteria, and also takes on audit costs, either directly or through the collaborating exporter. This close relationship carries the threat of supply chain captivity, particularly for participants in group certifications administered by the roaster. Interestingly, however, when achieving single-farm third-party certification as well as managing quality-related practices, estates in these regions gain considerable market power since frequently competing roasters source from the same regions. Indeed, in interviews, roaster representatives expressed frustration with their inability to have sales guaranteed from farmers linked to them despite the upfront certification investments.

Exporter-Led Initiatives

In the non-specialty coffee segment, roasters typically source through green coffee traders where the only specification for certified coffee is a country of origin, the certification type and a standardized quality measure. In this case, location is only a factor as far as it concerns accessibility and proximity to an exporter's coffee mill, in the case of unprocessed delivery. Rather, exporters try to fulfill known or expected demand for certified coffee in the most cost-effective way possible. This includes identifying single estates or groups of farmers that are very close to certification criteria and convincing them to join the program. Since exporters typically only bear auditing costs, but do not help with implementation expenses, it is paramount that prospective participants already have proper infrastructure, such as water treatment facilities, in place before being considered for inclusion in the scheme. Sometimes, exporters are also the nominal certificate holder for a group of farmers to reduce costs; at other times, the certificate is in the name of the farm but associated costs are borne by the exporter. Similar to roasters, exporters highlight the need to minimize their risk of lost investment via defection; in this case, they base their outreach strategies mainly on pre-existing relationships that have created trustful and loyal buyer-seller bonds. Since traceability is vital for certifications to remain credible, it is easier for exporters to turn toward large estates rather than disparate groups of smallholders. Finally, as intermediaries between final demand and supply, exporters may be one cause of the current oversupply of certified coffee if they incorrectly overestimate their share of demand and engage in competition amongst each other, the results of which decreases the marketable amount of certified coffee of their respective suppliers.

Institution-Led Initiatives

Frequently overlooked in discussions on sustainability in the coffee sector, coffee institutions such as the Costa Rican *Instituto del Café (ICAFFE)*, Guatemala's *ANACAFE* or the Colombian *Federación Nacional de Cafeteros (FNC)* can be a powerful force for change in contexts where they are endowed with sufficient resources and influence. Their strategies and focus areas differ between countries, as does their reach. Typically, they maintain a minimum structure of extension services, they may be involved in exporting activities, and many have a marketing arm that tries to position their country's coffee in niche markets. Some institutions such as the FNC have a clear goal of moving the sector toward VSS adoption and provide capacity-building trainings, extension activities and even hold the certificate for groups of farmers. They may also assume the auditing fees. Other institutions such as ANACAFE use VSS as one possible avenue

of market access, or pursue alternative strategies, such as ICAFE, which aims to position Costa Rica as a sustainable origin *per se* that does not require third-party verification. When coffee institutions pursue a sustainability strategy that includes VSS, they have a significant advantage due to their closeness to both farmers and markets, their relative impartiality within the negotiation process, and the resources and networks available to them. They are also valuable collaboration partners with some of the previously described actors. However, in deciding where to focus their efforts, political considerations may outweigh more objective criteria, and the level of motivation of regional offices can play a big role in the success of the national strategy.

Cooperative-Led Initiatives

As organizations that coordinate previously isolated farmers, first-level cooperatives can also be a powerful driver of change without external impetus. The economies of scale achieved by cooperative activities apply to the certification process; furthermore, they are the preferred organizational model for some certification schemes such as Fair Trade and thus at a competitive advantage in this market. Most frequently, they choose schemes with requirements that are the current *modus operandi*, for instance producers that are *de facto* organic due to a lack of access to inputs or their convictions (e.g. indigenous communities). But also visionary and worldly leaders can bring about incremental change in hitherto isolated communities (Raynolds et al. 2004). In the case of small producer groups, collaboration and assistance from local and international NGOs is often necessary to achieve the required level of capacity-building and investment to achieve certification, and to cover auditing fees up front. Larger cooperatives can more easily assume these costs themselves, but tend to leverage these investments by pursuing multiple certifications at a time. This again contributes to oversupply in the market place and to instable demand, making cost-benefit analyses of maintaining the certifications very difficult.

