

The spatial interplay between productive and destructive entrepreneurship: Do institutions meet expectations in rural areas?

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Abstract

Little is known about the coexistence and possible substitutability of destructive and productive entrepreneurship in regions characterized by weak institutions. This study explores the role of institutions in the interplay between destructive entrepreneurial activity (i.e., new coca crops share) and productive entrepreneurship (i.e., new coffee crops share) in rural Colombia. Institutional economics is used to frame our analysis, which is supported by an empirical spatial Durbin model. Using data from the municipal level of the Coffee National Information System during the 2000–2010 period, we found that destructive entrepreneurship has directly displaced productive entrepreneurship and the other way around. Although it is hypothesized that the presence of coffee-supportive institutions such as extensionists (i.e., regional representation of the national coffee association) mitigates the relationship between these entrepreneurial activities in favour of productive entrepreneurship, our results show that institutions are insufficient to control the crowding-out effect of destructive on productive entrepreneurship. The theoretical and policy implications of the study are considered in light of these findings.

Keywords: Destructive entrepreneurship; productive entrepreneurship; institutions; rural areas; spatial econometrics, Colombia.

1. Introduction

Since Baumol's (1990) seminal article on productive, unproductive, and destructive entrepreneurship, most of the literature has focused on entrepreneurial activities that are beneficial to society (Baumol and Strom 2007; Sobel 2008). Only a few studies have examined the interplay between productive and destructive entrepreneurship (Desai et al. 2013). According to Minniti (2016, 218), destructive entrepreneurship 'refers to activities that produce only a welfare transfer and that, in doing so, result also in a net reduction of social well-being.' It involves organized crime, drug dealing, armed insurgents, freelance assassins, slavery, and other activities related to rent-seeking (Desai et al. 2013). Despite Baumol (1990) having related productive entrepreneurship to innovative activities, Baumol (2002) has also referred to imitative entrepreneurial activity as productive. The latter is perhaps more aligned with rural activities than the former as space (i.e., land resources and productivity) determines the decision to increase the production of existing products (Muñoz and Kimmitt 2019). For example, Anderson (2000, 106) explains that 'the entrepreneurs have formed new bridges in space and time. This was achieved by creating and extracting new value from the old and redundant, by linking the uniqueness of the local to emergent global values.' According to Muñoz and Kimmitt (2019), these decisions are the consequence of the incentives provided by the current institutions (North 1990) in various (local) markets (Baumol 1990; Matos and Hall 2020; Minniti 2016; Sobel 2008).

However, few studies assess both the negative and positive effects of destructive entrepreneurship or the role played by institutions (Antony et al. 2017; Smith et al. 2017). The literature often emphasizes the favourable aspects of entrepreneurship due to institutional incentives, overshadowing evidence of unproductive (Audretsch et al. 2021) and destructive entrepreneurship, which includes morally questionable and harmful behaviours such as financial malfeasance, fraud, deception, organized crime, and drug dealing (Antony et al. 2017; Wood et al. 2022), as well as misconduct undermining societal and environmental principles (Anand et al. 2023; Haans and van den Oever 2021). Shepherd et al. (2024) provide a conceptual model for understanding destructive entrepreneurial actions, highlighting, in addition to deliberate action, the pursuit of profits, and psychological characteristics, the loss of self-regulation in a common entrepreneurial process as the salient factor explaining the emergence of negative externalities. In this regard, the potential over-crowd effect between destructive and productive entrepreneurship occurs because individuals lack the clarity to distinguish whether their actions positively affect societies or not. They argue that engaged stakeholders (considered part of the institutional environment) can dampen the likelihood of

destructive actions, presenting an opportunity for further research into how institutional contexts influence this dynamic. If institutions enable both productive and destructive entrepreneurship, how do these institutions engage with entrepreneurs to control or limit negative interplay? This complexity is compounded by the evolving nature of institutions and incentives across time and space (Audretsch et al. 2020; Welter 2011).

