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Is Eco-Certification a Win–Win for Developing Country Agriculture? Organic Coffee Certification in Colombia

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Summary. — According to advocates, eco-certification is a win–win solution to the problem of environmental degradation caused by developing country agriculture, improving both the environmental and the economic performance of farmers. However, these notional benefits can be undercut by the tendency of relatively wealthy farmers already meeting eco-certification standards to disproportionately participate. Using original farm-level survey data along with matching and matched difference-in-differences models, we analyze the producer-level effects of organic coffee certification in southeastern Colombia. We find that certification is associated with changes in farm practices linked to improved environmental outcomes. It significantly reduces sewage disposal in the fields and increases the adoption of organic fertilizer. However, we are not able to discern economic benefits.

Key words — organic certification, coffee, Colombia, difference-in-differences matching

1. INTRODUCTION

Although agricultural production is an important source of income and employment for developing countries, it also is responsible for serious environmental damage, including aquifer depletion, land degradation, water pollution, soil erosion, deforestation, biodiversity loss, and the spread of invasive species (Foley *et al*., 2011; Laurance, Sayer, & Cassman, 2014; Sebastian & Schulz, 2015; Tilman *et al*., 2001). Addressing these problems using conventional command-and-control regulation is challenging for a number of reasons: regulatory institutions are often weak, political will for stringent enforcement is limited, and producers tend to be small, numerous, and geographically dispersed (Chomitz, 2007; Sterner & Coria, 2011; Wehrmeyer & Mulugetta, 1999).

Organic, Rainforest Alliance, UTZ, and other eco-certification initiatives award labels to farmers conditional on their meeting specific environmental and social performance criteria. These initiatives represent a nonstate, market-based approach to addressing environmental problems in developing countries that has the potential to sidestep the constraints on conventional command-and-control regulation noted above (Auld, 2010; Blackman, 2010; Cashore, Auld, & Newsom, 2004; Jordan, Wurzel, & Zito, 2003). Moreover, unlike conventional environmental regulation, which generally imposes economic costs on producers, in principle eco-certification can generate economic benefits, such as price premiums and improved market access (Bolwig, Gibbon, & Jones, 2009; Dragusanu, Giovannucci, & Nunn, 2014; Giovannucci & Ponte, 2005). This feature makes it a particularly attractive environmental management strategy in the agricultural sector, which typically employs the poorest of the poor. Hence, eco-certification has the potential to be a win–win solution to the problem of environmental degradation caused by developing country agriculture.

According to proponents, eco-certification can generate both environmental and economic benefits at the producer level (Milder *et al*., 2014; Romero *et al*., 2013). Eco-certification enables consumer to differentiate among commodities based on their environmental attributes. This improved information translates into benefits for producers who receive price premiums for certified commodities and/or have improved access to output and credit markets. Those private economic benefits, in turn, motivate producers to improve their environmental performance. In addition to these private economic incentives, eco-certification may improve environmental and economic performance by helping to disseminate technical information about best management practices and molding private and public sector actors' environmental preferences and standards (Bartley, 2007a, 2007b).

However, in practice, both the environmental and the economic benefits of eco-certification may be limited at the producer level. In the case of environmental benefits, self-selection is a major barrier. Producers already meeting environmental certification criteria tend to disproportionately obtain certification (Barbosa de Lima *et al*., 2009; Blackman & Rivera, 2011). Such producers have relatively strong incentives to participate: the costs are low because they do not have to change production practices to meet certification standards, and the benefits, including price premiums and improved market access, can be significant. However, if the bulk of certified producers are already meeting certification criteria, then on average, certification will have only limited additional effects

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on production practices. Hence, it is not clear ex ante whether—after controlling for self-selection effects—eco-certifi cation actually has significant environmental benefits.

Just as the environmental effects of coffee eco-certification are uncertain, so too are the economic effects. In principle, the price premiums, improved market access, and technical change associated with eco-certification can boost growers' profits. But eco-certification also generally requires changes in production practices that raise some costs. For example, organic cultivation is typically more labor intensive than conventional farming (Lygbaeck, Muschler, & Sinclair, 2001; Van der Vossen, 2005). In addition, eco-certification entails fixed transaction costs associated with red tape and variable transaction costs associated with monitoring and reporting. Finally, just as it dilutes environmental benefits, self-selection also can dilute economic benefits. The reason is that relatively wealthy producers may be more likely to obtain eco-certification because they can more easily cover the fixed transaction costs (Barham, Callenes, Gitter, Lewis, & Weber, 2011; Mendez *et al*., 2010). Given all these factors, ex ante, the net effect of eco-certification on producers' economic status is uncertain.

