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The Evidence Base for Environmental and Socioeconomic Impacts of "Sustainable" Certification

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Abstract

Initiatives certifying that farms and firms adhere to predefined environmental and social welfare production standards are increasingly popular. According to proponents, they create financial incentives for farms and firms to improve their environmental and socioeconomic performance. This paper reviews the evidence on whether sustainable certification of agricultural commodities and tourism operations actually has such benefits. It identifies empirical *ex post* farm-level studies of certification, classifies them on the basis of whether they use methods likely to generate credible results, summarizes their findings, and considers the implications for future research. We conclude that empirical evidence that sustainable certification has significant benefits is limited. We identify just 37 relevant studies, only 14 of which use methods likely to generate credible results. Of these 14 studies, only 6 find that certification has environmental or socioeconomic benefits. This evidence can be expanded by incorporating rigorous, independent evaluation into the design and implementation of projects promoting sustainable certification.

Key Words: sustainable, certification, eco-label, literature review

JEL Classification Numbers: Q2, Q56

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Contents

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Allen Blackman and Jorge Rivera*

1. Introduction

Initiatives that certify that farms and firms adhere to defined environmental and social welfare production standards are increasingly popular. For example, more than 120 million hectares of forest have been certified by the Pan European Forest Certification Agency, the Forest Stewardship Council, and other organizations (Rametsteiner and Simula 2003). Some 100 certification schemes for tourism have emerged worldwide (Font 2002). And global production of organic, Fair Trade (FT), and other types of certified coffee has grown by 10 to 20 percent per year in recent years, a rate far higher than that for other types of specialty coffee (Kilian et al. 2004).

According to proponents, sustainable certification initiatives like these create incentives for farms and firms to improve their environmental and socioeconomic performance (Giovannucci and Ponte 2005; Rice and Ward 1996). In theory, certification enables the consumer to differentiate among goods and services based on their environmental and social attributes. This improved information facilitates price premiums for certified products, and these premiums, in turn, create financial incentives for farms and firms to meet certification standards.

Yet certification programs that aim to improve commodity producers' environmental and social performance face important challenges. They must use standards stringent enough and monitoring and enforcement strict enough to ensure that poorly performing producers are excluded. In addition, they must offer price premiums high enough to offset the costs of certification and attract a significant number of applicants. Even if these two challenges are met, certification schemes can still be undermined by selection effects. Commodity producers already

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meeting certification standards have strong incentives to select into certification programs: they need not make additional investments in environmental management to pass muster, and can obtain price premiums and other benefits. But certification programs that mainly attract such producers will have limited effects on producer behavior and few environmental and social benefits.

Although a fast-growing academic literature examines sustainable certification, we still know little about whether it actually affects farms' and firms' environmental and socioeconomic performance. Relatively few studies specifically aim to evaluate the impacts of certification, and many of those that do rely on crude methods that do not correct for selection effects or are likely to bias results for other reasons.

The objective of this paper is to assess the evidence base on the environmental and socioeconomic impacts of sustainable certification of agricultural commodities, tourism operations, and fish and forest products. We do this by identifying empirical studies of sustainable certification impacts, classifying them on the basis of whether they use methods likely to generate credible results, summarizing them, and considering the implications of our findings for future research.

The remainder of this paper is organized as follows. The next section discusses the methods we used to collect and classify certification studies. The third section discusses the main methodological challenge in evaluating certification impacts—constructing a credible counterfactual outcome. The fourth section provides an overview of the evidence base. The fifth section describes in more detail the studies that constitute the evidence base, and the last section considers the type of research needed to expand it.

2. Methods

To identify studies of sustainable certification, we searched digital databases, citations in relevant studies, and library catalogues. The digital databases included Econlit, Google, Google Scholar, Science Direct, Scirus, and Scopus. The library catalogues included the Center for Tropical Agricultural Research and Training (*Centro Agronómico Tropical de Investigación y Enseñanza*, CATIE) in Costa Rica, which houses a collection of unpublished studies of agricultural certification. In constructing electronic searches, we cast a wide net to identify as many studies as possible using a variety of combinations of search terms, including "certification," "ecolabel," and "label," sometimes in combination with the names of the sectors

on which we focused (bananas, cocoa, coffee, fish, etc.). We searched for published and unpublished studies in English and in Spanish.

Studies included in the evidence base met three criteria:

1. They analyzed certification of agriculture commodities, tourism enterprises, and fish and forest products (but not other types of activities, such as manufacturing).
2. They focused specifically on identifying socioeconomic and environmental impacts of certification (rather than consumer demand for certified products, the drivers of certification, or certification design recommendations).
3. They presented an *ex post* empirical analysis; in other words, an analysis of an actual experience with certification (rather than an *ex ante* simulation or general discussion).

Geographical focus was not a criterion; we included studies from industrialized countries as well from developing countries.

We grouped studies that met the three criteria into two categories:

A1. studies that constructed a reasonably credible counterfactual and could therefore be considered a test of the causal impact of certification; and

A2. studies that did not construct a reasonably credible counterfactual.

Section 3, below, discusses the reason for this distinction. Methodological issues that caused studies to be classified as A2 instead of A1 are detailed in Section 4, below. Studies that did not meet the three criteria for inclusion in the evidence base but were somewhat relevant because they shed light on certification impacts were placed in a third category, B.

We found studies in categories A and B for the following five sectors: bananas, coffee, fish, timber and nontimber forest products, and tourism. In addition, we found studies of certification of beef, pork, biofuels, cacao, and other agricultural products, which we include in a catchall “miscellaneous” category.

3. Counterfactual

To credibly identify the impacts of certification, an evaluation must construct a counterfactual outcome, which is an estimate of what environmental or socioeconomic outcomes for certified entities would have been had they not been certified. The impact of certification is defined as the difference between actual outcome and counterfactual outcome.

Unfortunately, most impact evaluations of certification programs use problematic counterfactual outcomes that likely bias their results. One common approach is to use certified entities' precertification outcome as the counterfactual outcome. The implicit assumption is that if certified entities had not been certified, their outcomes, on average, would have stayed the same. Obviously, this assumption is violated when outcomes change during the study period because of contemporaneous confounders, which are factors unrelated to certification that affect outcomes. For example, say that a study of the socioeconomic impacts of FT coffee certification uses certified growers' precertification household income as the counterfactual outcome and, therefore, measures impact as the difference between average precertification and postcertification household income. Furthermore, say that this difference is positive, significant, and large, so the evaluator concludes that certification raised average household income. This estimate of certification impact would be biased upward—and the evaluator's finding of a causal effect would be misleading—if growers' household incomes rose after certification for reasons that had nothing to do with certification. These reasons might include increases in international prices for coffee, advantageous weather conditions, or improvements in processing and marketing.

A second common approach is to use noncertified entities' outcomes as the counterfactual outcome; that is, noncertified entities serve as a control group. The implicit assumption is that if certified entities had not been certified, their outcomes would be the same, on average, as those of noncertified entities. This assumption is violated when entities with characteristics that affect outcomes select themselves—or are selected by certifiers—into certification, a problem known as selection bias. For example, say that a study of the impacts of organic coffee certification on soil erosion uses a measure of soil erosion on noncertified growers' farms as the counterfactual outcome and, therefore, calculates impact as the difference between average soil erosion measures for certified and noncertified households. Furthermore, say that this difference is negative, significant, and large, so the evaluator concludes that certification drove reductions in soil erosion. This estimate of certification's impact would be biased upward—and the evaluator's finding of a causal effect would be misleading—if growers with lower soil erosion rates self-selected into organic certification. This might happen if a disproportionate number of growers who had already adopted soil conservation measures sought organic certification, recognizing that they would not have to invest in additional conservation measures to meet certification standards.