Independent Certification

Finally, single farms may also choose to pursue VSS certification without the inclusion in any of the aforementioned channels. This is most frequently the case when farms already comply with the certification requirements, for instance larger estates with good management practices and a strong sense of environmental responsibility. These farms tend to have had at least some exposure to world markets, and frequently hold multiple certifications as well as direct trade relationships to roasters. According to expert interviews, even when offered certification support by exporters some of these independent farms prefer to stay untethered and pay their own way. This, however, makes them more vulnerable to changes in demand and certification procedures and costs, since they need to cover their out-of-pocket expenses with the received price premiums.

Based on these descriptions, the identified pathways can be differentiated in their stylized form according to the following characteristics:

Table 1. Characteristics of pathway types

	Roaster-Led	Exporter-Led	Institution-Led	Cooperative-Led	Independent
Goals and Implementation					
Primary motivation	Risk management	Higher market share	Rural development	Better prices	Better prices
Selection criteria	Quality (geographical cluster)	Readiness Vicinity Access Reliability	Political interests Local impetus Readiness	Local motivation De facto practices Visionary leader	Personal conviction De facto practices
Strategy	Mass roll-out	Selective integration	Stakeholder collaboration	Group-level roll-out	Isolated improvements
Assistance Support	Implementation and audits	Audits	Implementation and audits	Reliance on third-party (NGO)	None
Relationship	Long-term	Variable	Long-term	Variable	Variable
Outcomes					
Geographical integrity	Yes	No	Yes	Sometimes	No
Additionality	Yes	No	Medium	Medium	Medium
Guaranteed market	Yes (conditional on quality)	Sometimes	Sometimes	Mostly no	Mostly no
Threats for farmers	Captive supply chain	Loss of roaster demand	Change of political strategy	Loss of leadership No market	No market Cost increases

On the one hand, one can differentiate the pathways by their goals and implementation methods. The primary motivation of supply chain actors to engage in VSS activities is a first large difference: roasters and exporters do it to protect their reputation and expand their market shares, institutions focus on the larger rural development problematic, and cooperatives and independent farms just aim to improve their total coffee income. These motivations in turn influence the selection of which producers may participate in which channel: the demand-driven channels focus on quality and relative advancement in certifiable practices, while the self-selection of the supply-driven channels is based on the conviction of local leaders, farm owners and the current practices. Roll-out strategies and the available assistance equally diverge. Finally, producers may have longer-term relationships to downstream buyers, or their export channels may change importantly year to year.

On the other hand, these differences in implementation can have important implications for the effectiveness of sustainability standards and other related outcomes. The geographical integrity

of certified production areas—important for ecosystem protection— is given more frequently in region-specific roll-outs, such as roaster-driven and institution-driven pathways, than in more scattered and opportunistic certification dissemination. The additionality of practices is only given where they did not previously exist, which strongly depends on the selection criteria of participating farmers. Guaranteed market access is necessary to benefit from the price premiums linked to VSS. And the existence of threats to participating farmers may endanger the long-term sustainability of such schemes. In particular, interviewees agreed that it is increasingly seldom to encounter farmers that pursue certification independently and pay for it out of pocket, due to increasing implementation costs and plateauing or decreasing premiums. This causes frequent entry and exit in various certification schemes depending on buyer demand and exporter incentives.

The next section will evaluate whether these and other tendencies can be observed in the on-the-ground data.