While Shepherd et al. (2024) do not differentiate between urban and rural activities, illegal entrepreneurship is notably prevalent in rural areas of some developing and developed countries (Smith et al. 2017). In emerging economies, guerrilla groups dominate shadow markets for guns, drugs, and extortion within agricultural production contexts (Dias et al. 2019). This suggests a potential substitution effect favouring destructive activities, such as opium cultivation in Afghanistan, which displaces productive entrepreneurship and weakens institutions (Mansfield 2016). Similarly, in Latin American countries such as Colombia, weak institutions allow destructive activities to undermine productive farmers and rural entrepreneurs (Rhodes and Lancaster 2021).

Literature on illicit economies and destructive entrepreneurship converges on the societal response to inadequate institutional presence, incentivizing harmful activities (Desai 2016; Pain 2023). This highlights the need to examine institutional settings that foster either destructive or productive entrepreneurship (Antony et al. 2017; Boudreaux et al. 2018). In rural Latin America, formal institutions are often insufficient, forcing communities to self-organize and rely on resilience (Urbano et al. 2021). Despite some governmental efforts to promote productive agriculture, these do not effectively counteract the allure of illicit activities like coca production (Munoz-Mora et al. 2018; Paredes and Pastor 2024). Most entrepreneurship research focuses on urban areas, underscoring the need to explore rural entrepreneurship where destructive activities often arise due to incentives for harmful and illicit behaviours that undermine legal agriculture (Muñoz and Kimmit 2019) such as coffee crops (Munoz-Mora et al. 2018).

Even though a potential displacement of destructive rather than productive activities exists, there has been little research focused on the interplay between coca crops and productive entrepreneurial activities such as new coffee crops (Barrera-Ramírez et al. 2019; Garcia-Yi 2014). Assuming that such relationships exist, the underlying institutional mechanisms have not yet been clearly stated. Fergusson (2013) and Muñoz-Mora et al. (2018) suggest that further evidence on legal versus illegal farms is needed, especially in rural areas of countries where low institutional enforcement forces entrepreneurs to adapt themselves to the formal and informal environment.

Hence, this study explores the role of institutions in the interrelationship between destructive (i.e., new coca crops) and productive entrepreneurial activities (i.e., new coffee crops) in the municipalities of Colombia. It draws on institutional economics (North 1990) to analyze the possible mechanisms that underpin these types of entrepreneurship and employs a unique panel data set of coffee-growers, built from the Coffee National Information System (SICA) 2000–2010. As entry decisions might be associated not only with institutional variables but also spatial ones, we use spatial error models (Anselin et al. 2008) to achieve our objective.

Our findings reveal that a negative interplay between destructive entrepreneurship (i.e., new coca crops) and productive entrepreneurship such as new coffee crops exists. We also show that the institutional presence of the *Federación Nacional de Cafeteros* (FNC) is not sufficient to mitigate the crowding-out effect between destructive and productive entrepreneurship. Our results offer insights into productive and destructive entrepreneurship (Baumol 1990) from an institutional perspective (North 1990). Hence, we contribute to the literature about destructive entrepreneurship (Antony et al. 2017; Desai et al., 2013; Minniti 2016; Sheperd et al. 2024; Sobel 2008) with empirical evidence in rural areas. We also bring insights into the state presence in rural areas of a developing country (i.e., Colombia) and its capacity to provide incentives for productive activity whilst mitigating destructive entrepreneurship (Boudreaux et al. 2018). Finally, we contribute to a less explored literature in entrepreneurship research; namely, rural entrepreneurship (Muñoz and Kimmit 2019) by focusing our analysis on peripheral areas, where most of our variables of interest occur. Our findings, therefore, could be helpful for policymakers when discussing the effectiveness of those institutions that incentivize (new) farmers to produce goods and services that are beneficial for their communities and regions.

After this brief introduction, the paper is structured as follows. Section 2 is devoted to the conceptual framework and hypotheses development. The data and the empirical strategy are explained in Section 3. The results and robustness tests are presented in Section 4. Section 5 comprises a discussion, conclusions, and suggestions for future research.