Three principal approaches to constructing a credible counterfactual have been used (Ferraro 2009; Greenstone and Gayer 2007; Ferraro and Pattanayak 2006; Frondel and Schmidt

2005; Stern et al. 2005). One requires "randomized" or "experimental" design of certification projects to facilitate unbiased impact evaluation. For certification projects, this amounts to randomly selecting entities to receive certification from among a group of qualified and interested candidates. The outcome for the randomly constituted (noncertified) control group is then used as the counterfactual outcome for certified entities. This approach requires building evaluation into conservation project design. We discuss this issue in Section 6.

An alternative, "quasi-experimental" approach is to use matching. The idea is to match certified producers with noncertified producers that have very similar, if not identical, observable characteristics that plausibly affect outcomes, and to use outcomes for this matched control sample as the counterfactual outcome. For example, in a study of the soil erosion impacts of organic coffee certification, certified growers would be matched with noncertified growers of similar size, education, and previous history of adopting conservation practices. Measures of soil erosion for this matched control group would be used as the counterfactual. This approach depends on the dual assumptions that no unobservable characteristics of the entities in question (e.g., management skill) affect both selection into the certification program and outcomes, and that all noncertified entities in the matched control sample have characteristics that make them suitable for certification. Various methods are available for matching entities when the number of observable characteristics is large.

A second quasi-experimental approach, known as instrumental variables, takes advantage of known correlations between certification and "instruments"—characteristics of certified entities that plausibly affect the probability of certification but not the socioeconomic or environmental outcome of interest. These instrumental variables can be used to control for selection bias in a statistical analysis aimed at identifying the impact of certification on socioeconomic or environmental outcomes. For example, a study of environmental impacts of organic certification of coffee growers on farm income might use distance of the farm to a certifying agency headquarters as an instrument for certification. The drawback of this approach is that credible instrumental variables are generally hard to find.

As discussed in Section 5, the studies in the evidence base on the socioeconomic and environmental impacts of sustainable certifications that construct a counterfactual rely almost exclusively on quasi-experimental matching. Only two studies use instrumental variables, and none use an experimental design.

4. Overview of Evidence Base

We find that the evidence base is limited, consisting of just 37 studies meeting the three criteria for inclusion. Of these studies, 14 construct a reasonable counterfactual and have been categorized as A1. Only these 14 studies can be considered a credible test of the certifications' causal impacts. Most of the studies in the evidence base focus on coffee, timber, and bananas, and a disproportionate share examine FT certification. Although about half of the 37 studies in the evidence base analyze environmental impacts, only 4 of these are among the A1 studies that construct a reasonable counterfactual. Of these A1 studies, just 6 find some evidence that certification has positive socioeconomic or environmental impacts. Hence, at best, the A1 studies provide very weak evidence for the hypothesis that sustainable certification has positive socioeconomic or environmental impacts. The remainder of this section presents a more detailed overview.

4.1. By Relevance Category

From titles and abstracts, we identified 134 studies that might meet the criteria for inclusion in the evidence base. Upon acquiring and reading these studies, we deemed 75 studies irrelevant. Tables 1 and 2 provide an overview of the remaining 59 studies by relevance category (A1, A2, and B) and sector (bananas, coffee, etc.). Of these 59 studies, 37 meet the three criteria for inclusion in the evidence base listed in Section 2.2 (they analyze certification of agricultural commodities or tourism enterprises, focus specifically on impacts, and present an *ex post* empirical analysis) and were therefore placed in our A category. Twenty-two studies shed some light on certification impacts but do not focus directly on them and were therefore placed in our B category.

Of the 37 A studies included in the evidence base, 14 construct a reasonably credible counterfactual and were therefore categorized as A1. The remaining 23 studies were categorized as A2.

Of the 14 studies in the A1 category, all attempt to identify certification impacts by comparing certified and matched noncertified entities using cross-sectional data. Only three studies in the evidence base, all classified as A2, attempt to identify certification impacts using a before-after comparison (Quispe Guanca 2007; Ronchi 2002; Hicks and Schnier 2008). No studies compare certified and noncertified entities both before and after certification (i.e., "before-after-control-impact," BACI, study design).

Table 1. Studies of sustainable certification, by relevance category and sector

Category/Sector	Bananas	Coffee	Fish and shrimp	Timber	Tourism	Miscellaneous
A1: Credible counterfactual	Fort & Ruben (2008a) Ruben & van Schendel (2008) Zúñiga-Arias & Sáenz Segura (2008)	Arnould et al. (2009) Blackman & Naranjo (2010) Bolwig et al. (2009) Fort & Ruben (2008b) Lyngbaek et al. (2001) Sáenz Segura & Zúñiga-Arias (2008)	None	de Lima et al. (2008)	Rivera (2002) Rivera & de Leon (2004) Rivera et al. (2006)	Becchetti & Constantino (2008)
A2: Lacks credible counterfactual	Melo & Wolf (2007) Ruben et al. (2008)	Bacon (2005) Barbosa de Lima et al. (2009) Consumers Int'l (2005) Jaffee (2008) Kilian et al. (2004) Martínez-Sánchez (2008) Millard (2006) Philpott et al. (2007) Quispe Guanca (2007) Raynolds et al. (2004) Ronchi (2002) Valkila (2009)	Hicks & Schnier (2008)	Ebeling & Yasue (2009) Kukkonen et al. (2008) Madrid & Chapela (2003) Markopoulos (1998) Morris & Dunne (2003) Owari et al. (2006) Nebel et al. (2005) Thornber et al. (1999)	None	None
B: Not focused on impact but relevant	None	Calo & Wise (2005) Gobbi (2000) Kilian et al. (2003) Muradian & Pelupessy (2005) Ponte (2004) Potts (2007) TransFair USA (2006) TransFair USA (2008)	Erwann (2009) Garddiner & Viswanathan (2004) Gulbrandsen (2009) Ponte (2007)	Gullison (2003) Kurttila et al. (2000) Schlyter et al. (In Press) Schwarzbauer & Rametsteiner (2001) Vidal et al. (2005)	Rivera (2004) Goodman (2000) Tepelus & Castro Cordoba(2005)	Nilsson & Foster (2004) Rotherham (2005)

Table 2. Count of studies of sustainable certification, by relevance category and sector

	A1 Focused on impact	A2 Focused on impact	B Not focused on impact but relevant	*Total*
	Counterfactual	*No counterfactual*		
Bananas	3	2	0	**5**
Coffee	6	12	8	**26**
Fish	0	1	4	**5**
Timber	1	8	5	**14**
Tourism	3	0	3	**6**
Miscellaneous				
Ag. products	1	0	0	**1**
Beef, pork	0	0	1	**1**
Biofuels	0	0	0	**0**
Cacao	0	0	1	**1**
Total	**14**	**23**	**22**	**59**

4.2. By Sector

Of the 37 A1 and A2 studies in the evidence base, 18 focus on coffee, 9 on timber, 5 on bananas, 3 on tourism, 1 on fish, and 1 on a portfolio of agricultural products. Of the 14 A1 studies that construct a reasonably credible counterfactual, 6 focus on coffee, 3 on bananas, 3 on tourism, 1 on timber, and 1 on a portfolio of agricultural products. Finally, of the 23 A2 studies, 12 focus on coffee, 8 on timber, 2 on bananas, and 1 on fish.

