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World Development Vol. 96, pp. 294–314, 2017
0305-750X/

http://dx.doi.org/10.1016/j.worlddev.2017.03.013

Decoupling Standards from Practice: The Impact of In-House Certifications on Coffee Farms' Environmental and Social Conduct

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Summary. — In this paper we investigate whether coffee farms that have been granted in-house socio-environmental certification from a global buyer, display better social and environmental conduct compared to non-certified farms. We perform an econometric analysis using data from an original cross-country survey covering 575 farms in various regions of Brazil, Colombia, Costa Rica, Guatemala, and Mexico. We find that farms that have been granted in-house certification demonstrate better environmental but not better social conduct than non-certified farms. We find also that the positive relationship between in-house certification and environmental conduct is stronger if the farm sells to a cooperative, and if it is located in an institutionally weak country. Finally, we find that the institutional strength of the farm's home country has a positive influence on its social conduct. We discuss how our analysis contributes to the literature on the social and environmental impacts of certifications, and to scholarship in global value chains' social and environmental upgrading.

Key words — in-house certification, social and environmental conduct, decoupling, coffee value chain, global buyers, Latin America

1. INTRODUCTION

Production of certified goods has grown dramatically since the beginning of the 2000s, driven by consumers' concerns over the sustainability of the agro-food and other industries' value chains, and by global buyers' commitments to sourcing more inputs from certified suppliers (Bartley, 2007; Muradian & Pelupessy, 2005; Potts *et al.*, 2014). Certification usually is accompanied by the adoption of voluntary standards and codes of behaviors (Levy, Reinecke, & Manning, 2015), and provides the certified suppliers with a set of principles with which they are expected to comply, and a process for implementing and monitoring those standards (Gilbert, Rasche, & Waddock, 2011). Certification has become widespread in industries such as forestry, coffee, horticulture, and tropical fruit, characterized by the concentration of production in developing countries (Bartley, 2007; Kleemann, Abdulai, & Buss, 2014; Muradian & Pelupessy, 2005).

The idea underlying certification is that potentially it allows farmers and other producers to improve their social and environmental performance, and to receive higher prices and easier access to markets which boosts their economic performance. These improvements are particularly important in the case of small-farmer suppliers based in developing countries who due to the distance from the final consumer, tend to capture only a minor share of the value generated in their industry (Valkila, 2009). The rationale for certification is grounded on the premise that the final consumer is willing to pay a premium for certified products, because certification provides information on product origin, and signals adherence to good practice by suppliers and their buyers (Giovannucci & Ponte, 2005; Valkila, Haparanta, & Niemi, 2010).

Coffee, the context for this study, is one of the most traded commodities in the world, and is at the forefront of debates on standards and certification. Most coffee production comes from small farms in the developing world, is acquired by large global buyers, and then is consumed mostly in the US, Europe, and Japan (Giovannucci & Ponte, 2005). According to the International Trade Center (ITC), certified coffee is no longer a market niche: in 2009 more than 8% of all green coffee exported worldwide carried some form of certification or credible sustainability claim, and some countries imported higher shares of certified than non-certified coffee (e.g., Netherlands 40%; the US 16%; and Denmark, Sweden and Norway 10%) (International Trade Centre, 2011). In 2012, certified coffee accounted for 40% of global production (Potts *et al.*, 2014).

* The authors are especially grateful to the editor and three anonymous reviewers for very constructive comments on earlier drafts of this manuscript. Thanks go also to CIMS, Andres Guevara, and Sofia Aguinaga for their help; to Federica Nieri, Davide Fiaschi and to the participants of the Seminar Series at the Department of Economics and Management of the University of Pisa; to the reviewers of the Academy of International Business and Academy of Management (Social Issues in Management Division) 2016 Annual Meetings, and, finally, to the members of the Expert Group Meeting on Sustainable Value Chain Development (''Inclusiveness in Value Chain Development'') organized at FAO in 2016. Luciano Ciravegna would like to dedicate this paper to his wife and son—the typing noises made to finish this manuscript provided the soundtrack for the last hours spent at home before going to the hospital for his birth! Financial support from the University of Pisa (Italy) (PRA-2015-082) is gratefully acknowledged. All disclaimers apply. Final revision accepted: March 9, 2017.

The growing relevance of certification in the coffee market has resulted in a large body of research investigating the impact of certification on the socio-economic conditions of farmers and small farms (Arnould, Plastina, & Ball, 2009; Barham, Callenes, Gitter, Lewis, & Weber, 2011; Barham & Weber, 2012; Bolwig, Gibbon, & Jones, 2009; Chiputwa, Spielman, & Qaim, 2015; Ibanez & Blackman, 2016; Jena, Stellmacher, & Grote, 2015; Jurjonas, Crossman, Solomon, & Baez, 2016; Kleemann *et al.*, 2014; Levy *et al.*, 2015; Loconto & Dankers, 2014; Luna & Wilson, 2015; Muradian & Pelupessy, 2005; Neilson, 2008; Ortiz-Miranda & Moragues-Faus, 2015; Raynolds, 2009; Raynolds, Murray, & Heller, 2007; Renard, 2010; Ruben & Fort, 2012; Ruben & Zuniga, 2011; Taylor, 2005; Utting-Chamorro, 2005; Valkila *et al.*, 2010; Van Rijsbergen, Elbers, Ruben, & Njuguna, 2016; Vellema, Casanova, Gonzalez, & D'Haese, 2015; Wollni & Zeller, 2007). Despite several methodological advancements (Blackman & Rivera, 2011), these studies are not conclusive about the positive impacts of certification on farmers, small firms, and other constituencies. A recent and comprehensive literature review undertaken by the Food and Agriculture Organization (FAO) concludes that: "*the evidence of the impacts of voluntary standards is still weak*" (Loconto & Dankers, 2014, p. ix).

While most early work on the impact of certifications focuses on the experience of multilateral and non-governmental organization (NGO)-led certifications such as those promoted e.g., by Fairtrade, Organic, and UTZ (e.g., Neilson, 2008; Raynolds, 2009; Taylor, 2005; see also Loconto & Dankers, 2014 for a review), the present study examines the more recent phenomenon of in-house certifications which are developed by private firms, typically large global buyers or multinational corporations (MNCs) orchestrating relevant value chains in different locations (Reinecke, Manning, & Von Hagen, 2012). Examples in the coffee industry include Starbucks whose C.A.F.E. (Coffee and Farmers Equity Practices Programs) certification ranks farmers according to the extent of their compliance with a set of criteria related to four areas of their production processes (i.e., product quality, economic accountability, social responsibility, and environmental leadership) (Renard, 2010). Similarly, Nespresso (Nestlé Group) in 2003 developed its AAA Sustainable Quality program in response to the declining incomes in areas producing high quality beans, and the ensuing risk of shortages in coffee provision (Nespresso, 2012, 2015). Meanwhile other major global buyers in the coffee industry have been developing their own in-house certification and/or sustainability programs (e.g., Illy; see Ilycaffè, 2015).

Global buyers involved in the production and commercialization of coffee have made strong commitments to increasing the share of coffee sourced from certified farmers. Starbucks claimed recently that 99% of its coffee purchases are from certified farms, most of which have the Starbucks in-house certification (Starbucks, 2016), and in 2013, 84% of the coffee purchased by Nespresso was estimated to come from AAA-certified farms (Panhuysen & Pierrot, 2014). These initiatives are often part of a global coffee buyer's social responsibility program. For instance, Nespresso's AAA sustainability program was lauded by Porter and Kramer (2011) as a successful example of the creating shared values (CSV) [1] approach which allegedly, helps small farmers in impoverished rural areas of Africa and Latin America to increase their incomes, reduce environmental impacts, and consequently, create shared value for the community.

Analyses of these in-house certifications/programs are justified by both their increasing frequency, and their characteristics which can differ from those related to other kinds of NGO-led certification. Giovannucci, Byers, and Liu (2008, p. 44) suggest that in-house certifications/programs often are viewed with some skepticism, and seldom figure in sustainability discussions because they can be used instrumentally by private firms for their own ends rather than to truly improve the livelihoods of farmers: "*they may not meet the economic needs of producers … by not providing adequate remuneration for sustainable production practices*". However, with the exception of Ruben and Fort (2012), Ruben and Zuniga (2011) and Barham and Weber (2012), and some anecdotal evidence (Porter & Kramer, 2011), most authors do not investigate their impacts on farmers.

In this paper we examine the relationship between the adoption of in-house certification by coffee farms and these farms' social and environmental conduct. Social conduct refers to practices that guarantee the safety and health of workers (e.g., use of protection when spraying pesticides and other chemicals) at farm level, and practices that support or enhance the socio-economic rights of workers, farmers, and their family members (e.g., salaries equal to or above the minimum wage; written contracts; rights to education for children; child labor policies, among others). By environmental conduct we mean the set of practices adopted by farms to allow better environmental management of their operations, ranging from recycling to more conscious and reduced use of pesticides.

We consider farms' social and environmental conduct rather than more specific economic outcomes (productivity, income, crop quality, etc.) based on the notion of development as "*the removal of various types of unfreedoms*" (Sen, 1999, p. xii), and the contention that certification provides an opportunity to improve farmers' (and their families') human rights—including among others, the rights to health and a decent life; workers' rights; and children's and women's rights (Giuliani & Macchi, 2014). In our view, recognition of these rights is as relevant as income-related improvements, and they are one of the core components of sustainability programs and certifications, since for suppliers to receive certification these schemes require that certain socio-environmental standards are met. However, compliance with those standards should not be taken for granted after the award of certification.

Neo-institutional management scholars have described the (partial or total) lack of compliance with standards employing the notion of *organizational decoupling* which refers to the creation and maintenance of gaps between formal policies and actual organizational practices (Bromley & Powell, 2012; Marquis & Qian, 2013). The relevance of this notion for understanding the impact of certifications is that decoupling "*enables organizations to maintain standardized, legitimating, formal structures while their activities vary in response to practical considerations.*" (Meyer & Rowan, 1977, p. 357). We apply this idea to the context of coffee farming where certification allows farms to be considered legitimate economic actors *vis-à-vis* their commercial partners (e.g., global buyers or other intermediaries) based on their formal commitment to the adoption of socio-environmental standards. [2]

This concept is particularly relevant in our context since a decoupling would nullify the social and environmental impacts of in-house certification, and erase the difference between certified and non-certified farms. Decoupling occurs if farmers are unable fully to comply with the standards decreed by their certification which as some have suggested (Loconto & Dankers, 2014) can be frequent among small-scale suppliers. For instance, small farmers may be unable or unwilling to comply with safety conditions, or to recycle. Numerous contemporary studies of developing countries' small-scale informal producers operating in global value chains document the presence of decoupling practices associated with standards

and certifications, especially those imposed top-down by large MNCs (Giuliani, 2016). A recent state of sustainability initiative (SSI) review found that on average, in the coffee and cocoa industries—the two most important sectors measured by the market share of potentially standards-compliant production, only 35% and 33% respectively of total production sold was standards compliant (Potts *et al.*, 2014).

The motivations for decoupling standards from practice can differ: some diverging practices may be adopted in good faith, and may be guided by local specificities which do not allow for full implementation of the provisions (e.g., cultural resistance to some practices) (De Neve, 2009). In other cases, firms may exploit information asymmetries and imperfect monitoring to reduce production costs—for instance by avoiding the implementation of costly environmental practices, or enhanced protection of female workers during pregnancy (Blowfield & Dolan, 2008). In spite of some evidence documenting the practice of decoupling in developing country contexts, we know very little about its consequences in relation to certification schemes, or the factors which make its occurrence more or less likely.

To address these gaps in the literature, first, we investigate whether certified farms display better social and environmental conduct than non-certified farms. Second, we examine the moderators of these relationships in more depth. We focus on three factors that in our view either exert some pressure on certified farmers' willingness to comply with standards provisions, or enable certified farmers' compliance. We consider the type of local intermediaries that mediate the relationship between farmers and coffee global buyers, and distinguish between cooperatives and other private intermediaries (including traders, local roasters, exporters, etc.). We then consider the role of the institutional strength of the farmer's home country as an enabler of compliance. Lastly, we focus on economic status on the grounds that wealthier farmers will be more likely to invest resources and time in complying with standards.