2. Conceptual framework

2.1. Institutional structure

We depart from institutional economics (North 1990) to frame the context in which the interplay between destructive and productive entrepreneurship takes place. This is consistent with Baumol (1990), who draws upon North's (1990, 3–4) ideas to highlight the key role of

institutions (as ‘rules of the game’) in the creation of incentives for entrepreneurs. Since we focus on productive and destructive entrepreneurship, it is important to note what these types of entrepreneurship mean. For this study, we adopted the position of Sobel (2008), based on Baumol’s (1990) work, where productive entrepreneurship is defined as productive market activities carried out in an appropriate institutional scheme. A thorough literature review has revealed that this framework has been extensively adopted in studies that have focused on national and regional determinants and the outcomes of entrepreneurship (cf. Thornton et al. 2011; Urbano et al. 2019). Recent evidence shows that where local and national governments, investors, and universities are well-coordinated, entrepreneurs and leaders can produce social benefits at the regional level (Boutillier et al. 2016; Meador and Skerratt 2017; Williams and Vorley 2017).

However, Baumol and Strom (2007) explain that a lack of governance may incentivize the production of goods and services that harm societies. This is common in countries such as Colombia, Mexico, and Latin America in general, where there is a large variety of agricultural items (e.g., bananas, coffee, and flowers). Nonetheless, illegal activities, such as cocaine production, have affected the development of rural areas (Lacombe and Flores 2017). Colombian regions in particular are characterized by a low presence of the national government, which makes said regions ideal for destructive entrepreneurship (Fergusson 2013). At the same time, key products such as coffee are well supported via cooperatives and associations (e.g., the *Federación Nacional de Cafeteros* (FNC) and a price stabilization fund); these help new and incumbent farmers to compete locally and internationally (Muñoz-Mora et al. 2018).

2.2. Coffee and institutions (against cocaine production) in Colombia

The role of institutional intervention in the interplay between destructive (represented by new hectares of coca crops over the total available municipal land) and productive (represented by new hectares of coffee crops over the total available municipal land) entrepreneurship is crucial to our research. Focusing on Colombia, coffee production has been monitored and controlled since the early 20th century with the creation of the FNC in 1927. This is due to the importance of the economic benefits of coffee production for the country (Palacios 1980). According to Palacios (1980), there was a growing intervention by the state through the FNC that focused on the strengthening of a capitalist coffee sector. The author bases the formal and informal power of this entity on four fundamental elements (from 1960 to 1970): (1) control of the legal initiatives and the regulation and application of the law; (2) discretionary control over the

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quantity and quality of economic and financial resources (administration of the *Fondo Nacional del Café*); (3) an oligopoly agent in the internal coffee market; and (4) finally, its possession of several institutionalized monopolies. This supports the idea of the key role played by state institutions in the generation, production, location, regulation, and commercialization of coffee crops (Barjolle et al. 2017) in Colombia's history.

Initially, the FNC was created in 1927 and the price stabilization fund was set up in 1929. These two associations enhanced the production processes and provided support for not only the local coffee producers in many Colombian regions but also for the exploration of international markets. Additionally, the success of alternative development programmes depends on factors such as access to markets, infrastructure, and the availability of resources (Dammert 2008). Grabs (2018) discusses public measures such as producer income assistance that support coffee farmers. Gaiger et al. (2019) mention Inmecafé, a public agency created in 1952 to provide support and protection to small coffee growers. Do et al. (2019) highlight the role of coffee associations in supporting coffee producers. Ibáñez et al. (2013) touch upon economic policies that have guaranteed property land protection influencing the coffee sector in Colombia. These references collectively demonstrate the importance of public policies and institutional support in sustaining and developing the coffee industry in Colombia.

The extant literature also provides evidence that Colombian universities have contributed significantly to the development of the coffee industry in the country. Castaño-Mejía (2023) discusses regional policy implications, laying the groundwork for understanding universities' role in supporting entrepreneurship. This study has highlighted the role of regionalization policies by leading universities in the country (such as Universidad de Antioquia, Universidad Nacional de Colombia, Universidad del Valle, etc.). These programmes support societal needs in regions far away from capital cities by offering undergraduate and graduate careers specific to the region's competitive advantage (e.g., bananas, flowers, and coffee).