4.3. By Environmental Focus

Table 3 summarizes the number of studies in the evidence base that focus on environmental impacts of certification (some of which also focus on socioeconomic impacts). Of all 37 A1 and A2 studies in the evidence base, 17 focus on environmental impacts. Of the 14 A1 studies, 4 focus on environmental impacts. As discussed in the next subsection, most of the A1 studies examine FT certification, a standard that mainly focuses on economic, not environmental, criteria. Finally, of the 23 A2 studies, 13 focus on environmental impacts.

Table 3. Count of studies of sustainable certification, by relevance category, sector, and environmental focus

	A1		A2		A1+A2	
	Any impact	Environmental impact	Any impact	Environmental impact	Any impact	Environmental impact
Bananas	3	0	2	1	5	1
Coffee	6	1	12	6	18	7
Fish	0	0	1	1	1	1
Timber	1	1	8	5	9	6
Tourism	3	2	0	0	3	2
Miscellaneous					0	0
Ag. products	1	0	0	0	1	0
Beef, pork	0	0	0	0	0	0
Biofuels	0	0	0	0	0	0
Cacao	0	0	0	0	0	0
Total	**14**	**4**	**23**	**13**	**37**	**17**

4.4. By Type of Certification

Table 4 lists the types of certification represented in the evidence base. They include: FT, Organic, Rainforest Alliance (RA), Utz Kapeh, Starbucks, Sustainable Agriculture Network (SAN), C.A.F.E., Dolphin-Safe, Forest Stewardship Council (FSC), Finnish Forest Certification System, Certificate for Sustainable Tourism, and Sustainable Slopes Program. Counting the number of studies focused on each type of certification is problematic because many studies examine more than one type. For example, several examine coffee farmers who are both FT and organic certified. That said, it is clear that a disproportionate share of the studies focus on FT. Of the 13 A1 studies, 7 examine FT. Six of these studies appear in a single edited volume on FT. Of the 23 A2 studies, 10 focus on FT. It is also clear that a disproportionate share of timber studies examine FSC certification. Of the 9 A1 and A2 studies of timber, 6 examine FSC certification.

Table 4. Studies of sustainable certification, by relevance category, sector, and type of certification

	A1		A2	
	No.	**Type certification (no.)**	**No.**	**Type certification (no.)**
Bananas	3	FT (3)	2	FT (1); RA
Coffee	6	FT (3); Organic	12	FT (9); Organic; RA; Utz; Starbucks; SAN; C.A.F.E.
Fish	0		1	Dolphin-Safe
Timber	1	FSC	8	FSC (5); RA; FFCS;
Tourism	3	CST; SSP	0	
Miscellaneous				
Ag. products	1	FT (1)	0	
Beef, pork	0		0	
Biofuels	0		0	
Cacao	0		0	
Total	**14**		**23**	

C.A.F.E. = Farmer Equity Practices; CST = Certification for Sustainable Tourism; FFCS = Finnish Forest Certification System; FSC = Forest Stewardship Council; FT = Fair Trade; RA = Rainforest Alliance; SAN = Sustainable Agriculture Network; SSP = Sustainable Slopes Program.

4.5. Impacts

Table 5 shows the number of A1 studies that find certification has an observable positive impact on farms or firms. Of the 14 A1 studies, only 6 find some evidence that certification has positive impacts. One of these 6 studies tests for a environmental impact and five for a socioeconomic impact. However, in two of the five studies of socioeconomic impacts (both of coffee), the authors themselves remark that these impacts are either idiosyncratic or somewhat inconsistent (see discussion in Section 5.2.1). Eight of the remaining 14 studies fail to find that certification has an observable impact. Three of these 8 studies test for environmental impacts, and the rest for socioeconomic impacts. Hence, at best, the A1 studies provide very weak evidence for the hypothesis that sustainable certification has positive socioeconomic or environmental impacts.

Table 5. Count of (A1) studies of sustainable certification that construct counterfactual by sector, and findings of observable positive impacts on firms and farms

	No.	Positive socioeconomic impact	Positive environmental impact
Bananas	3	1	--
Coffee	6	2	1
Fish	0	--	--
Timber	1	--	0
Tourism	3	1	0
Miscellaneous			
Ag. products	1	1	--
Beef, pork	0	--	--
Biofuels	0	--	--
Cacao	0	--	--
Total	**14**	**5**	**1**

5. Description of Evidence Base

This section briefly reviews the 37 studies that constitute the evidence base on sustainable certification. It is divided into six subsections corresponding to the represented economic sectors: bananas, coffee, fish, timber, tourism, and miscellaneous. Each subsection begins with an overview of the count and broad findings of the studies in the sector, then proceeds to “Causal Impacts”—one-paragraph descriptions of each of the A1 studies that constructs a reasonably credible counterfactual—and concludes with “Correlations”—a more concise discussion of the A2 studies.

5.1. Bananas

We found five studies that attempt to identify environmental or socioeconomic impacts of banana certification: Fort and Ruben (2008a), Ruben and van Schendel (2008), Zúñiga-Arias and Sáenz Segura (2008), Melo and Wolf (2007), and Ruben et al. (2008). All focus on FT certification. All but one (Melo and Wolf 2007) are collected in Ruben (2008), an edited volume on FT certification, and therefore focus on the impact of certification on growers' socioeconomic status, the main concern of this type of certification. Of the five studies, three—Fort and Ruben (2008a), Ruben and van Schendel (2008), and Zúñiga-Arias and Sáenz Segura (2008)—attempt to construct a credible counterfactual and therefore can be considered tests of certification's causal impact; the other two—Melo and Wolf (2007) and Ruben et al. (2008)—simply report on differences in outcomes of certified and noncertified farms.

Overall, these studies do not provide compelling evidence that FT certification boosts banana farmers' socioeconomic status or environmental performance. The last two studies, which simply compare average outcomes of certified and noncertified farmers without controlling for selection effects, find that certified farmers in Ecuador have higher socioeconomic status and better environmental performance. However, two of the first three studies, which use matching techniques to control for selection effects, find that in Ghana and Costa Rica, most socioeconomic indicators were no higher for certified farms than noncertified farms. Only Fort and Ruben (2008a) find that certification may have an impact. It concludes that FT certification in Peru boosts farm productivity, presumably by generating on-farm investment.

5.1.1. Causal Impacts

Fort and Ruben (2008a) examine the impact of FT banana certification in northern Peru on farmer households' socioeconomic status. They compare average household income and wealth for a treatment sample of 50 farm households that are both FT and organic certified (all affiliated with the same cooperative) and for a matched control sample of 150 farm households (all affiliated with other cooperatives), 110 of which are organic certified but not FT certified and 40 of which are neither FT nor organic certified. They use propensity score matching based on nine household characteristics to construct the control group. Comparing the treatment farms with the organic control farms, the authors find that the FT farmers have higher net income and profits mainly because they have higher productivity, not because they receive higher prices for their bananas. The authors hypothesize that FT farms are more productive because of provisions ensuring that FT premiums are invested rather than consumed. Comparing FT and organic farms with non-FT, nonorganic farms, the authors find that FT farmers again have higher incomes, but

in this case, the difference is mainly due to higher banana prices. Note that the authors' finding that certification boosts income and profits implicitly depends on the untestable assumption that the matching procedure has controlled for all important factors that account for differences in income and profits in treatment versus control farms. This assumption may not hold, however, because these two samples of farms are drawn from different cooperatives.

Ruben and van Schendel (2008) analyze the impact of FT banana certification in eastern Ghana on worker households' socioeconomic characteristics. They compare incomes and expenditures for a treatment sample of 50 worker households affiliated with an FT certified cooperative with those for 50 worker households affiliated with a noncertified cooperative. Matching is ad hoc: the authors attempt to construct a control sample with average characteristics (household size, age, highest education level, acres of land owned, and asset value) similar to those of the treatment sample. The authors find that FT workers receive lower total salaries and have lower total family income than non-FT workers but work fewer hours and receive more fringe benefits. Total expenditures for the two groups and subjective assessments of job safety, job satisfaction, and fairness are not significantly different.