To explore these issues we conduct several econometric analyses (generalized linear regression, simultaneous equations system, outlier trimming robust regression, propensity score matching (PSM) and quantile regression) using an original cross-country survey including 575 certified and non-certified farmers in various regions in Brazil, Colombia, Costa Rica, Guatemala, and Mexico. Our results show that stronger home country institutions—measured by quality of civil and public services, and ability of government to formulate and implement sound policies and regulation, and ensure the rule of law—appear fundamental for the promotion of more socially sustainable production, regardless of whether or not farmers are certified. We find also that certified farmers demonstrate better environmental conduct *vis-à-vis* non-certified farmers, and this positive relation is stronger if most of their production is sold to a cooperative, and if they are located in an institutionally weaker country. Farmers' economic status does not appear to moderate the proposed relationships in any way.

The paper is structured as follows: We review the literature on the effects of certifications in the context of agro producers located in developing countries (Section 2), and then develop the theoretical framework (Section 3). Section 4 describes the data and methods used in this study, and Section 5 present our results. We conclude by discussing their implications (Section 6).

2. SOCIO-ENVIRONMENTAL IMPACTS OF CERTIFICATION: REVIEW OF THE EVIDENCE

There is a wealth of academic research on the effects of certification on yield, crop quality, farm gate prices, household living standards, and other economic measures (among many others, see e.g., Barham & Weber, 2012; Bolwig *et al.*, 2009; Chiputwa *et al.*, 2015; Kleemann *et al.*, 2014; Ruben & Zuniga, 2011; Vellema *et al.*, 2015; see also Loconto & Dankers, 2014). Despite the relevance of these studies, the focus here is on research that more directly observes the social and environmental impact of certification in order to address our research questions.

Environmental impact studies typically focus on a set of ecological indicators, and pro-environmental production practices. For instance, in a qualitative study of Nicaraguan Fairtrade cooperatives, Utting-Chamorro (2005) found that Fairtrade certification increased farmers' awareness of environmental issues and practices, and led to an increase in farmers' investments in capacity building and diversification. In one of the earliest quantitative studies on this topic, Philpott, Bichier, Rice, and Greenberg (2007) analyzed the differences between certified (Organic and Fairtrade) and non-certified Mexican coffee producers in relation to ecological indicators such as biodiversity. However, their analysis yielded no significant results.

The positive effects of certification on environmental practices is shown in a study by Bolwig *et al.* (2009) which examines 160 Ugandan farmers. The authors find that Organic certification has a positive effect on farmers' environmental conduct, and particularly soil management techniques. Blackman and Naranjo (2012) examine the impact of organic certification on a sample of 2,603 farmers in Costa Rica using PSM to control for selection bias. They found reduced use of fertilizers, pesticides, and herbicides, and increased use of organic fertilizers among certified farmers. They argue that third-party monitoring and clear definition of the criteria for certification facilitate compliance. Blackman and Naranjo suggest also that enforced monitoring seems to be more effective for eliminating negative practices (e.g., eliminating use of chemicals) than for promoting positive actions such as introducing soil conservation practices, which hints at the heterogeneous effects of monitoring on conduct. Positive results of organic certification on farmers' environmental management can be found in Ibanez and Blackman (2016) which examines coffee farmers in Colombia and finds that being certified leads to improvements in waste disposal, and increased use of organic inputs. In another study of Colombian coffee producers, Rueda, Thomas, and Lambin (2015) use satellite images to study environmental practices in areas where coffee producers had been granted Rainforest Alliance certification; they found a positive effect of the certification on tree cover and diversity. Similarly, Takahashi and Todo (2013) found that the likelihood of deforestation in Ethiopia was lower in Rainforest Alliance-certified areas.

Some studies focus also on the social repercussions of certifications. They use a different set of social measures including among others, access to education, health, and food security. For instance, Becchetti and Costantino (2008) examine the impact of Fairtrade certification on 120 Kenyan herb farmers, and observe some positive effects on access to food (measured as expenditure on food, and dietary variety) and health (captured via infant mortality, and use of hospitals for childbirth). However, their findings in relation to use of child labor and investments in human capital are inconclusive. Arnould *et al.* (2009) study the effects of membership in Fairtrade-certified cooperatives, focusing on a multi-country sample of 1,269 farmers from Guatemala, Nicaragua, and Peru, and a control group of 388 non-certified producers. The authors study the impact of certification on household-level health, measured by access and illness indicators, and education mea-

sured as numbers of years of formal education and the probability of being in education. The econometric models they employ show that certifications have positive effects on the likelihood of being in education but not on the level of education. Their study illustrates also that there are no clear effects of certification on health-related behavior and health indicators. Only farmers who had been members of a Fairtrade cooperative for at least six years showed better health indicators, suggesting that the effects of certifications on health issues may take time to materialize. Mendez *et al.* (2010) examined the effects of Organic and Fairtrade certifications on 469 coffee farmers in El Salvador, Guatemala, Mexico, and Nicaragua but found no association between certification and education improvements measured as the number of school age children effectively attending school. The authors examined also whether certifications were related to other livelihood dimensions such as savings, credit, food security, and migration, and found a positive relationship only for farmers' savings and access to credit. In relation to food security, certified farmers reported more difficulties than non-certified farmers due possibly to the former's increased specialization in coffee at the expense of other crops.

Ruben and Zuniga (2011) conducted PSM to study 315 farmers in Nicaragua, and compare the effects of Starbucks C.A.F.E., Rainforest, and Fairtrade certifications. They found that none of them appears to have a tangible impact on farm workers' wages, or gender relationships. The study by Van Rijsbergen *et al.* (2016) examines the impact of Fairtrade and UTZ certifications on 218 Kenyan coffee farmers, using a matched panel, and observations for 2009 and 2013. In addition to focusing on different types of economic impacts occurring at the farm, household, cooperative, and community levels, they examined some social impacts including access to potable water, and better access to latrines to improve sanitary conditions. The results for social impacts suggest that UTZ farms have better access to sanitation but that neither type of certification has any effect on access to potable water. Finally, Ruben and Fort (2012) studied the impact of Fairtrade certification on a sample of 320 Peruvian organic and non-organic farmers, using PSM. They found that Fairtrade certified farmers accumulated more assets and were more optimistic about the future. However, the environmental behavior of the groups differed very little apart from the more intensive use of organic fertilizer by Fairtrade organic farmers than non Fairtrade organic farmers which the authors attribute to technical cooperation among the members of Fairtrade cooperatives. The farmers in this study claimed also that the most tangible benefits of Fairtrade were technical assistance and credit, and that "*many farmers prefer using the Fairtrade premium for individual purposes and tend to undervalue investments made for collective and community services (education, health care, water, and electricity)*" (Ruben & Fort, 2012, p. 578).

It would seem that empirical evidence of the positive effects of certification on farmers' environmental conduct is increasing (e.g., Blackman & Naranjo, 2012; Ibanez & Blackman, 2016; Rueda *et al.*, 2015). This leads to questions about the factors that make this positive impact more or less likely to emerge. However, evidence of a positive effect of certification on the social conduct and social conditions of farmers and their families, and on workers and other constituencies influenced by farm operations more broadly (including minimum wages, access to water, sanitation, health, education, etc.) remains scant and mostly inconclusive. We contribute by providing new empirical evidence of the impact of in-house certifications on farmers' environmental and social conduct.

3. CONCEPTUAL FRAMEWORK

(a) *Farmers' in-house certification and their social and environmental conduct: Decoupling standards from practice*

Farmers who have been granted in-house socio-environmental certification can choose between two ways to conduct their business. They might substantively put into practice all of the social and environmental conditions imposed by the certification. This would mean that they would adopt the practices that contribute to improving the environmental management of the farm, and improving the conditions of their employees and other relevant constituencies (e.g., communities in proximity to the farm). In this case, the farmer would be complying with the standards associated to the certification, and would likely be demonstrating better social and environmental conduct than a similar non-certified farmer. On the other hand, farmers might decouple standards from practice, and opt for symbolic adoption of the certification to allow entry to the coffee value chain and legitimation as high quality and sustainable suppliers, without incurring the costs of compliance. In this case, their post-certification conduct will not be compliant with the standards imposed by the certification (Giuliani, 2016; Jamali, Lund-Thomsen, & Khara, 2015). According to neo-institutional theorists who proposed the notion of decoupling in the context of management research, this practice occurs when in order "*to maintain ceremonial conformity, organizations that reflect institutional rules tend to buffer their formal structures from the uncertainties of technical activities by becoming loosely coupled, building gaps between their formal structures and actual work activities*" (Meyer & Rowan, 1977, p. 341).

Decoupling often occurs in "opaque" institutional fields, that is in contexts where "*observers have difficulty identifying the characteristics of prevailing practices, establishing causal relationships between policies and outcomes, and measuring the exact results of policy implementation.*" (Wijen, 2014, p. 302). The field of socio-environmental governance is considered to be one such opaque context where alignment between the formal adoption of standards and actual conduct is difficult to understand, causally attribute, or measure. Developing countries pose an additional challenge since their context can make it difficult to monitor and establish relationships between standards and conduct due to institutional weaknesses and other failures which characterize those contexts, although with differences among countries. Research on developing countries in sectors other than coffee, shows that decoupling is a widespread practice (e.g., De Neve, 2009; Jamali *et al.*, 2015; Mezzadri, 2012; Taylor, 2011), and is more likely in the absence of rigorous monitoring of, and support for suppliers (Giuliani, 2016).

Enacting decoupling strategies may be cost-efficient for producers since lack of compliance or deviation from standards can translate into lower investment in new or demanding socio-environmental practices. This is compelling in the context of coffee production where farmers often bear the cost of certifications but may not be able to market all of their certified crop, or be forced to sell their produce as non-certified, and at a lower price (International Trade Centre, 2011). This can make it difficult for small farmers to benefit from certification (Beuchelt & Zeller, 2011; Ibanez & Blackman, 2016; Neilson, 2008; Ortiz-Miranda & Moragues-Faus, 2015; Valkila *et al.*, 2010; Vidyarthi, 2015), and may be a motivation for decoupling in order to cut operating costs.

Furthermore, monitoring and enforcement of voluntary codes of conduct are less than perfect in the coffee industry,

precisely because suppliers are numerous and geographically dispersed across remote areas which gives leeway for non-compliant behavior (Blackman & Naranjo, 2012). Also, although global buyers granting in-house socio-environmental certification give equal prominence to social and environmental issues, and set multiple rules and criteria to guide farmers' conduct, these rules may be badly defined making farmers' compliance even more difficult. This can lead to deviant behavior involving farmers being selective about which rules and criteria to respect and which to ignore. For instance, they may privilege more manageable practices, and practices such as waste management that provide more immediate and foreseeable economic returns, over practices whose results are likely to emerge only in the longer term such as investments in the quality of life of their family members and other workers.

Decisions to decouple practice from standards may have different motivations and in the presence of significant decoupling at farm level, we would not expect substantial differences in the social and environmental conduct of certified *vis-à-vis* non-certified farmers. In contrast, in the absence of decoupling (or in the presence of minimal decoupling), we would expect certified farmers to demonstrate better social and/or environmental conduct than similar non-certified farmers. We take this latter relationship as our baseline, and explore it further in the succeeding sub-sections.

(b) *Moderating factors*

We focus here on the moderators that might influence farmers' willingness to comply with the provisions of certification, and/or that might enable their compliance. First, we consider the type of local buyer that intermediates between the farmer and the global coffee buyer, and distinguish between cooperatives and other private intermediaries (including traders, local roasters, exporters, etc.) Second, we consider the role of the institutional strength of the farmer's home country as an enabler of farmer compliance. Third, we focus on farmers' economic status; we expect that wealthier farmers will be more relaxed about investing resources and time in complying with standards.