As discussed below, existing evidence on the producer-level environmental effects of coffee eco-certification is limited, and that on the economic effects is quite mixed. The present paper investigates both the environmental and the economic effects of organic certification in the southeastern part of Colombia, one of the world's leading coffee producers. We rely on an original panel data set and use matching and matched difference-in-differences (DID) estimators to control for selection effects (Rosenbaum & Rubin, 1983; Smith & Todd, 2005). We do not directly observe environmental outcomes such as water and soil quality, and we therefore use as proxies farm practices linked to these outcomes (e.g., Blackman & Naranjo, 2012; Quispe Guanca, 2007). We find that organic certification in southeastern Colombia fosters the adoption of cleaner farm practices: it significantly reduces the disposal of sewage in field and spurs the adoption of organic fertilizer. However, we are not able to discern an effect on producers' income or net returns. This last result implies that maintaining and expanding the current level of organic certification in Colombia may be challenging.

Empirical evidence on the environmental effects of coffee eco-certification is limited (Blackman & Rivera, 2011; IFAD, 2003; Parrot, Olesen, & Høgh-Jensen, 2007). To our knowledge, only three quantitative studies consider the producer-level environmental effects of coffee and attempt to control for self-selection bias. Blackman and Naranjo (2012) find that organic certification in Costa Rica reduces the use of chemical pesticides, herbicides, and fertilizers and increases the use of organic fertilizer—all farm practices linked to environmental outcomes like soil and water quality. They attribute this finding partly to the fact that in Costa Rica, the vast majority of coffee growers rely heavily on agrochemicals and therefore do not meet organic certification standards. As a result, opportunities for the type of self-selection described above are limited. Using remote sensing data, Takahashi and Todo (2013) conclude that Rainforest Alliance certification reduces deforestation in Ethiopia. Finally, relying on both satellite and survey data, Rueda and Lambin (2013) find that Rainforest Alliance certification in northern Colombia increases adoption of environmentally friendly farm practices but does not have a significant effect on deforestation. Like the present study, Blackman and Naranjo (2012), Takahashi and Todo (2013), and Rueda and Lambin (2013) use propensity score matching to control for self-selection bias. Unlike our study, Takahashi and Todo (2013) and Rueda and Lambin (2013) focus on Rainforest Alliance, not organic, certification.

Several less rigorous studies analyze environmental effects by comparing farm practices or environmental outcomes for certified farms before and after certification or comparing outcomes for certified farms and unmatched uncertified farms. Most find certification has little or no effect. Quispe Guanca (2007) compares environmental management practices before and after five types of eco-certification in Costa Rica and finds that aside from herbicides, certification did not lead to reductions in the use of agrochemicals. Philpott, Bichier, Rice, and Greenberg (2007) find no differences in ecological indicators for (unmatched) organic, Fair Trade, and uncertified farms in Chiapas, Mexico. Finally, Martínez-Sánchez (2008) finds that compared with unmatched conventional farms in Costa Rica, organic farms do not have significantly different shade levels, bird diversity, or bird abundance.

Empirical evidence on the producer-level economic effects of coffee eco-certification is more plentiful than that on environmental effects and includes several studies that purport to control for self-selection. Overall, this evidence also is quite mixed. Of the studies that control for self-selection, Bolwig *et al*. (2009) and Arnould, Plastina, and Ball (2009) reach the most optimistic conclusions. Relying on a Heckman model, Bolwig *et al*. (2009) find that the net revenues of Ugandan certified organic growers are 75% higher than those of uncertified growers. [1] Using a combination of matching and regression, Arnould *et al*. (2009) find that Fair Trade certification is positively correlated with volume of coffee sold and price obtained (but less consistently correlated with various indicators of educational and health status).

Other studies that control for selection effects reach more measured conclusions. For example, Chiputwa, Spielman, and Qaim (2015) use propensity score matching to analyze the effects of three coffee certification schemes in Uganda—Fair Trade, organic, and UTZ—and find that only Fair Trade raises household living standards. Using fixed effects panel regression models, Barham and Weber (2012) find that the net returns to Fair Trade/organic and Rainforest Alliance certification depend critically on how certification affects yields. Ruben and Fort (2012) use propensity score matching to analyze the economic effects of Fair Trade certification in Peru and conclude it has only a modest direct effect on income and production. Using the same methods, Jena, Chichaibelu, Stellmacher, and Grote (2012) find that Fair Trade certification had limited effects on small-scale coffee producers' livelihoods in Ethiopia. Using rudimentary matching, Lygbaeck *et al*. (2001) find that although the price premium from organic coffee partly compensates for lower yields, once the cost of certification is included, organic production generates lower net revenues than conventional production. Finally, two separate studies of coffee growers in Nicaragua that do not control for selection bias—Valkila (2009) and Beuchelt and Zeller (2011)—conclude that in some circumstances, Fair Trade organic certification can perpetuate or exacerbate low productivity and poverty among marginal growers.

Our paper aims to make several contributions to the literature on eco-certification. First, to our knowledge, it is only the second study to examine both the environmental and the economic effects of an eco-certification initiative (the other being Rueda & Lambin, 2013). As discussed above, studies focused on each effect separately reach varying conclusions. An important unanswered question is whether positive environmental effects are associated with positive economic ones (Milder *et al*., 2014). If eco-certification is in fact a win–win proposition, as some proponents contend, then it is more likely to