Zúñiga-Arias and Sáenz Segura (2008) examine the impact of FT banana certification in southern Costa Rica on farmer households' socioeconomic status. They compare incomes, expenditures, and profits (among other variables) for 58 farm households affiliated with a FT certified cooperative with those for a matched sample of 55 farm households from a non-FT certified association. They use propensity score matching based on six household characteristics to construct the control sample. They find that income, expenditures, and profits are not significantly different for FT and non-FT households. However, FT households have higher levels of wealth and invest more in education and training. Like Fort and Ruben (2008a), the authors attribute this difference to collective decisionmaking about the use of FT premiums. Regarding attitudinal variables, FT farmers have a more positive view of their current and future well-being and a stronger feeling of belonging to their community.

5.1.2. Correlations

As noted above, two studies that simply compare average outcomes of certified and noncertified banana farmers without controlling for selection effects, find that certified farmers in Ecuador have better environmental performance and higher socioeconomic status. Melo and Wolf (2007) compare two sets of certified farmers: (i) a random sample of 10 large farms that belong to a producer association certified en mass by Rainforest Alliance, and (ii) a random sample of 13 smaller farms that belong to a producer association certified en mass by FT. Their

unmatched control sample is a set of 15 large farms and 9 small ones. Using Likert-scale measures of environmental "risks" related to land management, water quality, agrochemical management, and waste management, the authors find that certified farms have lower risk indices than noncertified farms. Ruben et al. (2008) compare productivity, income, and other farm characteristics of 57 FT certified farms belonging to a single grower association with those of 63 unmatched neighboring noncertified farms. They find that FT farmers have higher yields, labor productivity, assets, and credit access; use more organic fertilizer and pest control; and invest more in production, packing, environmental management, and health care—results they attribute to FT rules mandating that premiums be devoted to social and environmental investments.

5.2. Coffee

Although a considerable literature examines the link between coffee certification and the socioeconomic and environmental characteristics of farm households, to our knowledge, only six studies—Arnould et al. (2009), Blackman and Naranjo (2010), Bolwig et al. (2009), Fort and Ruben (2008b), Lyngbaek et al. (2001), and Sáenz Segura and Zúñiga-Arias (2008)—attempt to construct a credible counterfactual and therefore can be considered tests of certification's causal impact. Most farm-level coffee studies simply compare average characteristics of a sample of certified and noncertified farmers.

Overall, farm-level studies of coffee certification do not provide compelling evidence that certification has positive socioeconomic or environmental impacts. Of the six studies that attempt to construct a credible counterfactual, two—Arnould et al. (2009) and Bolwig et al. (2009)—find that certification has significant socioeconomic benefits, and one—Blackman and Naranjo (2010)—finds that certification has a significant environmental impact. However, Arnould et al. (2009) find that although certification generates a price premium, it is not consistently correlated with socioeconomic indicators, and Bolwig et al. (2009) argue that in their case, socioeconomic benefits are mainly due to a design anomaly of the certification scheme (see below). The three remaining studies—Fort and Ruben (2008b), Lyngbaek et al. (2001), and Sáenz Segura and Zúñiga-Arias (2008)—find that certification either has minimal socioeconomic benefits or actually generates a net cost.

Even among studies that do not attempt to construct a credible counterfactual, many fail to find a correlation between certification and socioeconomic or environmental benefits. Although Bacon (2005), Barbosa de Lima et al. (2009), Consumers International (2005), and Millard (2006) find that certified farmers receive higher prices, earn higher profits, or engage in

fewer environmental harmful practices than (unmatched) noncertified farmers. Jaffee (2008), Martínez-Sánchez (2008), and Quispe Guanca (2007) reach less optimistic conclusions. Calo and Wise (2005) and Kilian et al. (2004) construct farm budget models suggesting that price premiums for certification are too low for certification to be profitable.

5.2.1. Causal Impacts

Arnould et al. (2009) test for impacts of FT certification on a variety of socioeconomic indicators in communities in Nicaragua, Peru, and Guatemala. The authors use a multistage method to control for self-selection bias and confounding factors. To construct a matched control group of non-FT farmers, they first chose non-FT certified communities that were adjacent to the certified communities and comparable to them in terms of climate, geography, and growing conditions (including altitude, infrastructure, and distance to market). Next, they randomly chose farms in these non-FT certified communities that met the landholding criteria for FT participation (1 to 3 hectares per adult household member). Finally, they used the pooled sample of certified and noncertified farmers in each study country to run regressions to explain various farm-level socioeconomic indicators, including coffee volume sold, price obtained, educational attainment, and health. The explanatory variables in these regressions include a dummy indicating whether the farm was FT certified along with various farm and farmer characteristics. The authors find that FT certification is positively correlated with coffee volume sold and price obtained, but less consistently correlated with indicators of educational and health status.

Blackman and Naranjo (2010) use detailed agricultural census and geographic information system data on more than 6,000 farms in central Costa Rica to test for the environmental impacts of organic certification. They compare rates of adoption of four environmentally friendly farm management practices (soil conservation measures, shade trees, windbreaks, and organic fertilizer) and three unfriendly practices (insecticides, chemical fertilizers, and herbicides) for certified farms and for a matched control group of noncertified farms. They use propensity score matching to control for the age and education of the farmer and various physical characteristics of the farm, including size, coffee variety, climate, slope, aspect, and distance to population centers. They find that organic certification improves coffee growers' environmental performance. It significantly reduces chemical input use and increases the adoption of environmentally friendly management practices.

Bolwig et al. (2009) use a Heckman selection model to test for the impact of organic certification on farm income using a random sample of 112 certified and 48 noncertified farmers in eastern Uganda. They find that certification boosts net coffee revenue by 75 percent on

average. However, they argue that this revenue effect is not principally due to price premiums offered to certified farmers. Rather, it is an anomaly of the "contract farming" organic marketing system in their study, which requires participants to process their coffee before selling it, thereby increasing its value.

Fort and Ruben (2008b) use propensity score matching to test for the impact of FT certification on socioeconomic status in central Peru using a sample of 151 farmers from three FT cooperatives and 164 matched farmers from three non-FT cooperatives. Because some FT producers are also organic certified, the authors compared two treatment and control samples: organic FT farmers versus matched organic non-FT farmers, and nonorganic FT farmers versus matched nonorganic, non-FT farmers. A methodological concern is that the matching does not control for important differences between the cooperatives (such as percentage of coffee sold as FT) that almost certainly affect outcomes. In comparing organic FT farmers and matched organic non-FT farmers, the study finds no significant difference in income or investment, although FT farmers have more of certain types of assets. In comparing nonorganic FT farmers and nonorganic, non-FT farmers, the study finds FT farmers have lower incomes and productivity but higher levels of some assets and investments. The authors attribute the limited benefits of FT in their study to the "deficient distribution and use" of the FT premiums.

Lyngbaek et al. (2001) use somewhat weak ad hoc matching to identify the socioeconomic impact of organic certification in Costa Rica. They selected 10 matched pairs of small-scale organic farms and conventional farms in five regions of Costa Rica. Matched conventional farms were located near organic farms and had similar altitude and size. The authors find that average yields on organic farms were lower than on conventional farms and that average net income (excluding fixed certification costs) were similar for both groups, mainly because of price premiums received by organic farmers. However, if certification costs were considered, net income for organic farmers was significantly lower than for conventional farmers.