(i) *Type of intermediaries: cooperatives vs. private intermediaries*

We examine whether the effect of certifications on farmers' social and environmental conduct is moderated by the type of intermediary to which the farmer sells the majority of his or her coffee.[3] Our focus is justified by the organization of the coffee value chain: fragmented production at farm level, and highly concentrated commercialization of coffee. In order to simplify their purchasing processes, global buyers (such as e.g., Nespresso and Starbucks) tend not to buy directly from the farmers but to purchase from an array of different organizational actors that act as intermediaries in the coffee value chain. Our main argument is that the organizational differences among different intermediaries may result in different types of pressures on certified suppliers, or provide them with different types of support which ultimately shape their decisions or their capacity to comply with the standards and enhance the social and environment conduct of the certified farmer accordingly (Neilson, 2008; Raynolds, 2009).

Thus, we distinguish between cooperatives and private intermediaries. The latter include coffee roasting companies, traders/exporters, and other residual private intermediary types. Coffee roasting companies, for instance, are one of the oldest intermediaries in the coffee industry; they are private businesses which buy the coffee from farmers, select it, process it, and sell it in both the domestic and global markets through a variety of channels such as large European and U.S. importers which commercialize it via large roasters, and niche importers that sell the coffee in specialty shops (e.g., organic or ethnic focused retailers), or to the agents of large global roasters. Thus, local coffee roasting companies are a crucial link in the global coffee value chain (Loconto & Dankers, 2014). A similar intermediary role is fulfilled by traders which may be large conglomerates based in developed economies, such as Neumann Kaffee Gruppe based in Germany, or Ecom based in Switzerland, that operate locally to buy large quantities of coffee from various actor types, and sell it on to large global buyers such as Nespresso, Sara Lee, Lavazza, and Starbucks.

We distinguish these and other types of private intermediaries from cooperatives which earlier research shows are organizationally different from pure private firms because they are voluntary organizations governed by their members to serve these members' social and economic interests (Peterson & Anderson, 1996). This form of organization is particularly common in the agricultural sector, and very frequent in coffee producing areas (Jena *et al.*, 2015; Wollni & Fischer, 2014). A review of the vast literature on the functioning of cooperatives is beyond the scope of this paper; however, one way that cooperatives differ from private market intermediaries is that the cooperative organizational model promotes a set of pro-social behaviors among its members (on the functioning of cooperatives, see among others Cechin, Bijman, Pascucci, & Omta, 2013; Fischer & Qaim, 2012; Handschuch, Wollni, & Villalobos, 2013; Kurjańska, 2015; Luna & Wilson, 2015; Mujawamariya, D'Haese, & Speelman, 2013; Murekezi, Jin, & Loveridge, 2012; Murray-Prior, Sengere, & Batt, 2009; Ortiz-Miranda & Moragues-Faus, 2015; Pennerstorfer & Weiss, 2012; Shepherd, 2007; Wang & Qin, 2012; Wollni, Lee, & Thies, 2010; Wollni & Zeller, 2007). Research on cooperatives shows that its members engage in superior forms of coordination which reduce transaction costs and asymmetric information, and allow economies of scale in the acquisition or use of certain production inputs, and increased bargaining power with buyers (Fischer & Qaim, 2012). Several studies show that cooperatives can help farmers to coordinate collective action, e.g., by lobbying governments to subsidize agricultural inputs (Calvo Coin & Wachong Ho, 1998; Wollni & Zeller, 2007). Cooperatives also may engage in the provision of selected club goods such as shared services, training, and technical support, and the sharing of knowledge that allows its members to improve production standards and products (Arnould *et al.*, 2009; Kurjańska, 2015; Ortiz-Miranda & Moragues-Faus, 2015; Perez-Aleman, 2011; Vidyarthi, 2015; Wang & Qin, 2012). In addition, cooperatives can help global buyers identify farmers suitable for certification on environmental grounds, and help in the eventual evaluation of certified farms (Raynolds, 2009).

All of the above points to the need to examine in more detail the role played by these intermediaries in moderating the relationship between farmers' certification and their social and/or environmental conduct. Based on the conventional wisdom related to cooperatives and their functioning rules, we posit that the relationship between certification and social and environmental conduct will be moderated positively if farmers sell predominantly to a cooperative. Certified farmers whose main buyer is a cooperative may receive more technical support from the cooperative (e.g., professional advice, and other types of managerial support) (Brown, Del Rosario, and Agagnon, 2015; Luna & Wilson, 2015) which facilitates their

better compliance with certification standards. Links to a cooperative can also increase social monitoring among farmers because compared to other intermediaries, cooperatives normally are rooted in a specific context, and their members are likely to be located in the proximate geographical area. This can reduce the likelihood of decoupling.

An additional motivation for our proposed positive moderating effect of cooperatives, is that certified farmers who sell most of their production to a cooperative may play a signaling role *vis-à-vis* global buyers which will increase the cooperative's legitimacy, and in turn, its bargaining power *vis-à-vis* different constituencies (e.g., it might support a search for higher prices). In other words, because socio-environmental certification can signal otherwise hidden qualities (King & Toffel, 2009), connections to certified farmers may benefit the cooperative and increase its legitimacy. Decoupling would threaten this effect; failure to comply with standards if discovered by the certifying entity, in this case the global buyer, might mean the withdrawal of certification from non-compliers and would constitute a negative signal which could jeopardize the cooperative's objectives. Thus, cooperatives are likely to have a strong incentive to discourage non-compliance among their affiliated farmers.

(ii) *Institutional quality of the farmer's home country*

We have already referred to the higher likelihood of decoupling in opaque institutional contexts and situations where rules and regulations are not perfectly understandable, and monitoring processes are neither rigorous nor predictable. We contend that the institutional quality of the farmer's home country defined in terms of the quality of civil and public services, and ability of government to formulate and implement sound policies and regulations and ensure the rule of law (Kaufmann, Kraay, & Mastruzzi, 2011), is an important moderator of the relationship of interest.

Previous sociological research suggests that institutional pressures in a given context or country influence the conduct and choices of the economic actors (DiMaggio & Powell, 1983). This literature suggests that economic actors adapt to the formal and informal rules governing their environment (regulations, laws, codes of conduct, etc.) in order to obtain acceptance from peers, and to facilitate business operations. Institutionally strong countries are more likely to exert pressure on economic actors and other constituencies which then model their choices in ways that align with these countries' rules and regulations. Therefore, abiding by the law is more likely in those contexts than in countries characterized by weak rule of law. In this paper, we look at home country institutional strength as a moderator in our baseline relationship and we conjecture that certified farmers will be more likely to comply with socio-environmental standards if the institutional quality of their home country is high, and they will be likely to demonstrate better social and/or environmental conduct than non-certified farmers. Certified farmers are provided by their buyers with a set of codes of conduct which are unavailable to non-certified ones, and we believe that farmers' home country institutional strength will facilitate compliance.

(iii) *Farmers' economic status*

So far we have examined two different types of external pressure for compliance; however, ultimately the decision to comply with certification standards is the decision of the individual farmer. We posit that the farmer's income positively moderates the relationship between adoption of certification standards and conduct. Our argument is based on the idea that there are substantial costs involved in compliance with certification. According to Handschuch *et al.* (2013), compliance involves both recurrent and non-recurrent costs. The latter refer to one-time initial investments required to meet standards such as construction of a medical aid point, or improvements to water infrastructure. The former refer to more regular and periodic costs borne by compliant farmers such as costs related to higher salaries, annual soil or water analysis, etc. Small-scale farmers may be less likely to obtain much tangible benefit from the recurrent costs of certifications, and in turn, may be less likely to seek certification or comply with its standards if certification is awarded (see e.g., Beuchelt & Zeller, 2011; Handschuch *et al.*, 2013; Ibanez & Blackman, 2016; Loconto & Dankers, 2014).

Thus, farmers' income is an important dimension; poorer farmers may be more inclined to cut costs and seek efficiency gains by decoupling their practice from standards (Baucus & Near, 1991). For instance, less well-off certified farmers may be quite keen to implement standards such as better waste management, or reduced electricity usage which appears more likely to deliver an economic return—but less keen to comply with requirements that are more difficult to monitor (e.g., democratic decision making). Wealthier farmers may have sufficient resources to invest in the implementation of all the standards requirements. Therefore, we posit that certified farmers will display better social and environmental conduct the higher is their income.

4. DATA

(a) *Sample and data collection*

Our analysis is in the context of coffee farmers located in various regions of Brazil, Colombia, Costa Rica, Guatemala, and Mexico. We rely on an original survey to assess the impact of in-house certification of a global buyer in the coffee industry that was conducted by one of the co-authors of this paper and a non-profit third-party organization. [4] Due to a confidentiality agreement with the buyer, we are unable to disclose its name. However, we can confirm that the certification program was developed by the global buyer to enhance farmers' productivity and to promote production of higher quality coffee based on socially and environmentally sustainable practices. Its certification program is based on numerous criteria related to social issues such as workers' health and safety, working conditions, child labor, democratic decision making, and good community relations, and environmental issues such as soil conservation, waste management, use of pesticides, etc. In common with other certification schemes, certified farmers receive a premium price for their higher quality and sustainably produced coffee.

The study focuses on the regions from which the global buyer purchases its coffee: the municipalities of Monte Carmelo, Coromandel, Serra do Salistre, and Rio Paranaiba in Brazil's Minas Gerais state; the departments of Caldas and Narinos in Colombia; the Naranjo and Paradiso cantons in the central region of Costa Rica; Ixhuatlán del Café city in the state of Veracruz in Mexico; and the department of Huehetenango in Guatemala. The local coffee producers' associations (i.e., Brazil: Centro do Comércio de Café do Estado de Minas Gerias (CCCMG); Colombia: Colombian Coffee Federation (FNC); Costa Rica: Costa Rican Coffee Institute (ICAFE); Guatemala: Guatemalan National Coffee Association (Anacafe); Mexico: Mexican Associacion of Coffee's Productive Chain (AMECA)) in each of these countries were asked to provide lists of the farmers located in the areas of

interest, in order to identify the sample. The farms in the sample were selected according to the following criteria:

(1) being operational for at least three years;
(2) being independently owned;
(3) having coffee production as their main economic activity;
(4) location in one of the regions in Brazil, Colombia, Costa Rica, Guatemala, or Mexico where the global buyer sources its coffee.

Farms that did not meet these criteria were excluded from the sample. Following standard practice and precedent, a random sample was selected from the resulting list of coffee farms, and selection was stratified based on farm size (small, medium, large). Our resulting random stratified sample is comprised of 862 coffee farms—138 in Brazil, 274 in Colombia, 138 in Costa Rica, 156 in Guatemala, and 156 farms in Mexico. After cleaning for non-respondents (some farms had ceased trading), outliers, invalid and missing responses, we obtained a final sample of 575 farms—96 in Brazil, 199 in Colombia, 91 in Costa Rica, 90 in Guatemala, and 99 in Mexico. The 575 farms include 365 certified farms and 210 non-certified farms (see also Section 4 (b)). [5]

Tests were performed for systematic statistically significant differences between respondents and non-respondents. No statistically significant differences were found at the 0.05 level or higher, between respondents and non-respondents and farm size, farm age, altitude of farm location, and region. This suggests that the final sample is representative of the population of coffee farms surveyed.

The questionnaire was administered to the farm's owner/-founder, or general manager (in the case that this was a different person). Data collection was conducted between late 2008 and early 2010, and processing and codifying the data to produce the dataset for this study extended to 2012. [6] The structured questionnaire was distributed in the five countries being analyzed. The field researchers received three full days of training to provide a detailed understanding of the project objectives, the importance of their neutrality as data collectors, and the need to be respectful toward the coffee farmers. Data were collected via face to face interviews conducted by the field researchers, and direct inspection to monitor environmental and social practices.