Despite these policy endeavours to grow coffee, the production of illegal products such as coca has persisted over time (see Muñoz-Mora et al. 2018). It is worth mentioning that Colombia has implemented policies such as aerial spraying and manual eradication to target coca crops (Mejía et al. 2014). These policies aim to physically destroy coca plants and disrupt the production process. However, the effectiveness of these measures has been debated, with some studies suggesting that the impact on reducing coca cultivation is limited (Mejía et al. 2014).

Colombia has recognized the need to address the root causes of coca cultivation, such as poverty and lack of economic opportunities in rural areas. As a result, the government has implemented programmes to promote alternative livelihoods for coca farmers, such as crop substitution and rural development initiatives (Duarte et al. 2021). These programmes aim to provide farmers with viable alternatives to coca cultivation and address the socio-economic factors that contribute to its prevalence. Additionally, Colombia has also taken steps to address the environmental impact of coca production. The cultivation of coca has been linked to deforestation and environmental degradation (Duarte et al. 2021). In response, Colombia has implemented policies to address coca-related deforestation, such as the establishment of protected areas and forest reservation zones (Duarte et al. 2021). These policies aim to mitigate the environmental consequences of coca cultivation and promote sustainable development. It is important to note that the effectiveness of these policies and their impact on coca production can vary. Some studies suggest that interdiction efforts may lead to the displacement of coca cultivation to other regions or countries, known as the “balloon effect” (Rosen 2021). In this regard, one might speculate that the production from destructive entrepreneurial activities affects the emergence of other types of productive and legal activities (e.g., coffee crops), and the other way around.

2.3. Hypotheses development

Munoz-Mora et al. (2018) explain that institutions might be key to modifying agricultural (i.e., coffee and cocaine) production through a set of incentives that guarantees price stability. This is consistent with Baumol’s (1990) discussion about the existence or absence of different institutions that incentivize entrepreneurial activity. Drawing on this theoretical perspective, it is important to understand that economic agents resolve trade-offs based on existing regulations and market dynamics (Acemoglu and Robinson 2012). In this sense, approaching the decision to produce one type of product or another entails the exploration of potential substitution between them (Baumol 1990). Whilst institutions can regulate some market prices, some others remain unregulated (North 1990). In our case, the initial decision-making process is conditioned by the level of substitutability between coffee and cocaine. The literature on the interplay between destructive (e.g., coca production) and productive entrepreneurship (e.g., coffee production) is not that extensive.

Camacho and Mejia (2017) suggest, for example, that the aerial eradication of illicit crops generates, apart from health issues, significant negative effects on coffee crops, especially young coffee crops. Grisaffi et al. (2021) find similar results in Peru. In this case, the country

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was promoting the eradication of coca, negatively affecting the development process as violence indices and instability went up. However, Grisaffi et al. (2021) alternatively find that Bolivia was a world leader in formulating a participatory, non-violent model in confronting the cocaine trade. Consequently, Bolivia's model became effective in reducing coca and expanding social and civil rights. Despite the contrary results when comparing Peru and Bolivia, both cases illustrate that crops such as coffee and cocoa are strongly affected by the ease of production and the profitability of coca. Dest (2021) is a bit more direct, comparing coca and coffee crops in Colombia. The author observes that whilst coffee crops yield 1.5 harvests per year, coca yields 4; while in one year the number of plants can reach 5,000, coca yields 10,000; and whereas coffee yields around COP\$ 8,240,000, coca yields COP\$ 16,800,000. With this, Dest (2021) makes clear the indirect negative interplay between coca and coffee (which occurs through production decisions). In other research for Colombia, Ceron, De los Rios-Carmenado and Martín Fernández (2018) establish that coffee crops and milk production are potential replacement crops for coca. However, the prior research has not yet been able to quantify this direct interplay, creating a gap in the literature that we want to fill with this research.