Quantitative Analysis

Geographical Distribution of Certificate Holders

Figures 2 to 4 show the regional distribution of the main four sustainability schemes (Fairtrade Labeling International, Fair Trade USA, Rainforest Alliance and UTZ Certified) in our focus countries according to their classification. Cooperative-led schemes are represented in yellow, exporter-led groups in dark blue, independent certificate holders in purple, institution-led groups in turquoise, and roaster-led certificate holders in green. The underlying shading represents the relative coffee area per administrative area; the darker the shading, the more coffee is planted in that district. From this analysis, it is apparent that there are certain regions that exhibit greater certification activity than other parts of the countries. In Colombia, the coffee belt of Caldas, Risaralda and Quindío seem to be overrepresented compared to its production volume. In Costa Rica, the provinces of Alajuela and San Jose seem to be most popular with certification schemes, while in Guatemala, the leading coffee producing regions of San Marcos and Santa Rosa show relatively fewer certificate holders than for example the provinces of Huehuetenango or Chimaltenango despite the latter's lower production volumes. It is also visible that roaster- and exporter-led certification tend to cluster in select areas, while independent certificate holders are scattered across the countries. Green circles highlight the roaster-identified focus areas, while exporter-led groups are gathered in blue circles.

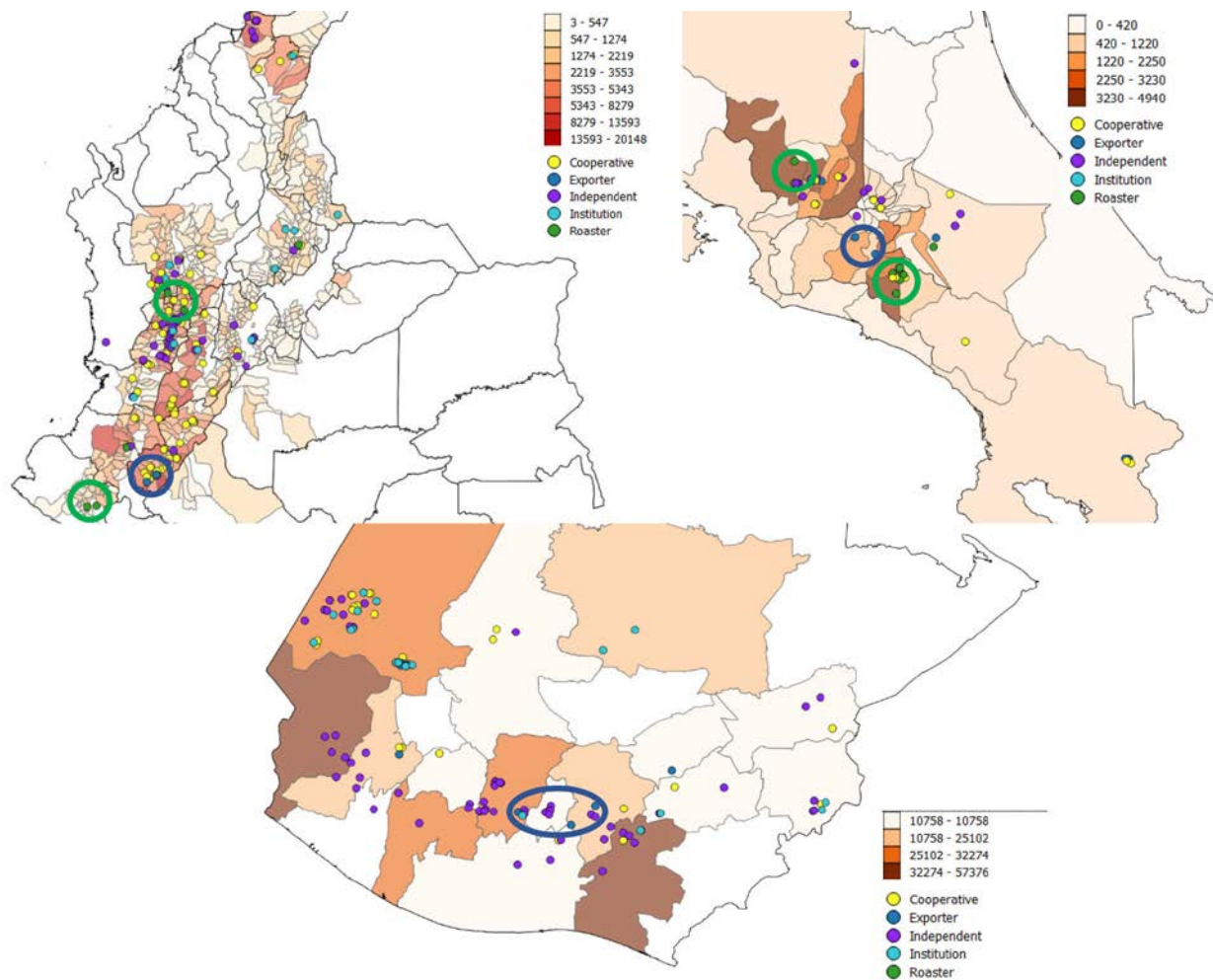


Figure 2. Geographical distribution of coffee certifications and relative coffee production (in ha) in Colombia, Costa Rica and Guatemala

Using the cleaned data, and national production information gathered from census and coffee institution information (FNC 2014; INEC 2015; MAGA 2015), the most prominent examples of over- and underrepresentation of certification are shown in Table 4.

Both in Guatemala and Costa Rica, the comparative shares roughly reflect the impression we reached from interpreting Figures 2 to 4. Notably, however, the shares of Rainforest Alliance and UTZ Certified distribution (first column) do not necessarily correspond to the member-based cooperative activity focused around Fair Trade certification (second column). This supports the hypothesis that the motivations for participation are different between the two groups, which loosely correspond to the demand-driven and supply-driven models. In Colombia, this phenomenon is even more pronounced—despite the presence of comparatively few certificate holders, Santander and Huila actually lead as sources of certified coffee, whereas Tolima for instance lags behind.