The questionnaire was designed specifically for the context being investigated, and tailored to account for different farm sizes; the majority of the farms in our sample are small farms employing less than ten workers (60%) which is in line the patterns of coffee production elsewhere (e.g., Luna & Wilson, 2015). Since our survey was at farm level, it is important to clarify that all the farms had at least one employee (either family member or contract) besides the owner. [7] This matters given that most social provisions are related to the rights of workers and their families.

The questions were developed to evaluate the impact of certification on a broad series of farm-level indicators, and were organized in four sections (i.e., general farm-level information, economic data, environmental sustainability, and social sustainability). The questions included in the social and environmental sustainability sections were coherent with all key certification standards provisions (see next section). In order to ensure that the questionnaire content was valid, it was tested on five academics and twelve coffee farmers including at least two from each of the five countries included in the study. The questionnaire was revised based on the feedback from these 17 respondents. Some of the questions were reordered, and several were dropped because the questionnaire was perceived as too long. The revised questionnaire was examined by two of the original twelve coffee farmers, and two additional coffee farmers; no further changes were deemed necessary. None of the farmers involved in testing the validity of the questionnaire are included in the final sample.

(b) *Econometric model and descriptive statistics*

The baseline specification of our econometric model is the following linear regression equation where the dependent variable Y^* can be the index of the farm *i's* environmental (*ENV*), or social (*SOC*) conduct *i*:

$$Y_i^* = \alpha + \beta CERTIF_i + \gamma X_i + \delta_j + u_i \quad (1)$$

To build the dependent variables we relied on responses to the questions in the survey that included several items investigating different aspects of farmers' social and environmental conduct (the full list of items is provided in Appendix Tables 10 and 11). Each item was a question on either a social or an environmental issue, and the responses were coded on a 0 to 1 scale. Some responses are dichotomous (e.g., Does the firm keep an energy consumption registry?), while those based on a Likert scale ranking (e.g., distance from the medical attention center) were rescaled to range between 0 and 1 after checking the consistency of their direction (i.e., 0- > worst conduct, 1- > best conduct). The dependent variables *ENV* and *SOC* were defined as the means of the valid responses to each of the environmental and social items respectively. Accordingly, each variable ranges from a minimum of 0 to a maximum of 1.

$CERTIF_i$ is the main independent variable of interest, and is a dummy which is equal to 1 if farm *i* holds in-house certification (and 0 otherwise).

The matrix *X* in Eqn. (1) includes the following set of moderating factors and control variables.

(a) Moderating factors:
- a dummy variable for the type of the firm's main intermediary (COOP)—equal to 1 if the farmer sells mainly to cooperative organizations and zero if the farmer sells to private intermediaries (i.e., coffee roasters, traders and/or exporters, other non-cooperatives organizations);
- an index for the institutional quality (GOVERN) of the farmer's home country, computed by averaging three measures of Kaufmann *et al.*'s (2011) World Bank Worldwide Governance Indicators, namely (a) government effectiveness, (b) regulatory quality, and (c) rule of law. The effect of governance quality is measured using national-level statistics since subnational-level data on this dimension were not available. Given the relatively limited variability of the resulting index across the countries under investigation, we codify it as a dummy variable that takes the value 0 for firms located in countries with low institutional quality and 1 for firms located in countries with medium-high institutional quality, using the median of the original index (−0.07) as the threshold value;
- farmers' economic status (INCOME), defined as total net income (in $US'000), measured as the farm's net income per hectare multiplied by the number of hectares devoted to growing coffee, divided by 1,000. [8]

(b) Control variables [9]:
- farm size measured as the (logarithm of the) number of hectares of its cultivated coffee area (*SIZE*);
- farm age measured as the (logarithm of the) number of years since it started to produce coffee (*AGE*);
- altitude of the farm defined as the (logarithm of the) average height in meters (*ALTITUDE*) which proxies for coffee bean quality;

– farm productivity defined as the (logarithm of the) yield in kilograms per hectare (*YIELD*);

Finally, the baseline model includes a set of regional dummy variables δ_j ($j = 1, \ldots, 8$), and a farm specific, normally distributed error term u_i. Note that to the baseline model presented here, we added a number of robustness checks to control for endogeneity (self-selection bias), measurement errors, and non-response bias (see Sections 5(b)–(d)).

The pair-wise correlation coefficients among the full set of the regressors in our models are reported in the correlation matrix in Appendix Table 12. Although some of the pair-wise correlations are statistically significant, the collinearity diagnostics based on the variance inflation factor (VIF) computed for each estimated model (and reported in the last row of the relevant column in the estimation output tables), show that there are no multi-collinearity problems since the values of the VIFs are well below the standard thresholds (4 and 10) used as rules of thumb in the literature (O'Brien, 2007).

Table 1 presents the main descriptive statistics of the variables in the analysis. Among the 575 firms in the final sample, 365 (63.48%) hold in-house certification. The number of firms that sell mainly to cooperatives (*COOP*) is 350 (60.87%). If we disaggregate by farmer's country of origin (Table 2 panel B), we observe some variation. On average, Mexican farmers appear to have the lowest scores for both measures of social and environmental conduct, while on average Brazilian firms have more hectares of plantation (35 ha.) than farmers in other countries, and also have the lowest incidence of certification (28%). Finally, Table 1 panel C shows the distribution of farmers according to the main type of direct buyer (*COOP vis-à-vis* other intermediaries) disaggregated by country. We observe that Brazilian and Colombian farmers sell almost entirely to cooperatives, while Costa Rican and Mexican farmers sell mostly through other intermediaries.

Similar to Arnould *et al.* (2009), in our regression analysis we control for many observable characteristics in order to estimate the effect *ceteris paribus* of certification on a sample of certified and non-certified farms selected randomly from a list of the farms located in the areas of interest (i.e., with the same climate, geography, and growing conditions) and satisfying the set of criteria set out in Section 4(a). In Section 5(d) we employ PSM methods (as suggested in Blackman & Rivera, 2011) in order to build a more restricted control group of non-certified farms matching the set of observable characteristics related to certified farms.

5. EMPIRICAL RESULTS

In this section, we report the estimation results of the baseline model (Eqn. (1)) when considering the dummy variable *CERTIF* as exogenous, i.e., uncorrelated with the error term u_i in Eqn. (1). We then relax and test this assumption by generalizing our econometric model using a system of two

Table 1. *Descriptive statistics (variables not in logarithms)*

Panel A: whole sample. Number of observations: 575.

	Mean	Std. Dev.	Min	Max
ENV[a]	0.468	0.226	0	0.986
SOC[a]	0.539	0.152	0	0.929
CERTIF[b]	0.635	0.482	0	1
COOP[b]	0.609	0.488	0	1
GOVERN[c]	0.677	0.468	0	1
INCOME	0.005	0.032	−0.173	0.389
SIZE	8.684	22.505	0.075	250
AGE	23.460	17.110	3	100
ALTITUDE	1404.380	289.734	600	2400
YIELD	1023.950	764.698	7.942	5454

Panel B: country averages

	Brazil	Colombia	Costa Rica	Guatemala	Mexico
ENV[a]	0.655	0.537	0.345	0.475	0.257
SOC[a]	0.673	0.561	0.552	0.543	0.351
CERTIF[b]	0.281	0.754	0.560	0.744	0.710
GOVERN[c]	0	1	1	0	1
INCOME	0.020	0.001	0.003	0.007	0.001
SIZE	35.484	2.066	3.853	7.417	1.589
AGE	15.005	21.810	30.462	20.633	31.111
ALTITUDE	992.364	1696.891	1201.062	1486.576	1328.097
YIELD	1796.386	703.597	1316.872	1207.024	483.181
Observations	96	199	91	90	99

Panel C: number of firms by main intermediary (percentages in parenthesis)

	Brazil	Colombia	Costa Rica	Guatemala	Mexico
COOP	95 (98.96)	188 (94.47)	9 (9.89)	58 (64.44)	0 (0)
NON COOP	1 (1.04)	11 (5.53)	82 (90.11)	32 (35.56)	99 (100)
Total	96 (100)	199 (100)	91 (100)	90 (100)	99 (100)

[a] Interval [0,1].
[b] Dummy (0 = No, 1 = Yes).
[c] Dummy (0 = Low, 1 = High).

Table 2. *OLS and GLM estimates. Dependent variable: ENV*

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) GLM
CERTIF	0.076***	0.058***	0.067***	0.054***	0.052***	0.243***
	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)	(0.082)
COOP		0.085***		0.081***	0.081***	0.332***
		(0.025)		(0.025)	(0.025)	(0.106)
GOVERN			0.011		0.019	0.080
			(0.023)		(0.024)	(0.100)
INCOME				−0.677	−0.682	−3.169*
				(0.452)	(0.452)	(1.999)
SIZE		0.054***	0.052***	0.059***	0.060***	0.262***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.032)
AGE		−0.014	−0.015	−0.012	−0.013	−0.054
		(0.011)	(0.011)	(0.011)	(0.011)	(0.047)
ALTITUDE		0.155***	0.244***	0.183***	0.180***	0.771***
		(0.053)	(0.051)	(0.052)	(0.052)	(0.225)
YIELD				0.019*	0.021**	0.086*
				(0.010)	(0.010)	(0.045)
Constant	0.416***	−0.758*	−1.362***	−1.085***	−1.084***	−6.782***
	(0.020)	(0.386)	(0.376)	(0.394)	(0.394)	(1.698)
R-Squared	0.320	0.408	0.395	0.418	0.418	
VIF	1.21	2.16	1.97	2.08	2.18	

Note: Regional dummy variables included. Robust/clustered standard errors in parentheses.
Number of observations: 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3. *OLS and GLM estimates. Dependent variable: SOC*

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) GLM
CERTIF	0.019	0.009	0.008	0.005	0.001	0.006
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.047)
COOP		0.012		0.010	0.009	0.035
		(0.014)		(0.016)	(0.016)	(0.064)
GOVERN			0.035***		0.048***	0.197***
			(0.012)		(0.013)	(0.052)
INCOME				−0.607	−0.620	−2.792
				(0.451)	(0.450)	(1.968)
SIZE		0.035***	0.037***	0.040***	0.043***	0.181***
		(0.005)	(0.005)	(0.005)	(0.004)	(0.019)
AGE		0.005	0.004	0.007	0.005	0.023
		(0.007)	(0.007)	(0.007)	(0.007)	(0.028)
ALTITUDE		0.091**	0.094***	0.118***	0.110***	0.455***
		(0.039)	(0.036)	(0.039)	(0.038)	(0.158)
YIELD				0.019***	0.024***	0.102***
				(0.006)	(0.006)	(0.026)
Constant	0.543***	−0.164	−0.194	−0.486*	−0.483*	−4.100***
	(0.011)	(0.283)	(0.264)	(0.289)	(0.281)	(1.166)
R-Squared	0.408	0.475	0.479	0.493	0.502	
VIF	1.21	2.16	1.97	2.08	2.18	

Note: Regional dummy variables included. Robust/clustered standard errors in parentheses.
Number of observations: 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

equations that take account of the potential simultaneity between the farm's level of environmental/social conducts, and its decision to apply for certification. We assess whether the effect of in-house certification on the farm's environmental and social conduct is moderated by the type of the main local intermediary, the institutional quality of the farmers' home country, and the farmer's economic status. Next, we check the robustness of our main findings by re-computing the dependent variables *ENV* and *SOC* with a weighting factor based on the response-rate of each single item, and using a measurement model based on latent factors. Finally, we employ several econometric methods such as outlier-trimming robust regression, matching estimators, and quantile regression to further check the robustness of our results.