Sáenz Segura and Zúñiga-Arias (2008) use propensity score matching to test for the impact of FT certification on socioeconomic status using a sample of 103 farmers from western Costa Rica. A methodological concern is that all FT certified farmers belong to one cooperative and all non-FT certified farmers belong to a second cooperative. As a result, unobserved factors correlated with cooperative membership (not FT certification) may drive the observed differences between FT and non-FT farmers. The authors find that compared with matched non-FT farmers, FT farmers have lower incomes, profits, and household expenditures and worse perceptions of the functioning of their cooperatives.

5.2.2. Correlations

As noted above, several studies compare certified with unmatched noncertified farmers and find that certified farmers have higher socioeconomic status and/or use more sustainable management practices. Bacon (2005) finds that in a sample of 228 Nicaraguan farmers, organic and FT certified farmers receive higher prices and believe they have more secure land tenure. However, he also finds certified farms were no more insulated from adverse economic impacts of the sharp decline in coffee prices in the late 1990s and early 2000s (the "coffee crisis") than were noncertified farmers. Barbosa de Lima et al. (2009) examine SAN coffee certification in Minas Gerais, Brazil. In a sample of 16 farms, half of which were SAN certified, they find that SAN certification is correlated with use of an array of environmental practices, including use of less toxic agrochemicals and solid and liquid waste management. Consumers International (2005) analyzes environmental and social indicators in a sample of 28 (FT, organic, Utz Kapeh, and Rainforest Alliance) certified farms and 10 noncertified farms. They find that certified farms generate higher revenues and use more environmental practices. Finally, Millard (2006) evaluates the Starbucks and C.A.F.E. Practices certification project in Chiapas, Mexico. He finds that productivity, prices, and profits are higher for participants than for nonparticipants.

Several other studies that compare certified with unmatched noncertified farmers find that certified farmers do not do any better in terms of socioeconomic status and environmental performance. Using data from Oaxaca, Mexico on 26 FT and organic certified farms and 25 unmatched noncertified farms, Jaffee (2008) finds that although certified farms receive higher prices, they do not generate more income or wealth. Also, certified farmers do not believe they are better off than noncertified neighbors. He suggests that root causes are low premiums for FT coffee and high costs of organic certification. Philpott et al. (2007) compare ecological indicators for farms belonging to three organic certified, three organic and FT certified, and two uncertified cooperatives in Chiapas, Mexico. No effort is made to match the three types of cooperatives. They find no differences among the farms in ecological indicators. Similarly, Martínez-Sánchez (2008) compares ecological indicators for 10 certified organic and 10 unmatched noncertified farms in northern Nicaragua. He finds that organic farms do not have significantly different shade levels, bird diversity, or bird abundance. Quispe Guanca (2007) uses survey data on changes in environmental management practices before and after (organic, FT, Rainforest Alliance, Utz Kapeh, and C.A.F.E. Practices) certification for a sample of 106 certified farms in Costa Rica. He finds that although all certified farms reduced herbicide use after certification, most did not reduce other agrochemicals.

Finally, two studies use data from field surveys to construct spreadsheet farm budget models for certified and noncertified farms. Calo and Wise (2005) model the returns from organic and FT certification in Oaxaca, Mexico. They find that although FT certification is profitable, price premiums paid to organic farmers generally fail to cover the added costs associated with certification and maintenance (assuming market rates for labor). Focusing on Costa Rica, Kilian et al. (2004) find that with one exception (organic coffee sold in Europe), certification by itself does not generate significant price premiums. However, coffee quality is a prerequisite for a price premiums, and certification is a signal of this quality. They also find that although FT coffee, which establishes a price floor for certified coffee, ostensibly has a high premium, in practice it is much lower since the price floor generates excess supply; that is, not all certified FT coffee can be sold as such.

5.3. Timber

We identified nine studies purporting to evaluate environmental or socioeconomic impacts of forest and forest product certification—mostly Forest Stewardship Council (FSC) certification—by comparing certified and noncertified entities. Only one (de Lima et al. 2008) attempts to construct a credible counterfactual to disentangle the impact of certification. The other eight either simply compare certified and noncertified entities, or include a certification dummy variable in a regression meant to explain an environmental outcome.

Overall, these studies find little evidence that certification has significant observable environmental or socioeconomic impacts. This findings echo those of a recent review of evidence on the impact of forest certification on biodiversity (van Kuijk et al. 2009). The one study that constructs a counterfactual (de Lima et al. 2008) concludes that the environmental and socioeconomic impacts from FSC certification in Brazil are small.

Eight other studies examine certified and noncertified entities with an eye toward environmental and socioeconomic impacts but are not rigorous enough to credibly identify these impacts. That said, they do shed light on simple associations between certification and environmental and socioeconomic characteristics. Regarding environmental characteristics, several of the studies suggest that compared with conventional forest operations, certified operations are more likely to adopt management practices associated with forest conservation. For example, they may be more likely to comply with mandated forest management plans, report violations of environmental law, and adopt wildlife protection, forest fire prevention, and solid waste management practices (Madrid and Chapela 2003). Nevertheless, some of the studies find that certification is not necessarily correlated with actual improved environmental and

conservation outcomes (Kukkonen et al. 2008) and does not prevent large-scale deforestation (Ebeling and Yasue 2009; Nebel et al. 2005).

Regarding socioeconomic characteristics, the vast majority of studies that consider price premiums suggest that certification provides zero to negligible premiums (Madrid and Chapela 2003; Morris and Dunne 2003; Owari et al. 2006; Nebel 2005). That said, several studies find that certification may have indirect socioeconomic benefits including improved marketing (Ebeling and Yasue 2009; Madrid and Chapela 2003; Owari et al. 2006), stricter quality control in timber operations (Morris and Dunne 2003), better relations with regulators (Madrid and Chapela 2003), and improvements in overall management (Madrid and Chapela 2003).

5.3.1. Causal Impacts

De Lima et al. (2008) examine the impacts of FSC certification in highland natural forests of the Brazilian Amazon region. They compare indicators, drawn from original survey data, of both environmental and socioeconomic impacts for four FSC certified forest associations and two matched noncertified associations. The two noncertified associations were chosen based on three criteria: use of community forest management practices, logging for wood production as the main forest management activity, and land tenure characteristics. The study concludes that the environmental and socioeconomic impacts from certification were small. The authors hypothesize that in their sample, many of the seeming benefits of certification were already being realized through community forest management.

5.3.2. Correlations

As noted above, several studies that do not construct a counterfactual find that although forest certification may improve environmental management practices, the overall impact on promoting forest regeneration and stemming deforestation is limited. Kukkonen et al. (2008) use regression analysis to determine whether FSC certification affects environmental management and tree regeneration on a sample of 46 forest treefall gaps. They find that although FSC-certified forest plots used more environmentally friendly practices, tree regeneration was actually lower on certified plots than on conventional ones. Ebeling and Yasue (2009) reports qualitative results about the environmental impacts of FSC certification in Ecuador and Bolivia based on semistructured interviews with a variety of stakeholders, including 13 certified and 16 noncertified timber companies and landowners. They conclude that certification is unlikely to have significant environmental impacts in the many developing countries that, like Ecuador, have limited governance capacity in the forestry sector. Nebel et al. (2005) use secondary data on FSC and Smartwood certification in the eastern lowlands of Bolivia to determine what

management practices forest operators actually change to get certified. The authors conclude that certification by itself has resulted in only minor improvements in forest management and has not stemmed deforestation. Finally, Thornber et al. (1999) draw on secondary data and existing literature to provide a qualitative overview of socioeconomic and environmental benefits of timber certification worldwide. They conclude that the environmental benefits of certification are typically, small since most adopters already have superior environmental performance.