Table 2. Comparative over-¹ and underrepresentation² of certified coffee by provinces.

Province	Share of Certified Coffee Area	Share of Cooperative Activity	Share of National Production Area
Colombia			
Caldas ¹	12%	19%	8%
Huila ¹	21%	15%	16%
Santander ¹	12%	4%	5%
Tolima ²	3%	3%	12%
Costa Rica			
Cartago ¹	23%	–	13%
San Jose ¹	58%	50%	36%
Alajuela ²	15%	14%	30%
Guatemala			
Huehuetenango ¹	30%	54%	8%
Chimaltenango ¹	12%	–	8%
Quetzaltenango ¹	1%	28%	7%
San Marcos ²	10%	–	16%
Suchitepequez ²	4%	–	9%

The mapping analysis also evaluated the importance of infrastructural access using road maps. Results were inconclusive: while many certificate holders are located close to major roads, this information pertains to where they are registered (for instance, some were also located in the countries' capitals where no coffee is produced) and is not necessarily correlated with the accessibility of individual farmers. More research on this correlation is required on the basis of farm-level location data and will be addressed in subsequent papers. In change, the importance of relative size and quality characteristics is further explored in the next section.

Contribution of Different VSS Adoption Pathways to Overall Certified Supply

When differentiated by certification pathway, as done in Table 3, we observe that independent farms and cooperatives still account for the majority of certificate holders. Mirroring the structure of the countries' coffee sectors, Guatemala has more independent estates that are certified than cooperatives, while the reverse is true for Colombia. In Costa Rica, though the majority of farmers are organized in cooperatives, independent certificate holders outweigh cooperatives. This may be because the supply-driven pathways tend to be stronger in this country, and cooperatives arrive at a negative cost-benefit balance when becoming certified

independently. Roaster-led certified groups are explicitly present in Colombia and Costa Rica, whereas roasters tend to partner with exporters in Guatemala. Institutional support is apparent in certified groups in Colombia and Guatemala, but not in Costa Rica.