(a) *Results of the baseline model*

Tables 2 and 3 report the estimation results for different specifications in the baseline model (Eqn. (1)), including the respective dependent variables farm's environmental (*ENV*)

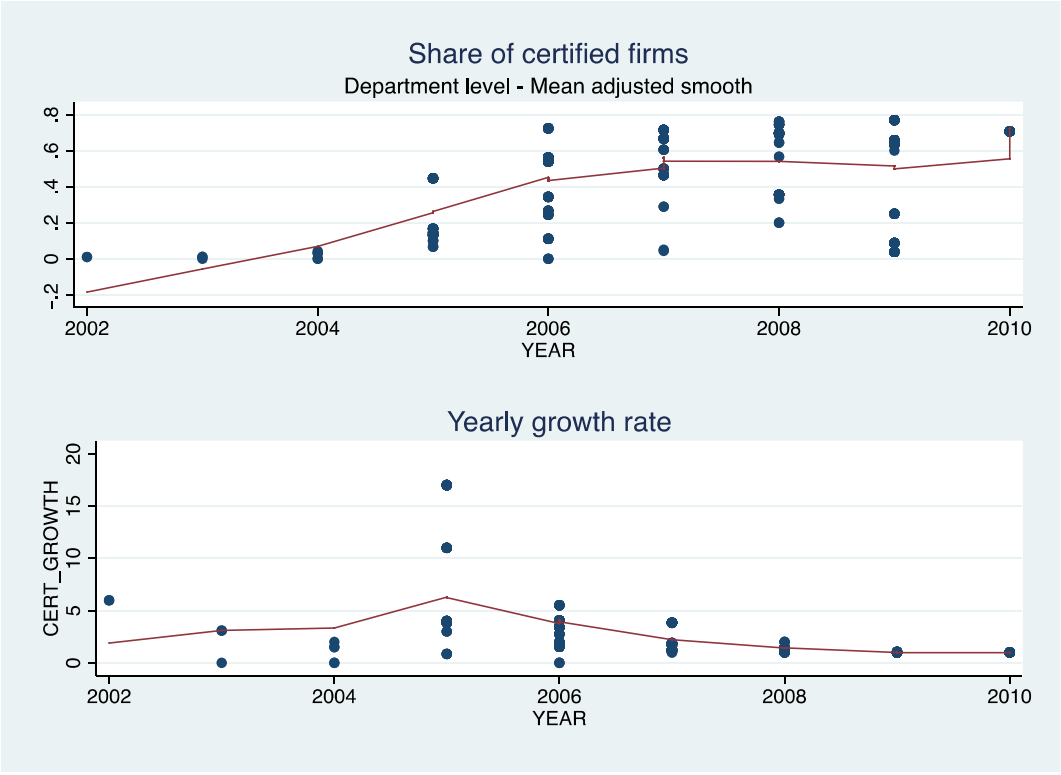

Figure 1. *Evolution of the share of certified farms in each region (upper panel) and its yearly average growth rate (lower panel).*

and social (*SOC*) conduct. Since both these variables are bounded between 0 and 1, we estimate model (Eqn. (1)) using ordinary least squares (OLS) and maximum-likelihood generalized linear models (GLM) with a logit link function.

The coefficient of the dummy *CERTIF* is positive and statistically significant for predicting the environmental conduct of the farm (Table 2). The estimated parameter of the GLM model in column (6) is +0.243 (standard error 0.082) which corresponds to an expected increase (average marginal effect) of about 26% of the sample standard deviation of the dependent variable for a certified farm (with respect to a non-certified farm). In contrast, the estimated marginal effect of *CERTIF* on the farm's social conduct (Table 3) is very low, and never statistically significant.[10]

In relation to the type of intermediary, farms that sell mainly to cooperative organizations (*COOP*) seem to demonstrate better environmental conduct on average than farms selling to private intermediaries. In contrast, we observe no statistically significant relationship between the farm's social conduct and the type of local intermediary. The institutional quality of the farm's home country (*GOVERN*) positively affects its social conduct but does not significantly affect its environmental conduct. Finally, the farmer's economic status (*INCOME*) is, ceteris paribus, negatively associated to environmental conduct which means that poorer farmers' environmental conduct is better than the conduct of wealthier farmers although the statistical significance of the estimated coefficient in the GLM model (Table 2, column 6) appears weak (at 10% level).

Among the control variables, we find that the coefficients of farm size (*SIZE*), productivity (*YIELD*), and altitude (*ALTITUDE*) are positive for explaining both environmental and social conduct (Tables 2 and 3).

(b) *Endogeneity checks*

The coefficients of the independent dummy variable (*CERTIF*) in Eqn. (1) estimated in the previous section, might be affected by endogeneity bias. In fact, the farms' levels of environmental and social conduct, and their decision to apply for certification might be determined simultaneously. This could lead to potential correlation between *CERTIF* and the error term u_i in Eqn. (1) which in turn, would lead to a bias in the OLS and GLM estimates. In order to check and take account of this issue which might be driven by the omission of relevant unobserved variables from Eqn. (1), we estimate the following system of two simultaneous equations:

$$\begin{cases} Y_i^* = \alpha_1 + \beta_1 CERTIF_i + \gamma_1 X_i + \delta_{1j} + u_{1i} & \text{(2a)} \\ CERTIF_i^* = \alpha_2 + \beta_2 Z_i + \gamma_2 X_i + \delta_{2j} + u_{2i} & \text{(2b)} \end{cases} \quad (2)$$

where X includes the same set of moderating and control variables defined in the previous sub-section, δ includes a set of regional dummy variables, Z is an instrumental variable (*CERT_GROWTH*, defined below), and u_{1i} and u_{2i} are error terms which are assumed to follow a bivariate normal distribution with mean zero and variance/covariance matrix Σ equal to:

$$\Sigma = \begin{bmatrix} \sigma^2 & \rho\sigma \\ \rho\sigma & 1 \end{bmatrix}.$$

The first equation (Eqn. (2a)) has the same specification as Eqn. (1), and the certification decision (Eqn. (2b)) is assumed to be the observed binary outcome of an unobservable latent variable ($CERTIF_i^*$) defined according to the following rule: $CERTIF_i = 1$ if $CERTIF_i^* > 0$, and $CERTIF_i = 0$ if

Table 4. *Treatment FIML estimates of Eqns. (2a) and (2b).*

Dependent variable:	(1) *ENV*	(2) *CERTIF*	(3) *SOC*	(4) *CERTIF*
CERTIF	0.061***		0.008	
	(0.023)		(0.012)	
COOP	0.079***	0.727***	0.008	0.735***
	(0.025)	(0.224)	(0.016)	(0.223)
GOVERN	0.018	0.982***	0.047***	0.951***
	(0.024)	(0.296)	(0.013)	(0.282)
INCOME	−0.677	0.740	−0.616	0.740
	(0.448)	(2.434)	(0.445)	(2.438)
SIZE	0.060***	0.273***	0.042***	0.271***
	(0.007)	(0.085)	(0.004)	(0.084)
AGE	−0.013	−0.117	0.005	−0.116
	(0.011)	(0.112)	(0.007)	(0.112)
ALTITUDE	0.183***	−1.716**	0.113***	−1.699**
	(0.052)	(0.701)	(0.038)	(0.692)
YIELD	0.020*	0.144	0.024***	0.142
	(0.010)	(0.101)	(0.006)	(0.100)
CERT_GROWTH		2.191***		2.186***
		(0.469)		(0.467)
Constant	−1.110***	8.333	−0.504*	8.234
	(0.392)	(5.210)	(0.279)	(5.167)
Rho (std. err.)	−0.060		−0.076	
	(0.086)		(0.081)	
Wald test of indep.	0.49		0.90	
equations (*p*-value)	(0.49)		(0.34)	
Kleibergen–Paap LM	61.10		61.10	
Under. test (*p*-value)	(0.01)		(0.01)	
Cragg–Donald *F* test	26.98		26.98	
Weak ident. (5% c.v.)	(13.46)		(13.46)	
Anderson–Rubin *F*	1.37		1.26	
Orthog. test (*p*-value)	(0.26)		(0.29)	
Hansen *J* test	2.16		2.31	
Overident. (*p*-value)	(0.14)		(0.13)	

Note: Regional dummy variables included. Robust/clustered standard errors in parentheses.
Number of observations: 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

$CERTIF_i^* \leqslant 0$. The model is estimated using the full information maximum likelihood (FIML) method proposed by Maddala (1983) for binary endogenous variables.

The instrumental variable (*CERT_GROWTH*) which is included in Eqn. (2b) but excluded from Eqn. (2a) in order to identify the system, is computed as the annual growth rate of the share of farms located in the same region k ($k = 1, \ldots, 10$), with certification from a program of the same global buyer. [11] Our assumption for identification of the system of Eqns. (2a) and (2b) is that the variable *CERT_GROWTH* has a direct (and expected positive) effect on the decision of farm i to apply for certification but no direct effect on its environmental and social conduct because these latter can be decoupled from the standards associated to the certification soon after certification is awarded.

Figure 1 plots the average time trend for the share of certified firms in each region (upper panel) and their yearly growth rate (lower panel). The average share of certified farms shows the typical shape of a logistic function with an accelerating trend up to year 2007 which then becomes quite flat.

Table 4 reports the FIML estimates of the system of equations considering as the dependent variable for Eqn. (2a) the scores for both the firm's environmental (column 1) and social (column 3) conduct. The FIML estimation results for (2a) are similar to the OLS/GLM estimation results for Eqn. (1), suggesting lack of severe endogeneity bias in our previous estimates. This evidence is supported by the Wald test of independent equations which indicates that the null hypothesis of no correlation ($\rho = 0$) between the treatment error u_{2i} and the outcome error u_{1i} terms cannot be rejected. The validity of the instrumental variable *CERT_GROWTH* is supported by the under-identification, weak-identification, over-identification, and orthogonality tests (reported in Table 4). [12] Also, the estimated parameter of *CERT_GROWTH* in Eqn. (2b) is strongly significant and has the expected positive sign. The estimation results of Eqn. (2b) in Table 4 columns (2) and (4) show that the probability of being awarded certification is greater for larger farms, for farmers whose main intermediary is a cooperative, for farms located in countries with high institutional quality, and for farms at low altitudes.

(c) *Moderating effects of farmers' main intermediaries, home country institutional quality, and economic status*

This section assesses whether the certification effects on the farm's social and environmental conduct (analyzed in the previous sections) are moderated by the type of its main intermediary, the farm's home country's institutional strength, and the farmer's economic status.