Different mechanisms are also discussed in the prior literature to understand the interplay between destructive and productive entrepreneurship when certain incentives (un)exist. For example, Ibañez et al. (2013) found that the risk of violence and the presence of illegal crops (i.e., coca) had negative effects on the decision to continue coffee production on farms allocated for the purpose. This is a possible mechanism that might explain such negative interplay. For example, if the price of cocaine goes up, coca farmers increase production regardless of the consequences (such as violence and the destruction of other crops; Millán-Quijano 2020). Dávalos and Dávalos (2020) state that poor farmers without resources (monetary and public services) and government support are more likely to grow coca crops. Even so, whether socioeconomic characteristics are not favourable, this can hinder the coffee growers' will if the governors of rural regions are, for instance, susceptible to bribery and corruption, as coca producers can then take advantage of election periods to gain political power over producers of other crops such as coffee (Fergusson 2013). This literature suggests that a negative interplay between destructive (coca crops) and productive entrepreneurship (coffee crops) might exist. We, therefore, propose that:

Hypothesis 1: *There exists a negative interplay between destructive (new coca crops share) and productive entrepreneurship (new coffee crops share).*

Having a negative interplay between a destructive and productive activity not only implies an economic problem but also a societal one. North (1990) offers the foundations to comprehend and sort out the negative effects of human interaction. Baumol (1990) brings these ideas into the entrepreneurship phenomenon by suggesting that the problem is derived from the system of incentives (Baumol 1990), in which institutions are crucial. Literature relies on a formal institutional perspective to further comprehend the interplay between coca and coffee production (Muñoz-Mora et al. 2018). For example, it has been found that the existence of certain institutions conditions the interplay between productive and unproductive entrepreneurship in rural areas. Whilst corruption is a persistent element in political institutions (Fergusson 2013), the existence of associations such as the FNC and the price stabilization fund guarantees that economic and non-economic factors (e.g., price drops, violence, and drug wars) do not affect coffee production heavily (Ibáñez et al. 2013; Ibanez and Klasen 2017). This is why scholars have been concerned mainly with studying factors that have a positive effect on coffee crops. For example, Mitiku et al. (2018) discovered that more intensive coffee plots produced higher yields and return to land than less intensive semi-forest coffee plots. In addition, the authors stated that Rainforest Alliance certification of semi-forest coffee led to higher returns to land and labour than non-certified semi-forest and garden coffee. Sibelet and Ba (2012) demonstrated that the Ugandan government and research institutions encouraged farmers to maintain coffee production, notably through the distribution of (non-resistant) free seedlings. In particular, a policy initiative called coffee wilt disease (CWD) led to crop diversification. Based on these positive results, the government and organizations continue to support coffee producers who heavily depend on the product to maintain their household budgets (in terms of regular income, insurance, retirement, and so on).

A similar example was found in Colombia. Miklian and Medina Bickel (2020) discuss how policy initiatives executed through the FNC have helped coffee farmers overcome the negative effects of war. They have been provided with social aid and production advice, and they have been encouraged to return to farming. Ibañez et al. (2013) identified coffee as a substitute for coca crops and examined the role of institutions in the process. Garcia-Yi (2014) discussed farmers' responses to several coca-growing reduction strategies and found that common drug-control policies, such as organic coffee certification, road construction, and education, have mixed effects on coca cultivation, and that they depend on the individual coca grower. Based on these findings, Garcia-Yi (2014) suggested substituting coffee for coca crops using organic certification. Similarly, Miklian and Medina Bickel (2020) found that peace-building practices, orchestrated by the FNC, can incentivize agricultural farmers to enter into

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coffee production rather than coca or other harmful products. This was consistent with Rettberg (2016), who suggested that not only business leaders but also the farmers themselves realize the importance of these practices for Colombian national development. In the present case, the role of the FNC in articulating government policies and agricultural producers is the key to overcoming the devastation of civil and drug wars, one consequence of which is the displacement effect of coca on coffee crops. The previous literature allows us to suggest the following hypotheses:

Hypothesis 2a: *The presence of legal institutions such as the FNC (through extensionists in the Colombian municipalities) positively benefits productive entrepreneurship (new coffee crops), while negatively affecting destructive entrepreneurship (new coca crops).*