Table 3. Summary statistics on percentage of certificate holders (FLO, Fair Trade USA, Rainforest Alliance and UTZ Certified) by country and VSS adoption pathway

Pathway	Colombia	Costa Rica	Guatemala	Total
Cooperative	49.2%	11.8%	14.7%	31.1%
Independent	35.2%	44.1%	60.8%	46.2%
Exporter	3.1%	17.6%	7.8%	6.8%
Institution	8.6%	–	16.7%	10.6%
Roaster	3.9%	26.5%	–	5.3%

However, the mere number of certificate holders does not tell the entire story. To understand where most certified coffee volume comes from, we used detailed certified area data from two of the leading schemes (Rainforest Alliance and UTZ Certified), and supplement it with producer number data regarding the cooperative-focused sustainability standards (FLO and Fair Trade USA). We exclude multiple certified hectares and producers, which account for an important share of supply. From the data, it is also apparent that Fair Trade USA and UTZ Certified are used more frequently as secondary label in farms that hold multiple certifications (with 72% and 42% of certified farmers holding another certification, respectively), whereas the FLO and Rainforest Alliance certifications more often stand-alone (36% and 20%).

Overall, we are able to identify Rainforest Alliance and UTZ Certified areas corresponding to 50,521 ha in Colombia, 22,659 ha in Costa Rica and 28,279 ha in Guatemala. Furthermore, 88,553 producers pertain to a fair trade cooperative in Colombia, 33,683 in Costa Rica and 16,618 in Guatemala. These numbers compare favorably to previous information, as far as it is available (see section 4 on country information). Of these grand totals, in Colombia, 20% of both total certified area and producers can be clearly identified as non-additive (i.e. the certification of already certified hectares/cooperatives); in Costa Rica, this share is only 2% of area but 30% of cooperative members; and in Guatemala, 10% of area and 30% of cooperative producers. This is a tentative estimate, since producers may form part of differently named groups that cannot easily be associated; nevertheless, it reflects the stronger focus on multiple certification in Colombia, and in general in cooperative-led schemes, driven by supply-side interests, and the lower prevalence of multiple certification in demand-driven schemes such as those dominating the Costa Rican and Guatemalan sustainable coffee supply.

The distribution of volumes by pathway categories differs markedly from the distribution by certificate holder numbers. Due to the schemes' entry requirements, most FLO and Fair Trade USA certificate holders are cooperatives, but there is more variance in Rainforest and UTZ Certified certificate holders, which strongly reflect the respective institutional context. In Colombia, where the FNC has been extraordinarily proactive in promoting certification amongst its members and collaborating with supply chain stakeholders, institution-led and roaster-led pathways have significantly contributed to the coffee area certified according to the Rainforest

Alliance and UTZ Certified standards.² In Costa Rica, institutional support has been less vigorous, and hence 77% of certified coffee area supply is attributable to roaster- and exporter-led initiatives, with only one cooperative entering the top contributors. In Guatemala, in turn, individual estates still dominate the certification landscape, though they may also have received financial or logistic assistance by exporters to achieve certification.

Table 3. Distribution of Rainforest Alliance and UTZ Certified producers and certified area according to country and VSS adoption pathway.

Pathway	Colombia		Costa Rica		Guatemala		Total	
	Certificate Holders	Certified Area	Certificate Holders	Certified Area	Certificate Holders	Certified Area	Certificate Holders	Certified Area
Cooperative	38.7%	33.3%	13.9%	9.7%	12.9%	7.0%	25.0%	20.7%
Independent	42.9%	14.7%	44.4%	13.5%	61.4%	54.6%	50.4%	25.5%
Exporter	3.4%	4.8%	16.6%	22.7%	7.9%	19.2%	7.0%	12.8%
Institution	10.1%	25.0%	–	–	17.8%	19.2%	11.7%	17.8%
Roaster	5.0%	22.2%	25.0%	54.1%	–	–	5.8%	23.1%
Total	119	50,521 ha	36	22,659 ha	101	28,279 ha	256	101,459 ha

Area Size of Certificate Holders and Certified Groups

As Table 4 shows, size matters. The data indicate that the current supply of certified coffee—as approximated by the certified coffee area under production—is highly skewed by a small number of certificate holders with very large areas. Their makeup again depends on the country context: roaster- and exporter-led groups dominate in Costa Rica, single estates in Guatemala, and a mix of cooperatives and roaster-led groups are the biggest contributors in Colombia. In Guatemala, the 10% largest certificate holders contribute 35% of total area; in Costa Rica, they contribute 47%, and in Colombia even 58% of total certified coffee area.