Since we found no severe endogeneity issues affecting the OLS/GLM estimates of model (Eqn. (1)) in the above section, we extend this model by adding several interaction terms for

Table 5. *Interaction effects. OLS and GLM estimates. Dependent variable: ENV*

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) GLM
CERTIF	0.032	0.050***	0.099***	0.083*	0.412
	(0.028)	(0.018)	(0.031)	(0.043)	(0.258)
COOP	0.060*	0.082***	0.075***	0.065*	0.269
	(0.035)	(0.025)	(0.025)	(0.035)	(0.191)
COOP × CERTIF	0.035			0.018	0.060
	(0.036)			(0.038)	(0.205)
GOVERN	0.022	0.020	0.075**	0.071*	0.329
	(0.025)	(0.024)	(0.037)	(0.038)	(0.204)
GOVERN × CERTIF			−0.072*	−0.064*	−0.312*
			(0.037)	(0.038)	(0.178)
INCOME	−0.682	−0.808	−0.674	−0.749	−3.231***
	(0.449)	(0.689)	(0.454)	(0.699)	(0.303)
INCOME × CERTIF		0.291		0.172	0.060
		(0.780)		(0.800)	(0.862)
SIZE	0.061***	0.060***	0.059***	0.060***	0.259***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.040)
AGE	−0.012	−0.013	−0.012	−0.011	−0.048
	(0.011)	(0.011)	(0.011)	(0.011)	(0.061)
ALTITUDE	0.172***	0.179***	0.190***	0.184***	0.795
	(0.053)	(0.052)	(0.051)	(0.051)	(0.558)
YIELD	0.021**	0.021**	0.020**	0.021**	0.087
	(0.010)	(0.010)	(0.010)	(0.010)	(0.056)
Constant	−1.022**	−1.080***	−1.190***	−1.144***	−7.102*
	(0.397)	(0.394)	(0.386)	(0.387)	(4.154)
R-Squared	0.419	0.419	0.422	0.423	
VIF	2.65	2.21	2.95	3.50	

Note: Regional dummy variables included. Robust/clustered standard errors in parentheses.
Number of observations: 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 6. *Interaction effects. OLS and GLM estimates. Dependent variable: SOC*

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) GLM
CERTIF	0.001	−0.001	−0.012	−0.022	−0.084
	(0.014)	(0.011)	(0.024)	(0.024)	(0.121)
COOP	0.009	0.010	0.011	0.008	0.031
	(0.021)	(0.016)	(0.016)	(0.021)	(0.073)
COOP × CERTIF	−0.000			0.007	0.027
	(0.021)			(0.021)	(0.103)
GOVERN	0.048***	0.049***	0.033	0.030	0.125***
	(0.013)	(0.013)	(0.024)	(0.023)	(0.048)
GOVERN × CERTIF			0.019	0.026	0.100
			(0.027)	(0.024)	(0.066)
INCOME	−0.620	−0.769	−0.622	−0.793	−3.378***
	(0.451)	(0.665)	(0.452)	(0.664)	(0.260)
INCOME × CERTIF		0.346		0.396	1.500*
		(0.781)		(0.776)	(0.894)
SIZE	0.043***	0.043***	0.043***	0.043***	0.182***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.040)
AGE	0.005	0.005	0.005	0.005	0.023
	(0.007)	(0.007)	(0.007)	(0.007)	(0.043)
ALTITUDE	0.110***	0.109***	0.107***	0.104***	0.434***
	(0.038)	(0.038)	(0.038)	(0.038)	(0.156)
YIELD	0.024***	0.024***	0.024***	0.024***	0.102***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.039)
Constant	−0.483*	−0.478*	−0.455	−0.428	−3.887***
	(0.284)	(0.281)	(0.279)	(0.279)	(1.150)
R-Squared	0.502	0.503	0.502	0.504	
VIF	2.65	2.21	2.95	3.50	

Note: Regional dummy variables included. Robust/clustered standard errors in parentheses.
Number of observations: 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 7. *Marginal effects. Full GLM model*

MARGINAL EFFECTS *CERTIF*	(1) *ENV*	(2) *SOC*
CERTIF	0.054***	0.002
(overall)	(0.020)	(0.009)
CERTIF	0.060***	0.005
Buyer type: COOP	(0.021)	(0.009)
CERTIF	0.046	−0.002
Buyer type: NON COOP	(0.043)	(0.021)
CERTIF	0.100***	−0.014
GOVERN: low (=0)	(0.030)	(0.016)
CERTIF	0.031	0.009
GOVERN: high (=1)	(0.026)	(0.008)
CERTIF	0.054***	0.001
INCOME: low (mean-1SD)	(0.021)	(0.008)
CERTIF	0.054***	0.002
INCOME: high (mean + 1SD)	(0.020)	(0.008)

Note: Standard errors in parentheses computed with Delta Methods. *Number of observations:* 575. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

the dummy *CERTIF* which is multiplied by *COOP*, *GOVERN,* and *INCOME*. Tables 5 and 6 report the OLS and GLM estimates considering each type of moderating factor separately (columns (1)-(3)) and jointly (columns (4) and (5)). Therefore, the sign and statistical significance of the coefficients of the dummy variable *CERTIF,* and its interaction terms, in columns (1)–(5) change according to the reference category of each model.

Provided that in the full GLM model (Tables 5 and 6 columns (5)) there are multiple and repeated interaction terms that cannot be used directly to check the magnitude and statistical significance of the moderating factors (Tsai & Gill, 2013), we can ease interpretation of the reported estimates by computing the marginal effects and their statistical significance using delta methods (Barthus, 2005). The computed marginal effects of the independent and moderating variables are reported in Table 7 (columns (1) and (2)). When considering the farm's environmental conduct (*ENV*) as the dependent variable (column (1)), we still find a positive and significant marginal effect (+0.054) associated to the dummy *CERTIF*. This effect is stronger if the main intermediary is a cooperative (+0.060, buyer type: *COOP*) and if the farm is located in a country with low institutional quality (0.100, *GOVERN*: low = (0)). [13]

The variable *INCOME* does not appear to be a significant moderator of *CERTIF* since the estimated effect of certification on the environmental conduct is very similar for low- and for high-income farmers (+0.054). In contrast, if we consider the firm's social conduct as the dependent variable (*SOC*, column (2)), we find no significant effect of our moderators (type of main intermediary, home country institutional quality, and farmer's economic status).

(d) *Robustness checks*

In this section we check the robustness of our results in several ways. In order to take account of the different response rates across the items used to compute the dependent variables (*ENV* and *SOC)*, we re-compute them as weighted averages (rather than the previous unweighted averages), by weighting each single item by its response-rate (*ENV_WA* and *SOC_WA)*. We re-calculate the main marginal effects of the full GLM using these new dependent variables (Table 8 columns (1) and (2)) to check if they remain in line with those previously reported (Table 7 columns (1) and (2)). The estimated marginal effects do not change considerably. The dummy *CERTIF* has an estimated positive and significant effect (+0.048) on the firm's environmental conduct which is stronger if the main intermediary is a cooperative (+0.051), and if the farm is located in a country with low institutional quality (+0.069), and is of (approximately) the same magnitude for low- and high-income farmers (+0.07 and +0.048, respectively). However, here we observe a positive and significant effect of certification on social conduct but only for farmers located in high institutional quality countries (+0.014).

To further check the robustness of our results to different measures of the dependent variables, we estimate a multiple indicators multiple causes (MIMC) structural equation model (Jöreskog & Goldberger, 1975) involving two latent constructs for the farm's environmental (*ENV_MM*) and social (*SOC_MM)* conduct. The measurement parts of these two latent endogenous variables are defined by the following equations:

$$Ei = \lambda_{Ei} ENV\_MM + e_i \tag{3a}$$

$$Sj = \lambda_{Sj} SOC\_MM + s_j \tag{3b}$$

where Ei ($i = 1, \ldots, 17$) and Sj ($j = 1, \ldots, 21$) are the set of items listed in Appendix Tables 10 and 11, λ_{Ei} and λ_{Sj} are the respective estimated loadings (reported in Appendix Tables 10 and 11), and e_i, s_j are measurement errors. The structural equations of the model are defined similarly to the baseline model (1) (Appendix Figure A1 depicts the structure of the estimated MIMIC model):

$$ENV\_MM = \alpha_{ENV\_MM} + \beta_{ENV\_MM} CERTIF + \gamma_{ENV\_MM} X + u_{ENV\_MM} \tag{4a}$$

$$SOC\_MM = \alpha_{SOC\_MM} + \beta_{SOC\_MM} CERTIF + \gamma_{SOC\_MM} X + u_{SOC\_MM} \tag{4b}$$

The marginal effects computed from the estimated structural parameters α, β, γ, are reported in Table 8 (columns 3 and 4). The magnitudes of these marginal effects are different from those in columns 1 and 2 because *ENV_MM* and *SOC_MM* are standardized latent variables. [14]

However, the statistical significance of the marginal effects is roughly similar across the models which confirms the robustness of our results with respect to different measures (and measurement errors) of the dependent variables.

As a final robustness check, we re-estimate the marginal effects of *CERTIF* on all three measures of farmers' environmental and social conduct (*ENV; SOC; ENV_WA; SOC_WA; ENV_MM; SOC_MM*) using three different econometric techniques: i) an outlier-trimming robust regression using weights based on the Cook's distance for each observation (Rousseeuw & Leroy, 1987); ii) an average treatment effect on the treated (ATT) based on PSM with eight nearest neighbors; [15] iii) a quantile regression computed at the 25th, 50th, and 75th percentiles.

The estimation results are reported in Table 9. The robust regression and PSM estimates confirm the sign and magnitude of the marginal effects of *CERTIF*, while the results of the quantile regression highlight a stronger and positive estimated effect of *CERTIF* for the lower quantiles of *ENV*, i.e., certification improves environmental practices among farmers demonstrating "bad" environmental conduct but improves it less for farmers with already "good" environmental conduct. The results in Table 9 also highlight some small differences

Table 8. *Marginal effects. Full GLM model. Dependent variables: ENV_WA; SOC_WA; ENV_MM and SOC_MM*

MARGINAL EFFECTS	(1)	(2)	(3)	(4)
CERTIF	*ENV_WA*	*SOC_WA*	*ENV_MM*	*SOC_MM*
CERTIF	0.048**	0.003	0.019***	0.021
(overall)	(0.019)	(0.007)	(0.004)	(0.014)
CERTIF	0.051***	0.002	0.036***	0.040**
Buyer type: COOP	(0.018)	(0.005)	(0.005)	(0.018)
CERTIF	0.045	0.006	0.018	−0.002
Buyer type: NO COOP	(0.041)	(0.015)	(0.018)	(0.021)
CERTIF	0.069*	−0.018	0.018***	0.021
GOVERN: low (=0)	(0.037)	(0.017)	(0.007)	(0.035)
CERTIF	0.037	0.014***	0.019***	0.022**
GOVERN: high (=1)	(0.023)	(0.005)	(0.005)	(0.010)
CERTIF	0.047**	0.001	0.020***	−0.006
INCOME: low (mean-1SD)	(0.020)	(0.006)	(0.005)	(0.027)
CERTIF	0.048**	0.002	0.018***	0.049
INCOME: high (mean + 1SD)	(0.019)	(0.006)	(0.005)	(0.030)

Table 9. *Marginal effects of CERTIF. Robust, PSM and quantile regressions*

ESTIMATION METHOD	*ENV*	*SOC*	*ENV_WA*	*SOC_WA*	*ENV_MM*	*SOC_MM*
ROBUST REGRESSION	0.059***	0.005	0.054***	0.005	0.016***	0.003**
(outliers trimming)	(0.018)	(0.010)	(0.015)	(0.007)	(0.002)	(0.001)
PSM ATT	0.055**	−0.004	0.058***	−0.002	0.054***	0.013
(8 nearest neigh)	(0.021)	(0.012)	(0.018)	(0.007)	(0.014)	(0.009)
QUANTILE REGRESSION	0.075***	−0.005	0.062***	0.005	0.027***	0.004**
(quantile 0.25)	(0.018)	(0.015)	(0.018)	(0.009)	(0.005)	(0.001)
QUANTILE REGRESSION	0.073***	0.013	0.065***	0.003	0.023***	0.003*
(quantile 0.5)	(0.017)	(0.012)	(0.017)	(0.008)	(0.004)	(0.002)
QUANTILE REGRESSION	0.021	0.006	0.026	0.002	0.023***	0.002
(quantile 0.75)	(0.019)	(0.015)	(0.019)	(0.007)	(0.004)	(0.002)

in the statistical significance across the different dependent variables adopted. In particular, when considering *SOC_MM* we find a positive and statistically significant although small in magnitude effect of certification on social conduct.[16]

6. CONCLUSIONS

Large global buyers in the coffee industry have developed their own in-house socio-environmental standards and related certification schemes which is raising questions about whether they deliver the expected outcomes, particularly in relation to improved social and environmental conduct from farmers. While most previous research investigates the impacts of multiparty and NGO-led certifications such as Fairtrade, Organic and UTZ (see Blackman & Rivera, 2011 and Loconto & Dankers, 2014 for recent reviews), we focused on in-house certifications justified by their increase and their alleged differences *vis-à-vis* other types of certifications schemes (Giovannucci *et al.*, 2008).