Hypothesis 2b: *The presence of legal institutions such as the FNC (through extensionists in the Colombian municipalities) weakens the crowding out process between destructive (i.e., new coca crops) and productive entrepreneurship (i.e., new coffee crops).*

3 Methodology

3.1 Data

To test our hypotheses, we focused on municipalities that possessed the natural conditions to grow both coca crops and coffee crops (principally, an altitude of 800 to 1,600 meters above sea level) and that were located outside the traditional coffee region, known as *eje cafetero* (i.e., Quindío, Caldas, and Risaralda municipalities), and coca grows municipalities (Some in Caquetá, Putumayo, Guaviare, among others) between 2000 and 2010. This is vital for the viability of the analysis because it indicates that a municipality predominant in either coffee or coca crops is not included due to the predominance bias. We used a unique panel data set of coffee-growers built from the Coffee National Information System (SICA) from 2000 to 2010. With this information, we were able to identify new coca crops as a share of the territorial extension (hectares) representing destructive entrepreneurship (Anderson 2000; Muñoz and Kimmitt 2019). Albeit we did not observe new farmers, our variable fits the Reynolds et al. (2005, 209) definition of entrepreneurship as a process, in which people manifest intentions of undertaking a business project and show actions such as exploiting a new or established venture. It is worth noting that altitude plays a fundamental role in our research due to the dependence of coffee crops on certain atmospheric characteristics (Cerdeira et al. 2017; de Roux 2020; Sarmiento-Soler et al. 2022).

As a proxy of institutional support, we used the number of extensionists from the FNC, who were able to support coffee growers at the municipality level. This variable is of crucial

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importance for our research. According to Molina (2010), extensionism, with its presence in Colombia since the mid-20th century, is not only technical assistance but also focuses on important details of the market activity such as the farmer and everything that affects them, i.e., the family environment, the regional economy, the psychological aspect, amongst others. Moreover, this accompaniment creates an adequate institutional environment for coffee growers to locate their crops and develop their enterprises correctly. Extensionists (i.e., rural advisors, with the FNC as the institutional presence), were mostly constant over the period (Figure 3). The purpose of extensionists consists of providing advice on productive practices related to the improvement of technology until the final processing of the product (FNC 2018). Agricultural extensionism has been used as an agricultural policy in Colombia since the middle of the 20th century (Molina 2010). Unlike technical assistance, agricultural extensionism goes further, since it assumes that productive markets are not only the crops but also the farmers, their emotions, their families, and the atmospheric and commercial environment. Therefore, agricultural extensionism generates and strengthens a friendly scheme for the coffee grower. This is deeply related to Baumol's (1990) ideas on location decisions and venture growth.

For destructive entrepreneurship, we acquired data from the United Nations on Drugs and Crime (UNODC) Integrated Illicit Crops Monitoring System (SIMCI), which provides information on the number of new hectares allocated to coca crops in each municipality in Colombia. Thus, both destructive and productive entrepreneurship measures were consistent with Baumol's (1990) and Minniti's (2016) definitions. We complemented the analysis by controlling for local characteristics such as displaced people [received and generated] (Ibanez and Klasen 2017), as well as the fiscal performance index and the percentage of transfer income (to capture corruption and state capacity, respectively; Ibáñez et al. 2013). Two control variables are directly related to the administrative capacity of the municipalities to support productive entrepreneurship (coffee crops), both the savings capacity and the amount of debt. The savings capacity is expected to have a positive effect on productive entrepreneurship and a negative effect on destructive entrepreneurship. And opposite results are expected for the amount of debt variable. This information comes from the Municipal Panel Data CEDE (Universidad de los Andes), which is a dataset largely used to explore rural dynamics such as violence, fiscal aspects, and civil conflict in Colombian Municipalities (Acemoglu et al. 2020; Fergusson et al. 2020; Ferrell 2019). In total, we had data from 232 municipalities for 11 years (2000-2010). Table 1 presents the summary statistics for all variables, whereas Table 2 shows the basic correlation matrix.