On the other hand, the institutional support in Colombia and positive spill-over effects may have aided smaller producers to enter the certification landscape: over 38% of Colombian certificate holders hold less than 100 hectares, while only 25% of certificate holders in Guatemala and 29% in Costa Rica do so. When performing the same type of analysis with Fair Trade producers, we can see that 61% of Colombian cooperatives and producer groups had more than 200 members, 56% of Guatemalan cooperatives had over 350 members, and 91% of Costa Rican groups had over 450 members. In comparison, Colombia has the greatest share of small- to medium-sized cooperatives that participate in Fair Trade distribution channels of all countries. In Costa Rica and Guatemala, in turn, smaller groups may turn to other ways of value-addition beyond certification.

² It should be noted that cooperatives are frequently the on-the-ground implementers of FNC policies, such that it is impossible to strictly divide cooperative-led and institution-led certification other than by certificate holder name, which is what we have done here.

Size also matters for the average area per producer, though it differs by country. As presented in Section 4, Costa Rica and Colombia tend to be dominated by smallholder coffee farmers, which makes independent certification difficult and economies of scale, such as those inherent in externally organized group certifications, attractive. Specifically, in 2014 the average coffee area of a Colombian coffee farmer was 1.4 hectares, while Costa Rican farmers possess on average 3.2 hectares (FNC 2014; INEC 2015). On average, Guatemalan farmers also hold around 3 hectares (USAID 2010), but the population is much more dispersed, with a larger number of medium- to large-scale coffee estates and a comparatively weak institutional support system. Breaking these numbers down, individual farms and those in groups with less than ten members hold on average 156 hectares, with the largest individual certified farm (in Guatemala) holding 990 hectares. In group certifications, as expected average farm sizes are smaller, but still above country averages with a mean of 5.3 hectares per person. On the other hand, where area information coexists with producer numbers for FLO and Fair Trade USA certification—which is unfortunately only true for a subset of cooperatives –, we see that mean farm size is 2.9 hectares, more in line with country averages than the mainly demand-driven standards.

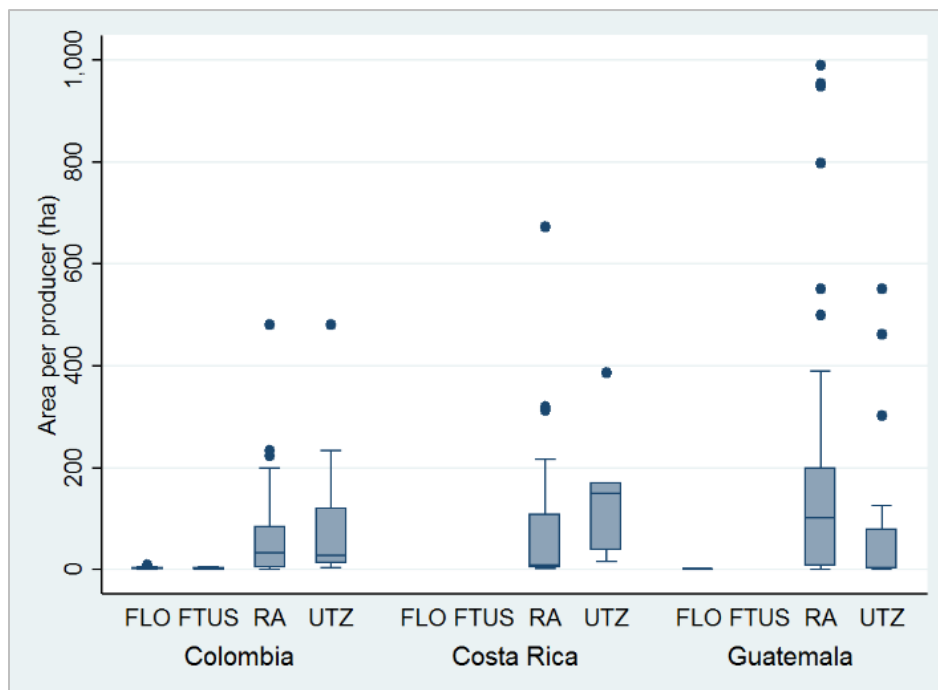


Figure 3. Box plots of certified coffee area per person by country and VSS

We can also differentiate the pathways of certification according to size. Table 5 shows that externally influenced certification paths—roaster-, exporter- and institution-led certification—take significant advantage of economies of scale by grouping farmers with as much as 5,000 collective hectares of land into one group certification. There was a statistically significant difference between the mean size of the different pathway groups as determined by two-way ANOVA (with country being the second independent variable).³ Yet, they do it in different