Several other studies that do not include a counterfactual generate similarly negative findings about certification's direct socioeconomic impacts but also note longer-term and less concrete certification benefits. Madrid and Chapela (2003) present a qualitative discussion of benefits of unspecified types of certification in communities in Mexico. Their study concludes that although the direct economic benefits are small or nonexistent, indirect benefits include conferring prestige, smoothing relations with external agencies, preserving the option of future business in the event that demand for certified timber increases, and providing an external audit of forestry operations that can be used to detect management inefficiencies. Morris and Dunne (2003) present an analysis of FSC certification in the South African furniture industry based on interviews with a variety of stakeholders, including certified and (unmatched) noncertified producers. They find that although FSC certification does not provide a price premium, it helps preserve existing market opportunities and contributes to quality control (because FSC labels include the location of manufacture and harvest). Markopoulos (1998) analyzes the impact of Rainforest Alliance certification on a community forest management project in Bolivia by comparing environmental and socioeconomic indicators from before and after certification. He finds that certification is correlated with price premiums but has not boosted community incomes. Owari et al. (2006) report results from a survey of 25 certified and 25 noncertified Finnish wood products companies, focusing on the companies' perceptions of certification. They conclude that although certified companies did not receive significant price premiums and did not believe that certification helped improve their financial performance, they viewed it as important for signaling environmental responsibility and maintaining existing market share. Finally, Thornber et al. (1999) (see above) find that FSC certification may marginalize smaller, local operations that lack the capital necessary to invest in certification.

5.4. Fish

We were able to identify only one empirical case study that focuses specifically on the environmental or socioeconomic impact of fish or shrimp certification—Hicks and Schnier (2008). This study purports to identify the impact of dolphin-safe certification on fishing

practices among U.S.-flagged ships in the eastern tropical Pacific. Dolphin-safe certification became mandatory for U.S-flagged ships in 1990. To identify the environmental impact of the certification mandate, the study uses a dynamic discrete choice model that essentially compares 1990–92 fishing practices with practices from 1980–81. Hence, the latter practices essentially serve as a counterfactual—that is, an indication of what would have happened absent certification. Results show that U.S.-flagged ships did, in fact, change their fishing practices as a result of the certification mandate, switching to methods of targeting tuna that kill fewer dolphins. Several issues complicate the policy implications of this study for certification schemes generally. First, it does not control for changes in the fishing fleet between 1980 and 1992 that had little to do with certification. Also, it does not control for self-selection into and out of the eastern tropical Pacific U.S. fleet. Finally, the dolphin-safe certification was mandatory, not voluntary. Therefore, it is more akin to a conventional regulatory standard than to a certification scheme.

5.5. Tourism

We identified three studies that focus on the environmental or socioeconomic impacts of certification in the tourism sector. All three—Rivera (2002), Rivera and de Leon (2004), and Rivera et al. (2006)—construct a reasonable counterfactual that controls for self-selection bias and therefore can credibly claim to have identified impacts. Overall, the studies paint a mixed picture. Rivera (2002) finds that hotel certification in Costa Rica can generate significant price premiums and therefore presumably have an economic benefit. However, the other two studies demonstrate that ski slope certification in the United States has failed to improve environmental performance and may even have generated environmental costs.

5.5.1 Causal Impacts

Rivera (2002) examines the economic impact of Certification for Sustainable Tourism, a Costa Rican program that certifies the environmental performance of hotels based on more than 100 criteria. The study compares pricing and sales of a sample of participating and nonparticipating hotels using a two-stage Heckman procedure to correct for self-selection bias. A limitation is that the sample of certified hotels is small (52). The econometric results suggest that certified hotels with particularly high environmental performance ratings show a commensurate increase in room pricing, of about $20 per room per night.

Rivera and de Leon (2004) and Rivera et al. (2006) analyze the environmental impact of the Sustainable Slopes Program, a voluntary initiative established by U.S. ski areas' industry

association. The studies compare independent third-party environmental performance ratings of participating and nonparticipating ski areas in the western United States using a two-stage Heckman procedure to control for self-selection bias. Here, too, a limitation is the small sample of certified ski areas (fewer than 100 in each study). Results of the two studies suggest that in the first years of the Sustainable Slopes Program, noncertified ski areas had better environmental performance than certified areas and subsequently had equivalent but not superior levels for most environmental performance indicators. The authors attribute this finding to a lack of institutional mechanisms to prevent opportunistic behavior. That is, the program does not have specific environmental standards, lacks third-party oversight, and does not have sanctions for poor performance.

5.6. Miscellaneous

We identified one empirical study of the impacts of certification in a sector other than bananas, coffee, fish, timber, or tourism. Becchetti and Costantino (2008) analyze the socioeconomic impact of FT certification of a variety of agricultural products (including mango, guava, lemon, sorghum, maize, millet, okra, and red pepper) for producers affiliated with an FT certified producer association in central Kenya. It explicitly controls for selection bias by estimating a system of two equations—a certification (selection) equation and an impacts (treatment) equation—for each socioeconomic indicator in question (no environmental indicators are included). The first equation regresses a certification dummy onto farm and farmer characteristics, and the second regresses a socioeconomic indicator onto a participation dummy along with a variable that indicates the number of years the producer has been affiliated with the FT association. The authors find that the number of years of affiliation variable is positive and significant in two of the six selection effects models: for nutritional quality and satisfaction with living conditions. They conclude that FT certification has causal impacts on these two variables.

6. Conclusion

As discussed in Sections 4 and 5, the evidence base on the environmental and socioeconomic impacts of sustainable certification is relatively thin, comprising 37 studies, of which only 14 attempt to construct a credible counterfactual and can, therefore, be considered tests of causal impacts. This section considers how future research could contribute to the evidence base.

6.1. What Type of Research is Needed to Expand the Evidence Base?

The overview of the evidence base presented in Section 4 highlights the type of research that is lacking. At a very general level, more studies of causal impacts—that is, studies that construct a credible counterfactual—are needed. Several more specific gaps are also apparent. First, certain sectors have been ignored. Twelve of the 14 existing studies of causal impacts focus on bananas, coffee, and tourism. Studies are needed on fish, timber, cacao, biofuels, beef and pork, and other agricultural products. Second, certain types of certifications have been ignored. Eleven of the 14 existing studies examine FT and organic certification (indeed, most are drawn from a single edited volume on FT). Studies are needed on other types of certification, such as Rainforest Alliance, SAN, and EUREGAP. Finally, 10 of the 14 studies of causal impacts of certification focus on socioeconomic impacts. More studies of environmental impacts are needed, including studies of impacts on ecological services and biodiversity.

6.2. How Can Certification Projects Be Designed to Generate Further Evidence?

An array of institutions, including nongovernmental organizations, national governments, and multilateral and bilateral international cooperation organizations, fund projects that purport to either expand participation in existing certification systems or develop new systems. However, few include rigorous evaluation components that take full advantage of the opportunities the projects afford to expand the evidence base on the impacts of sustainable certification. The following are recommendations for designing certification projects to help fill this gap.

First, require projects to clearly articulate the general and specific objectives of certification and to spell out measurable indicators of success. For example, the general objective of a cocoa certification project might be to enhance biodiversity in cacao-growing landscapes. Specific objectives might include increasing bird and insect species richness on certified plots by 10 percent compared with control plots over a specified period. Indicators of success might be specific measures of bird and insect richness. Explicit objectives and indicators of success like these will facilitate impact evaluation and strengthen incentives to design and implement certification projects in a manner that generates these impacts.