Our work rests on the notion of decoupling. Borrowing from earlier research (Bromley & Powell, 2012; Marquis & Qian, 2013; Meyer & Rowan, 1977), we define decoupling as variation between certification standards and the conduct or practices undertaken by farmers after certification. Decoupling occurs when farmers are not fully compliant with certification policies and guidelines which means that their social and environmental conduct cannot be expected to differ from that of similar non-certified farmers. Our focus on social and environmental conduct is justified by evidence that farmers find it difficult to obtain the benefits from compliance (Blackman & Rivera, 2011; Loconto & Dankers, 2014), and by the relatively less attention to these impacts *vis-à-vis* purely economic impacts (e.g., Chiputwa *et al.*, 2015; Handschuch *et al.*, 2013; Jena *et al.*, 2015; Kleemann *et al.*, 2014; Utting-Chamorro, 2005; Van Rijsbergen *et al.*, 2016).

Our study relied on original survey data on 575 coffee farmers located in different regions of Brazil, Colombia, Costa Rica, Guatemala, and Mexico. We conducted an econometric analysis using different estimators (OLS, GLM, FIML, outlier trimming robust regression, PSM, quantile regression) in a quasi-experimental setting (Blackman & Rivera, 2011), and controlled for self-selection to check the robustness of our estimations. Our main results are discussed below.

First, we found that while in-house certifications may improve how farmers deal with environmental issues they are not an easy fix for social issues: certified farmers do not display substantially better social conduct than non-certified farmers. To interpret this result, we refer to the different incentives and rewards farmers might associate with each type of conduct: heightened attention to social issues may be perceived as costly and delivering very little immediate return. For instance, paying higher salaries, eradicating child labor, or improving the safety conditions of workers would be excessively expensive for most small-scale farms and for those small farmers likely to oppose or delay these kinds of interventions. Our results for social conduct are in line with earlier research on certification in agribusiness which shows that it has very limited, or statically insignificant impacts on health and education-related issues among workforces and families (Becchetti & Costantino, 2008; Mendez *et al.*, 2010; Ruben & Zuniga, 2011). More broadly, these findings echo the

findings of similar studies conducted in other industries which show that the introduction of codes of conduct in the context of developing countries' global value chain suppliers have controversial impacts on social upgrading conceptualized as improvements in workers' conditions (e.g., De Neve, 2009; Mezzadri, 2012; Puppim de Oliveira & de Oliveira Cerqueira Fortes, 2014; Rossi, 2013). For instance, Rossi (2013) finds that Moroccan fast fashion suppliers do not protect the rights of informal workers, essentially because they cannot afford to do so. Rossi (2013, p. 231) quoting an interviewee says that: *firms need to have the means to be compliant. If they cannot cover the expenses, they ask themselves why they are doing it. ... If they have to choose between survival and exports, they will choose survival, which means that they would delay the social compliance and maybe not export as much as they would, rather than close the factory because they cannot afford the expenses.*

In contrast, farmers with in-house certifications are more diligent about their environmental conduct, a result that we interpret in light of the higher efficiency which certain environmentally friendly practices bring about. For instance, re-use of sewage water may result in lower water costs, while measures such as recycling can improve the farm's waste management and provide direct tangible benefits for the farm. This interpretation is in line with research on the positive impact of multilateral/NGO-led certifications on farmers' environmental management (Ibanez & Blackman, 2016; Rueda *et al.*, 2015; Takahashi & Todo, 2013), and work on other industries (see e.g., Khattak, Stringer, Benson-Rea, & Haworth, 2015), suggesting that reductions in operational costs enabled by good environmental performance are an incentive for suppliers.

Another explanation for this result might be that environmental provisions are more easily codified and translated into practice, and therefore, are easier to perform and monitor. Social provisions related to certification can be more complex to implement and monitor, and more likely to generate conflict within the value chain. It is possible also that buyers put different weight on social compared to environmental issues, and monitor the former less closely. Unfortunately, we could not double-check the plausibility of this interpretation with buyers but earlier research shows that this type of selective focus by buyers does take place. For instance, in their work on Indian football manufacturing, Jamali *et al.* (2015) find that global buyers put more emphasis on eradication of child labor in their supply chain than on other still major issues such as job discrimination and gender inequality which allow significant production efficiency gains. In our research context it is possible that global buyers' particular emphasis on environmental compared to social issues, results in what Jamali *et al.* (2015) describe as a 'selective decoupling' strategy, where compliance is expected only in relation to more salient issues—either because they are less complex and more cost-effective, or because they are easier to monitor and govern.

A second result of our analysis is related to the role played by cooperatives as intermediary organizations. We find that farmers that sell most of their produce to cooperatives exhibit better environmental conduct than farmers that sell mostly to private intermediaries. In addition, when farmers sell to cooperatives, the positive impact of in-house certification on environmental conduct is higher. None of these results hold for farmer's social conduct: farmers selling to cooperatives do not exhibit better social conduct, and we observed no moderating role of cooperatives on the relationship between holding in-house certification and social conduct. This ambivalent result for cooperatives in relation to social and environmental practices is interesting. On the one hand, it supports earlier research suggesting that cooperatives can encourage upgrading through social monitoring or enhanced coordination (Arnould *et al.*, 2009; Luna & Wilson, 2015; Perez-Aleman, 2011; Shepherd, 2007; Wang & Qin, 2012; Wollni & Zeller, 2007) which eventually allows farmers to adopt more environmentally sustainable practices. On the other hand, it casts doubt on the effectiveness of these mechanisms for improving the social conditions on coffee farms. This latter result is not entirely new; previous work has highlighted concerns related to the cooperative organizational model, and the collective action problems and free riding behavior it engenders (Fischer & Qaim, 2012; Ortiz-Miranda & Moragues-Faus, 2015; Pennerstorfer & Weiss, 2012; Sexton, 1986; Staatz, 1987). Also, several studies have questioned the capacity of cooperatives to deliver the expected benefits to their members and affiliates (Cechin *et al.*, 2013; Luna & Wilson, 2015; Mujawamariya *et al.*, 2013; Murekezi *et al.*, 2012; Utting-Chamorro, 2005; Wollni & Fischer, 2014). As Shepherd (2007, p. 7) put it: "*The very success of this relatively limited number of cooperatives is often used to justify further investment to try to replicate that success elsewhere. Unfortunately, with these honourable exceptions, the track record of cooperative development has often been disappointing*".

Due to lack of information on the qualities and characteristics of cooperatives, and on their internal functioning, we are unable to dig further into what types of cooperatives are more likely to promote socially sustainable practices, and which are not able to do so. Similarly, we cannot investigate the reasons why the certified farms in our analysis that sell to cooperatives are not more socially sustainable. It might be that complying with social standards and improving social practices may be complex, and some cooperatives may not be sufficiently strong institutionally to promote these processes among certified farms. Qualitative research investigating the different motivations for cooperatives to promote compliance with environmental practices but not social ones, would be particularly worthwhile; we would encourage more research in this area. However, we do not downplay the relevance of cooperatives to promote social and environmental change on the ground, and our results should be understood in light of the limited data available to classify different kinds of cooperatives.

The third result of our analysis concerns the role of the home country government as an enabler through the quality of its institutions (Loconto & Dankers, 2014). We observed a direct effect of countries' institutional strength on farmers' social conduct, and in some of our robustness checks we also observed a positive effect of certification on social conduct among farmers located in institutionally stronger countries. These results might be because institutionally stronger countries are better able to enforce the rule of law, and ensure justice on issues related to workers' rights and workers' health, generating a disincentive for enacting socially harmful conducts.

This finding is juxtaposed to the negative moderating effect of national institutional quality on the relationship between in-house certification and environmental conduct. The effect of being certified is higher for farmers in institutionally weak countries. This result is coherent with the idea that global buyers provide assistance and support certified farmers operating in weaker institutional contexts to improve their environmental practices (London, 2008; London & Hart, 2004; Porter & Kramer, 2006, 2011). Another interpretation is that weak institutional contexts act as a spur to farmers who may see private certification as one of the few opportunities they will have to build a better and more sustainable future. In other words, the standards imposed by global buyers may act as a source of

guidance and stimulus not provided by the national institutional apparatus. Not surprisingly, it is those farmers with the poorest environmental conduct who benefit more from certification while the environmental conduct of farmers with "already good" environmental management standards is improved less by certification.

Overall, our work contributes to the literature on the impact of socio-environmental certifications on farmers' social and environmental conduct, in particular through its focus on in-house certifications which have received less attention in prior studies compared to other kinds of certification schemes (Arnould *et al.*, 2009; Ibanez & Blackman, 2016; Renard, 2010; Ruben & Zuniga, 2011; Rueda *et al.*, 2015; Wollni *et al.*, 2010). We add to the existing research by examining some of the factors that might contribute to the existence of a positive relationship between socio-environmental policies and practices, and would suggest that the drivers of farmers' social conduct may be very different from the drivers of their environmental conduct. In a nutshell, strong home country institutions appear fundamental for promoting more socially sustainable production, while other types of meso-level institutions such as certification and cooperatives may help to enhance environmental sustainability in the absence of strong national institutions.

While we believe that our study sheds further light on the impacts of certifications, we follow a major stream of contemporary research on standards and certifications that focuses on compliance in narrow terms—i.e., it is limited to observation of the socio-environmental impacts of the requirements of a certification scheme. Therefore, we are unable to observe the overall advances triggered by award of in-house certification on local communities' human rights, or on the eradication of different types of "unfreedoms" (Giuliani & Macchi, 2014; Sen, 1999). We would encourage study of the link between policies and practices, and their expected outcome (Bromley & Powell, 2012) of the construction of more sustainable and just societies. We leave this very important area to future research.

Our study contributes tangentially also to recent research on understanding whether suppliers' participation in global value chains contributes to their social and/or environmental upgrading (e.g., Barrientos, Gereffi, & Rossi, 2011; De Marchi, Di Maria, & Micelli, 2013; Nadvi & Knorringa, 2016; Nadvi & Raj-Reichert, 2015; Poulsen, Ponte, & Lister, 2016; Rossi, 2013; Selwyn, 2013). Gereffi and Lee (2016) point out that we still know very little about the conditions under which economic upgrading and social upgrading might be mutually supporting. Similarly, we know very little about how environmental upgrading comes about (De Marchi *et al.*, 2013). Our evidence suggests that social upgrading and environmental upgrading may be distinct processes, and leaves open questions about whether making advances in one of these aspects might come at the expense of the other.

This paper has some limitations, and the results should be interpreted with some caution. We count only on cross-sectional data due to the costs and difficulty involved in replicating the survey to collect data on the same farmers over several periods. Hence, our analysis is run in a quasi-experimental setting by comparing the different environmental and social performance of certified vs. non-certified farms, conditioned ceteris paribus on several observable characteristics, and assuming that no other relevant variables or confounding factors are omitted from our models. Although we checked the robustness of our results (including for self-selection issues) using different measurement methods, econometric tools, and model specifications, causal interpretation of our findings should be cautious since panel data and random treatment assignment in a randomized control trial have been proven to be statistically more robust approaches to impact evaluation. In addition, our data do not allow us to distinguish among different kinds of cooperatives; thus, we treated these intermediaries as a unique homogeneous bundle which likely is overly simplistic. A more qualitative ethnographic approach to the analysis of the influence of cooperatives, and more broadly, the processes through which our moderators influence farmers' conduct, could be a valuable way forward and would complement the present study. Finally, we acknowledge that our measures of environmental and social conduct were computed based on the responses to a set of questionnaire items from a third-party audit. Inevitably, we lost some information by summarizing in a 0–1 score such complex and multidimensional constructs.

NOTES

1. According to its proponents, CSV puts sustainability at the core of business activity by (i) re-conceiving products and markets to meet societal and environmental needs and target underserved markets; (ii) re-defining value chain productivity by promoting sustainability among the different actors in the chain; and (iii) building supportive industry clusters at company sites.