³ Statistically significant main effect of pathway on area: $F(4, 231): 20.38, p=0.000$, as well as interaction between pathway and country on area: $F(6, 231): 3.00, p=0.007$. A Tukey HSD pairwise comparison test showed that in particular the roaster-led pathway has a statistically different effect on size compared to all other pathways.

ways. Exporter-led group certifications tend to gather few larger producers together, while institution- and roaster-led groups include large numbers of smaller producers. Here again, average farm size was statistically significantly different between the pathway groups as determined by two-way ANOVA⁴.

Table 5. Mean, minimum and maximum size by certification pathways

Pathway	Mean Size	Minimum Size	Maximum Size	Average Farm Size
Cooperative	1011 members	17 members	10'000 members	2.9 ha
Independent	212 ha	5 ha	1413 ha	157 ha
Exporter	724 ha	17 ha	4168 ha	90 ha
Institution	609 ha	77 ha	3566 ha	5.3 ha
Roaster	1903 ha	96 ha	5084 ha	3.7 ha

Quality

The differences in geographical distribution that were found in Section 6.2.1. may be due to differing primary selection criteria, one of which is quality. In specialty coffee, quality is strongly correlated with altitude (Wilson and Wilson 2014), making it an appropriate proxy to test for. When comparing the average altitude between pathway categories, it is apparent that means are significantly different between independent and externally influenced certifications. In particular, roaster-led initiatives clearly focus on a narrow ideal band of altitude, having the smallest variance around the mean, while self-selected certified farms have a broader distribution of altitudes with a lower mean. This significance holds even after controlling for country selection, as apparent in two-way ANOVA analysis⁵.

Table 6. Mean, maximum and minimum altitude by certification pathway

Pathway	Mean Altitude	Minimum Altitude	Maximum Altitude
Cooperative	1340 m	19 m	3651 m
Independent	1346 m	42 m	3703 m
Exporter	1521 m	724 m	2356 m
Institution	1555 m	144 m	2953 m
Roaster	1643 m	1073 m	2534 m

⁴ Statistically significant main effect of pathway on average farm size: $F(4, 229): 8.41, p=0.000$, as well as interaction between pathway and country on average farm size: $F(6, 229): 2.95, p=0.009$. A Tukey HSD pairwise comparison test showed that in particular, the exporter, institutional and roaster-led certification pathways differed in farm size.

⁵ There was a statistically significant main effect of pathway on altitude: $F(4, 358) = 3.52, p=0.008$; as well as a statistically significant main effect of the respective country: $F(2, 358) = 9.79, p=0.000$.

Yet, a general trend toward high quality coffee can be observed in all certifications and pathways. According to our data, 42% of FLO and Fair Trade USA producers in these three countries have farms at above 1400 m (which qualifies for “Strictly Hard Bean” status, one normalized quality characteristic), with 24% reaching above 1600 m. Furthermore, 51% of the total coffee area of Rainforest Alliance and UTZ Certified coffee grows at above 1600 m, supporting the hypothesis that quality attributes and requirements coincide with certification, and that these characteristics may be blended in with sustainability characteristics when determining the premium price paid.

Discussion

Putting the Results into Context

The results of this study both confirm the two guiding theories and provide a more nuanced understanding of their applicability. The proportional importance of exporter- and roaster-driven group certifications presented in Section 6.2.2. highlight the significance of the Gereffian demand-driven model of global supply chain governance when characterizing the global coffee sector. Yet, the structural influence of the coffee institutions and the pre-existing distribution of land in the agricultural sector are important preconditions that shape the space in which this global value chain actors exert power. Thus, in Colombia collaboration with the FNC is of prime importance that can be seen within the certification landscape; while the Guatemalan set-up continues to benefit the traditional landed coffee elite most.