Second, require that projects include a detailed plan for project evaluation and a budget sufficient to implement it.

Third, require that project evaluations—including design, implementation, and dissemination—be conducted by an independent third party. Allowing certification programs to evaluate their own efforts may create conflicts of interest.

Fourth, design evaluations to maximize the opportunities for knowledge creation. Several recent studies discuss design principles for environmental project evaluation (Ferraro 2009; Greenstone and Gayer 2007; Ferraro and Pattanayak 2006; Frondel and Schmidt 2005; Stern et al. 2005). Here, we briefly list recommendations as they apply to sustainable certification programs:

- Evaluations should not be *ex post* exercises. Rather, they should be planned alongside the certification project itself and built into project design.
- Evaluations should collect outcome data for certified entities (the treatment group) and noncertified entities (the control group), ideally from before and after certification. Collecting *ex post* data from certified entities is generally straightforward and low cost. More difficult—but critically important—is collecting data from uncertified entities and *ex ante* (baseline) data from both groups.
- When practical, projects should incorporate a randomized design that generates a control sample of noncertified entities that is very similar to certified entities. This can be accomplished by, for example, compiling a sampling frame of matched locations (towns, villages, etc.) targeted for certification, and then randomly selecting a subsample where certification is actually promoted; or by delaying the award of certification by one or two years for a random sample of entities that have successfully applied for certification.
- After a control group is constructed, a second layer of randomization should be introduced, where practical, to create additional knowledge about certification drivers and impacts. This could be accomplished by, for example, randomly assigning different types of certification (e.g., Rainforest Alliance and Bird Friendly for coffee producers) across applicants to gauge their relative impacts; or randomly varying the amount and type of certification subsidies (financial and technical) provided to producers to gauge their effectiveness; or allowing for slight changes in certification requirements across randomly selected applicants.

Fifth, train project personnel in the principles of project evaluation to facilitate cooperation with third-party evaluators.

Finally, promote transparency in the evaluation process and plan and budget for dissemination of the evaluation results. Transparency helps minimize opportunities for gaming, and widespread dissemination via websites and academic publication maximizes the benefit of evaluation.

References

Arnould, E., A. Plastina, and D. Ball. 2009. Does Fair Trade deliver on its core value proposition? Effects on income, educational attainment, and health in three countries. *Journal of Public Policy and Marketing* 28(2): 186–201.

Bacon, C. 2005. Confronting the coffee crisis: Can Fair Trade, organic, and specialty coffees reduce small-scale farmer vulnerability in northern Nicaragua? *World Development* 33(3): 497–511.

Barbosa de Lima, A., A.L. Novaes Keppe, F.E. Maule, G. Sparovek, M. Corréa Alves, and R. F. Maule. 2009. Does certification make a difference? Impact assessment study on FSC/SAN certification in Brazil. Available at http://www.imaflora.org/arquivos/Does_*certification*_make_a_difference.pdf.

Becchetti, L., and M. Constantino. 2008. The effects of fair trade on affiliated producers: An impact analysis on Kenyan farmers. *World Development* 36: 823–42.

Blackman, A., and M.A. Naranjo. 2010. Does eco-certification have environmental benefits? Organic coffee in Costa Rica. Working paper. Washington, DC: Resources for the Future.

Bolwig, S., P. Gibson, and S. Jones. 2009. The economics of smallholder organic contract farming in tropical Africa. *World Development* 37(6): 1094–104.

Calo, M., and T.A. Wise. 2005. Revaluing peasant coffee production: Organic and Fair Trade markets in Mexico. Global Development and Environment Institute, Tufts University. October.

Consumers International and the International Institute for Environment and Development. 2005. From bean to cup: How consumer choice impacts upon coffee producers and the environment. December. Available at http://www.consumersinternational.org/Shared_ASP_Files/UploadedFiles/FDB0EF2D-14FE-4558-B219-A7FD81E089FB_CIcoffeereport.pdf.

de Lima, A.C.B., A.L. Novaes Keppe, M. Corrêa Alves, R. Fernando Maule, and G. Sparovek. 2008. Impact of FSC forest certification on agroextractive communities of the state of Acre, Brazil. Instituto de Manejo e Certificação Florestal e Agrícola (Imaflora), University of São Paulo (USP), Entropix Engineering Company.

Ebeling, J., and M. Yasue. 2009. The effectiveness of market-based conservation in the tropics: Forest certification in Ecuador and Bolivia. *Journal of Environmental Management* 90(2): 1145–53.

Erwann, C. 2009. Eco-labeling: A new deal for a more durable fishery management? *Ocean & Coastal Management* 52(5): 250–57.

Ferraro, P. 2009. Counterfactual thinking and impact evaluation in environmental policy. In M. Birnbaum and P. Mickwitz (eds.), *Environmental Program and Policy Evaluation: New Directions for Evaluation* 122, 75–84.

Ferraro, P., and S. Pattanayak. 2006. Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLoS Biology* 4(4): 482–88.

Font, Z. 2002. Environmental certification in tourism and hospitality: Progress, process and prospects. *Tourism Management* 23: 197-205.

Fort, R., and R. Ruben. 2008a. The impact of fair trade on banana producers in Northern Peru. In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 2.

———. 2008b. The impact of fair trade on coffee producers in Peru. In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 3.

Frondel, M., and C. Schmidt. 2005. Evaluating environmental programs: The perspective of modern evaluation research. *Ecological Economics* 55(4): 515–26.

Garddiner P.R., and K. Viswanathan. 2004. Ecolabeling and fisheries management. *World Fish Center Studies and Reviews* 27: 44.

Giovannucci, D., and S. Ponte. 2005. Standards as a new form of social contract? Sustainability initiatives in the coffee industry. *Food Policy* 30: 284–301.

Gobbi, J. 2000. Is biodiversity-friendly coffee financially sustainable? An analysis of five different coffee production systems in western El Salvador. *Ecological Economics* 33: 267–81.

Goodman, A. 2000. Implementing sustainability in service operations at Scandic hotels. *Interfaces* 30(3): 202–14.

Greenstone, M., and T. Gayer. 2007. *Quasi-experimental and experimental approaches to environmental economics.* Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id_1001330.

Gulbrandsen, L. H. 2009. The emergence and effectiveness of the Marine Stewardship Council. *Marine Policy* 33(4): 654–60.

Gullison, R.E. 2003. Does forest certification conserve biodiversity? *Oryx* 37: 153–65.

Hicks, R.L., and K.E. Schnier. 2008. Eco-labeling and dolphin avoidance: A dynamic model of tuna fishing in the Eastern Tropical Pacific. *Journal of Environmental Economics and Management* 56(2): 103–16.

Jaffee, D. 2008. Better, but not great: The social and environmental benefits and limitations of Fair Trade for indigenous coffee producers in Oaxaca, Mexico. In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 9.

Kilian, B., C. Jones, L. Pratt, and A. Villalobos. 2004. Can the private sector be competitive and contribute to development through sustainable agricultural business? A Case study of coffee in Latin America. *International Food and Agribusiness Management Review* 7(3): 21-45.

Kukkonen, M., H. Rita, S. Hohnwald, and A. Nygren. 2008. Treefall gaps of certified, conventionally managed and natural forests as regeneration sites for Neotropical timber trees in northern Honduras. *Forest Ecology and Management* 255(7): 2163-2176.

Kurttila, M., M. Pesonen, J. Kangas, M. Kajanus. 2000. Utilizing the analytic hierarchy process (AHP) in SWOT analysis: A hybrid method and its application to a forest-certification case. *Forest Policy and Economics* 1(1): 41-52.