2. Here, we are contending that decoupling is observed also on smaller farms, and simple organizations with very few employees—often family members. We thank an anonymous reviewer for challenging our application of the notion of decoupling in the context of small farmers which often employ family members: why would they not be willing to improve the social conditions of their family members or their right to work in a more environmentally safe place? While the answer might seem intuitive, we would refer to the economics literature on the value of life and health which suggests attribution of the value of life and health increases as individuals' incomes increase (see among others Deaton, 2003; Hall & Jones, 2007; Murphy & Topel, 2006). Simply put, this literature suggests that the poor are more willing than the rich to sacrifice some of their health rights for an immediate economic return. Thus, we consider it plausible that farmers will privilege immediate economic returns over enhancement of the socio-environmental conditions which may be postponed or never fully implemented, of family members and/or workers. These insights suggest that the notion of decoupling can be applied to the context of small-scale farms.

3. We acknowledge that farmers may sell to different kinds of local intermediaries at the same time. However, the focus here is on the farmers' main local intermediary—i.e., the type of local intermediary to which they sell *most* of their coffee. We expect the most important intermediary (*vis-à-vis* more marginal local intermediaries) to have a stronger influence on the farmer's conduct.

4. The indicators and survey were developed by the Center for Intelligence on Sustainable Markets (CIMS), a non-profit organization based in Costa Rica.

5. The sample of certified farms on average covers 7% of the total population of farmers with the specific in-house certification analyzed in this study, up to the year of the survey (5% in Brazil; 4% in Colombia; 6% in Costa Rica; 16% in Guatemala; and 5% in Mexico). Since our interest is in assessing whether in-house certification improves farmers' environmen-

tal and social conduct (with respect to non-certified farmers), we excluded from the final sample 17 firms holding different certification from global buyers' in-house certification (e.g., C.A.F.E, UTZ, Organic, Rainforest, Fairtrade). However, we exploited this out-of-sample information to build an additional instrumental variable to test the over-identifying restrictions of our econometric model (see also fn. 12).

6. We acknowledge that the survey was conducted across two consecutive years when there may have been price fluctuations. However, since farmers located in the same country were surveyed in the same year, the regional dummy variables included in our econometric models capture both the heterogeneity of the geographical characteristics and the unobserved time effects (such as price fluctuations across different regions during 2008–09).

7. We thank an anonymous reviewer for her/his remarks on this point. We can confirm that 70% of the farms employ paid workers (sometimes in addition to unpaid workers), and the remaining 30% employ only unpaid family workers.

8. We acknowledge that this measure of farmers' income does not account for other potential sources of income. However, we point out that our sample includes only farms whose main source of income is coffee production which mitigates concerns about the validity of this measure. We thank an anonymous reviewer for suggesting the need to consider a farmer-level measure of economic status.

9. We computed the variables *SIZE*, *AGE* and *YIELD* in logarithms in order to obtain a scale-free interpretation of the estimated coefficient (semi-elasticities), and to reduce the influence of outliers.

10. Following a comment from a reviewer, we performed a split sample analysis on Brazilian farms since these are larger than the farms in other countries (see Table 1), and therefore, their social conduct is likely to affect a larger number of people, generating a potentially different incentive for enacting good social conduct. However, the results of our split sample do not indicate any impact of certification on social conduct in the context of Brazil which is in line with the results for other countries.

11. The focal farm i is excluded from the computation of shares by taking as the reference period a 1- year lag with respect to its certification date, or with respect to the survey reference period in the case of right censoring (i.e., if farm i was not certified at the end of the period of observation).

12. For the over-identification and orthogonality tests we used as an additional instrumental variable, the annual growth rate of the share of firms (located in the same region k) belonging to a certification program different from that of the global buyer. The descriptive statistics for this variable are available upon request.

13. These estimated effects of certification are significantly different from those estimated considering the other reference categories (i.e., intermediary = *NON COOP* and *GOVERN* = high(1)).

14. If we multiply these marginal effects by the sample standard deviations of *ENV* and *SOC* we obtain similar magnitudes.

15. When we estimated the ATT using PSM, none of the non-certified farmers was excluded from the common support. The median absolute bias computed when checking for the balancing properties of the matched units was less than 8%. Therefore, in our sample non-certified farmers can reasonably represent an adequate control group for the estimation of the average treatment effect on certified firms.

16. These differences can be explained by the different methodologies used to weight the set of questionnaire items used to build our composite indicators of farmers' environmental and social conduct, as explained in this section and in the Appendix.

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APPENDIX A.

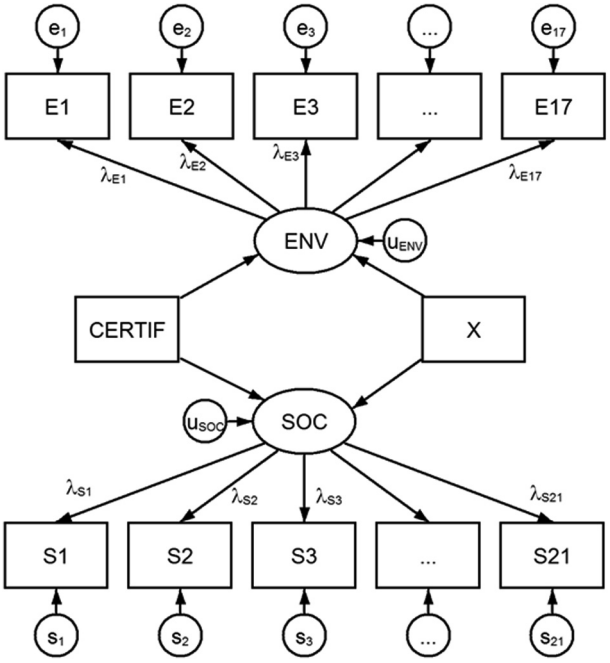

Figure A1. *Multiple Indicators Multiple Causes (MIMIC) Structural Equation Model.*

Table 10. *List of Items used to measure Environmental Conduct and estimated factor loadings λEi (Si) of the measurement model 3a for ENV_MM*

Items used to measure *ENV; ENV_WA; ENV_MM*	Codification	Estimated factor loadings λ_{Ei}
E1 – Energy consumption registry	1 if yes, 0 if no	1
E2 – Reduction of electricity use	1 if yes, 0 if no	0.506^{**}
E3 – Water consumption registry	1 if yes, 0 if no	-0.718^{**}
E4 – Water conservative practices	1 if yes, 0 if no	1.414^{***}
E5 – Agrochemical registry	1 if yes, 0 if no	1.145^{***}
E6 – Equipment washing	1 if yes, 0 if no	0.101
E7 – Policy of not applying biocides near drinkable water sources	1 if yes, 0 if no	1.182^{***}
E8 – Fertilizer registry	1 if yes, 0 if no	1.554^{***}
E9 – Soil Analysis	1 if yes, 0 if no	1.825^{***}
E10 – Use of fertilizer based on analysis	1 if yes, 0 if no	2.007^{***}
E11 – Use of organic fertilizer	1 if yes, 0 if no	2.692^{***}
E12 – Recycling of coffee pulp	1 if yes, 0 if no	3.819^{***}
E13 – Recycling of organic material (other than coffee pulp)	1 if yes, 0 if no	0.805^{***}
E14 – Recycling of plastics	1 if yes, 0 if no	1.610^{***}
E15 – Recycling of cardboard and paper	1 if yes, 0 if no	1.730^{***}
E16 – Processing and re-use of sewage water	1 if yes, 0 if no	2.353^{***}
E17 – Environmental management: 0 = no evidence of env management; 6 = physical evidence of env. Policy; 8 = physical evidence plus dedicated personnel; 10 = all of these plus written plan	Rescaled from 0 (no evidence) to 1 (1 would be 10)	0.836^{***}

Note: The first factor loading is constrained to 1 for each of the latent variables *ENV_MM* and *SOC_MM*. Estimated statistical significance of the factor loadings at the 10% (*), 5% (**) And 1% (***) level.

Table 11. *List of Items used to measure Social Conduct and estimated factor loadings λEi (Si) of the measurement model 3b for SOC_MM*

Items used to measure *SOC; SOC_WA; SOC_MM*	Codification	Estimated factor loadings λ_{Sj}
S1 – Existence of written employment policy for permanent workers: 1 = no; 2 = yes but little evidence of it; 3 = yes, dedicated personnel but not written; 4 = yes, written clear labor policy	rescaled from 0 (no) to 1 (maximum, i.e., score of 4)	1
S2 – Existence of written employment policy for temporary workers: 1 = no; 2 = yes but little evidence of it; 3 = yes, dedicated personnel but not written; 4 = yes, written clear labor policy	Rescaled from 0 (no) to 1 (maximum, i.e., score of 4)	1.375***
S3 – Distance from closest medical attention center (km): 1 = over 50 km; 2 = 10–50 km; 3 = 5.1–9.9 km; 4 = less than 5; 5 = within the farm	Rescaled from 0 (over 50 km) to 1 (within the farm)	−0.189***
S4 – Distance from medical center (Minutes): 1 = over 1 h; 2 = 30–60 min; 3 = 5-29 min; 4 = less than 5; 5 = within the farm	Rescaled from 0 (over 1 h) to 1 (within the farm)	0.195***
S5 – Accessibility of medical attention: 1 = too expensive; 2 = affordable; 3 = free	Rescaled from 0 (too expensive) to 1 (free)	0.106**
S6 – Status of the first aid kit: 3 = optimal; 2 = not very good; 1 = not existent	rescaled from 0 (not existent) to 1 (optimal)	0.602***
S7 – Suitable protection when applying agrochemicals: 1 = yes; 2 = no	1 if yes, 0 if no	0.820***
S8 – Workers' access to potable water in their houses: 1 = yes; 2 = no	1 if yes, 0 if no	0.224**
S9 – Workers' houses have a suitable place to prepare food: 1 = yes; 2 = no	1 if yes, 0 if no	0.181**
S10 – Permanent workers earn at least the minimum legal salary: 1 = yes; 2 = no	1 if yes, 0 if no	0.248**
S11 – Temporary workers earn at least the minimum legal salary: 1 = yes; 2 = no	1 if yes, 0 if no	0.292***
S12 – Evidence of wage discrimination? 1 = yes; 2 = no	1 if no, 0 if yes	0.074
S13 – Use of written contracts: 1 = yes; 2 = no	1 if yes, 0 if no	1.055***
S14 – Clarity of the contractual terms: 1 = yes; 2 = no	1 if yes, 0 if no	0.057
S15 – Employer respect of the contractual terms: 1 = yes; 2 = no	1 if yes, 0 if no	0.030
S16 – Workers' unionization: 1 = yes; 2 = no	1 if yes, 0 if no	−0.017
S17 – Relatives' supervision of minors than 14 when working: 1 = yes; 2 = no	1 if yes, 0 if no	0.029
S18 – Permanent workers enrollment in the social security system: 1 = yes; 2 = no	1 if yes, 0 if no	0.571***
S19 – Temporary workers enrolled in the social security system: 1 = yes; 2 = no	1 if yes, 0 if no	0.272**
S20 – Evidence that children in school years attend to school: 1 = yes; 2 = no	1 if yes, 0 if no	0.052
S21 – Democratic decision making in the farm: 1 = yes; 2 = no	1 if yes, 0 if no	0.073

Note: The first factor loading is constrained to 1 for each of the latent variables *ENV_MM* and *SOC_MM*. Estimated statistical significance of the factor loadings at the 10% (*), 5% (**) and 1% (***) level.

Table 12. *Correlation table*

	1	*2*	*3*	*4*	*5*	*6*	*7*
1. CERTIF	1						
2. COOP	0.0357	1					
3. GOVERN	0.1858	−0.3030	1				
4. INCOME	−0.0720	0.0101	−0.1795	1			
5. SIZE	−0.1527	0.2049	−0.5357	0.2823	1		
6. AGE	0.0875	−0.2242	0.1981	−0.0071	−0.0513	1	
7. ALTITUDE	0.2716	0.1841	0.4270	−0.1142	−0.4797	0.0353	1
8. YIELD	−0.1010	0.1487	−0.4242	0.2353	0.2374	−0.1112	−0.3295

Note: Pairwise correlation coefficients with and absolute value larger than 0.07 (0.08) [0.11] are statistically significant at the 10% (5%) [1%] level.