Furthermore, the example of Costa Rica shows that macroeconomic developments and sector-specific opportunity costs need to be taken into account when using governance cost theories to explain the decision to participate in VSS. For instance, despite favorable infrastructural and socio-economic preconditions, individual Costa Rican coffee farmers are turning away from VSS and toward quality premiums, and VSS schemes are dominated by externally-led groups. Still, the predicted focus on above-average farm and group size as well as high quality can be observed very well in this dataset.

In general, when examining the current distribution of certificate holders in Costa Rica, Guatemala and Colombia, one can conclude that the incentive structure rewards either large, advanced, already sustainable farms due to their reliability and the low implementation costs, or farms located in select geographical areas well-known for particular flavor profiles. This research is in line with the results from Guedes Pinto et al. (2014) on Rainforest Alliance-certified farms, though the Brazilian coffee industry operates on an even larger scale. In particular, we identified a trend of certified production areas toward high altitudes with better quality characteristics. Furthermore, the search for other attributes such as reliability and financial stability may precondition supply chain actors to eschew working with those smallholder farmers who were initially targeted by VSS.

Policy Implications

The comparative cases of Colombia, Costa Rica and Guatemala also show that the presence of a strong institutional or supply chain actor committed to VSS is necessary for the inclusion of

smaller actors and farmer groups. In all three countries we found a strong concentration of certified area and producers in large, externally driven groups, while smaller players likely struggle to achieve positive cost-benefit outcomes of VSS participation. This transformation of the sustainability marketplace toward efficiency and cost minimization runs counter to public perception in consumer countries and has the potential to create disenchantment with sustainability schemes in the long run. Yet, a surprising result was the important contribution of roaster-led groups made up of relatively small farms in concentrated clusters that allow for geographic connectivity. Constituting only 6% of Rainforest Alliance and UTZ Certified certificate holders, they nevertheless contributed 23% of the total certified area; exporter-led groups (7% of certificate holders) added another 13%. It is thus high time for public actors to recognize the essential role of private entities in the roll-out of VSS systems and acknowledge connected benefits as well as address potential drawbacks for farmers such as selectivity issues and supply chain captivity. Working together with multinational trading and roasting firms in the form of public private partnerships can harness their logistic and market advantages while ensuring that small-scale farmers are included in diversified and fair value chains. Additionally, the study highlighted the importance of active coffee institutions for a broad-scale roll-out of VSS among smallholders. Governments wishing to see a stronger presence of VSS in their agricultural value chains should therefore consider investing more in VSS-specific extension services that introduce farmers to and train them in the stringent certification criteria.

Limitations and Steps Forward

When combining a number of databases, it is always possible that errors in the underlying data influence one's results. In this particular case, the GPS information of certificate holder locations has proven unreliable in some instances and was corrected according to the best information available; nevertheless, last outliers may remain in the dataset. Furthermore, altitude data was derived from the available GPS coordinates of the certificate holders, not participating farmers directly. There is thus a chance that the real mean altitude of these farms differs slightly from our estimate, though these errors are likely to average out since our estimation technique is the same for all observations. As mentioned, the classification of pathway types was done according to certificate holder name and public information linked to these certificate holders. This method provides a lower bound for the amount of institutional, exporter- and roaster-led support, since it is possible that individual farms or cooperatives received significant financial and capacity-building assistance from these sources but obtained the certificate in their own name. Finally, the topographical and environmental characteristics of the three countries under investigation are particular to the study region, such that results might not be generalizable to other coffee-growing countries outside of Central America.

Considering the stated limitations above, further work is necessary to investigate whether the above results regarding certificate holders hold at farm-level. Furthermore, it would be interesting to compare the prevalence of different certifications and certification pathways in country contexts where quality characteristics have yet played a minor role, due to location or institutional shortcomings.

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