Lyngbaek, A., R. Muschler, and F. Sinclair. 2001. Productivity and profitability of multistrata organic versus conventional coffee farms in Costa Rica. *Agrofestry Systems* 53: 205-213.

Madrid, S., and F. Chapela. 2003. Forest certification in Mexico: The cases of Durango and Oaxaca. Annex 3. Case study report prepared for A. Molnar (ed.) *Forest certification and communities: Looking forward to the next decade*. Washington, DC: Forest Trends. Available at http://www.forest-trends.org.

Markopoulos, M. 1998. The impacts of certification on community forest enterprises: A case study of the Lomerio Community Forest Management Project, Boliva. Oxford Forestry Institute, Oxford. April. Available at http://www.research4development.info/PDF/Outputs/Forestry/R7285Impacts_of_Certification_on_community_forest_enterprises.pdf.

Martínez-Sánchez, J.C. 2008. The role of organic production in biodiversity conservation in shade coffee plantations. Ph.D. Dissertation. University of Washington, Seattle.

Melo, C.J., and S.A. Wolf. 2007. Ecocertification of Ecuadorian bananas: Prospects for progressive North–South linkages. *Studies in Comparative International Development* 42: 256–278.

Millard, E. 2006. Increasing profitability for farmers supplying to the international coffee market by improving supply chain management, including traceability. USAID Regional Consultation on Linking Farmers to Markets: Lessons Learned and Successful Practices, Cairo, January. Available at http://www.globalfoodchainpartnerships.org/cairo/papers/EdwardMillardCoffee.pdf.

Morris, M., and N. Dunne. 2003. Driving environmental certification: Its impact on the furniture and timber products value chain in South Africa. *Geoforum* 35(2): 251-266.

Muradian, R., and W. Pelupessy. 2005. Governing the coffee chain: The role of voluntary regulatory systems. *World Development* 33(12): 2029–2044.

Nebel, G., L. Quevedo, J. Bredahl Jacobsen, and F. Helles. 2005. Development and economic significance of forest certification: The case of FSC in Bolivia. *Forest Policy and Economics* 7(2): 175–86.

Nilsson, T., and K. Foster. 2004. Product and process certification in imperfectly competitive markets. AAEA selected paper 118564. Denver,. August. Available at http://ageconsearch.umn.edu/bitstream/19933/1/sp04ni02.pdf.

Owari, T., H. Juslin, A. Rummukainen, and T. Yoshimura. 2006. Strategies, functions and benefits of forest certification in wood products marketing: Perspectives of Finnish suppliers. *Forest Policy and Economics* 9(4): 380–91.

Philpott, S., P. Bichier, R. Rice, and R. Greenberg. 2007. Field testing ecological and economic benefits of coffee certification programs. *Conservation Biology* 21(4): 975–85.

Ponte, S. 2004. Standards and sustainability in the coffee sector. International Institute for Sustainable Development. Available at http://www.iisd.org/.

Ponte, S. 2007. Greener than thou: The political economy of fish ecolabeling and its local manifestations in South Africa. *World Development* 36(1): 159–75.

Potts, J. 2007. Alternative trade initiatives and income predictability: Theory and evidence from the coffee sector. International Institute for Sustainable Development.

Quispe Guanca, J.L.. 2007. Caracterización del impacto ambiental y productivo de las diferentes normas de certificación de café en Costa Rica. Master's thesis. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). Available at http://orton.catie.ac.cr/repdoc/A1725e/A1725e.pdf.

Rametsteiner, E. and M. Simula. 2003. Forest certification: An instrument to promote sustainable forest management? *Journal of Environmental Management* 67: 87–98.

Raynolds, I., D. Murray, and P. Taylor. 2004. Fair Trade coffee: Building producer capacity via global networks. *Journal of International Development* 16: 1109-1121.

Rice, R. and J. Ward. 1996. Coffee, conservation and commerce in the western hemisphere: How individuals and institutions can promote ecologically sound farming and forest management in northern Latin America. Washington, DC: Smithsonian Migratory Bird Center.

Rivera, J. 2002. Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences* 35: 333–60.

———. 2004. Institutional pressures and voluntary environmental behavior in developing countries: Evidence from the Costa Rican hotel industry. *Society and Natural Resources* 17: 779–97.

Rivera, J., and P. de Leon. 2004. Is greener whiter? The Sustainable Slopes Program and the voluntary environmental performance of western ski areas. *Policy Studies Journal* 32(3): 417–37.

Rivera, J., P. de Leon, and C. Koerber. 2006. Is greener whiter yet? The Sustainable Slopes Program after five years. *Policy Studies Journal* 34(2): 195–224.

Ronchi, L. 2002. The impact of Fair Trade on producers and their organizations: A case study with Coocafé in Costa Rica. Policy Research Unit. Sussex: University of Sussex.

Rotherham, T. 2005. The trade and environmental effects of ecolabels: Assessment and response. United Nations Environment Programme.

Ruben, R. (ed.). 2008. *The impact of Fair Trade*. Netherlands: Wageningen Academic Publishers.

Ruben, R., and L. van Schendel. 2008. The impact of Fair Trade in banana plantations in Ghana: Income, ownership and livelihoods of banana workers. In R. Ruben (ed.), *The impact of Fair Trade*. Netherlands: Wageningen Academic Publishers. Chapter 6.

Ruben, R., L. Clercx, D. Cepeda, and T. de Hopp. 2008. Fair trade impact of banana production in El Guabo Association, Ecuador: A production function analysis. In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 7.

Sáenz Segura, F., and G. Zúñiga-Arias. 2008. Assessment of the effect of Fair Trade on smallholder producers in Costa Rica: A comparative study in the coffee sector. In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 5.

Schlyter, P., I. Stjernquist, and K. Backstrand. In Press. Not seeing the forest for the trees? The environmental effectiveness of forest certification in Sweden. *Forest Policy and Economics*. Available online 23 January 2009.

Schwarzbauer, P., and E. Rametsteiner. 2001. The impact of SFM-certification on forest product markets in Western Europe: An analysis using a forest sector simulation model. *Forest Policy and Economics* 2(3-4): 241–56.

Stem, C., R. Margoluis, N. Salfasky, and M. Brown. 2005. Monitoring and evaluation in conservation: A review of trends and approaches. *Conservation Biology* 19(2): 295–309.

Tepelus, C.M., and R. Castro Cordoba. 2005. Recognition schemes in tourism: From 'eco' to 'sustainability'? *Journal of Cleaner Production* 13(2): 135–40.

Thornber, K., D. Plouvier, and S. Bass. 1999. Certification: Barriers to benefits. A discussion of equity implications. Briefing paper. Forest Certification Advisory Group.

TransFair USA. 2006. 2005 Fair Trade coffee facts and figures. http://www.transfairusa.org/content/Downloads/2005Q2FactsandFigures.pdf

———. 2008. Coffee: Imports of fair trade certified coffee into the US.

Valkila, J. 2009. Fair Trade organic coffee production in Nicaragua: Sustainable development or a poverty trap? *Ecological Economics* 68: 3018–25.

van Kuijk, M., J. Putz, and R. Zagt. 2009. Effects of Forest Certification on Biodiversity. Wageningen, Netherlands: Tropenbos International.

Vidal, N., R. Kozak, and D. Cohen. 2005. Chain of custody certification: An assessment of the North American solid wood sector. *Forest Policy and Economics* 7(3): 345-355.

Zúñiga-Arias, G., and F. Sáenz Segura. 2008. The impact of Fair Trade in banana production of Costa Rica" In R. Ruben (ed.), *The impact of Fair Trade.* Netherlands: Wageningen Academic Publishers. Chapter 4.