3.2 Empirical strategy

The following econometric models were used to observe the direct effect that destructive entrepreneurship (Coca share) had on productive entrepreneurship (Coffee share) in municipality m in survey year t [equation 1], and the other way round [equation 2]:

$$P_{mt} = \alpha + \beta_1 D_{mt-1} + \beta_2 M_{mt} + \sum_{t=1}^T \tau_t + \sum_{r=1}^R \gamma_r + \varepsilon_{mt} \quad (1)$$

$$D_{mt} = \alpha + \beta_1 P_{mt-1} + \beta_2 M_{mt} + \sum_{t=1}^T \tau_t + \sum_{r=1}^R \gamma_r + \varepsilon_{mt} \quad (2)$$

On the one hand, the outcome P_{mt} is related to productive entrepreneurship (i.e., coffee share). The effect of destructive entrepreneurship (coca share) is captured through D_{mt-1} , making use of the lagged independent variable for two main reasons. First, the difficulty of developing an instrument that adapts to the conditions not only of substitutability between coca and coffee but also considers spatial, territorial, institutional, and public policy elements. Second, it is a resource widely used in the literature to solve endogeneity (Bellemare, Masaki and Pepinsky 2017; Wang and Bellemare 2020). Also, we condition on M_{mt} , which contains the effects of the municipality variables mentioned previously. Year (τ_t) and Region (γ_r) fixed-effects control for the time-invariant/variant factors that influence labour market conditions. Standard errors were robust, to account for the arbitrary correlation of outcomes between municipalities. On the other hand, equation 2 presents the same methodology, but exchanging productive for destructive entrepreneurship, to observe the double causality (and interplay) between coca and coffee.

However, it is necessary to introduce extensionists to know the effect of institutions on both types of entrepreneurship and the role of extensionists in the interplay between coca and coffee. Equations 3 and 4 include extensionists as a key independent variable and how the interaction of this variable with coffee and coca affects the dependent variable in question. Extensionists are represented by E_m , and the elasticity of the interaction effect is represented by β_3 in both equations.

$$P_{mt} = \alpha + \beta_1 D_{mt-1} + \beta_2 E_m + \beta_3 D_{mt-1} * E_m + \beta_4 M_{mt} + \sum_{t=1}^T \tau_t + \sum_{r=1}^R \gamma_r + \varepsilon_{mt} \quad (3)$$

$$D_{mt} = \alpha + \beta_1 P_{mt-1} + \beta_2 E_m + \beta_3 P_{mt-1} * E_m + \beta_4 M_{mt} + \sum_{t=1}^T \tau_t + \sum_{r=1}^R \gamma_r + \varepsilon_{mt} \quad (4)$$

It is important to clarify that we transformed the variable extensionist by creating a dummy that allowed us to identify whether a municipality has support and follow-up by extensionists. In other words, E_m is equal to 1 if the municipality has two or more extensionists and is equal to 0 if it does not have extensionists or if it has only one. With this, we consider that a single extensionist is insufficient to adequately accompany coffee growers in a single municipality (Muñoz-Mora et al. 2018). The extension service is the FNC's direct contact with coffee growers. There are three extension methods: individual, group, and mass. Group and mass methods require two or more extensionists, but the individual method also requires two or more extensionists. This is necessary because the individual method is divided into two: the farm visit and the office visit, which is why at least two extensionists are needed, one for each form of contact with the coffee growers (FNC 2023). This enabled us to represent subgroups of institutional support to coffee growers in our study. Thus, the effect of extensionists on the interplay between destructive and productive entrepreneurship is represented by $D_{mt-1} * E_m$ and $P_{mt-1} * E_m$, respectively.

Nonetheless, there is a difficulty in estimating equations 1-4 to identify β_1 , which is the direct effect and substitution between destructive and productive entrepreneurship. This is linked to the exclusion of factors that vary in time and the strategic location of coca crops, which can lead to an illusory significance of the estimators when calculating OLS. In addition, year- and region-fixed effects are used to solve unobservable characteristics that change over time. As the decision to grow new coffee crops might not only be associated with institutional variables but also with spatial ones, we applied spatial panel data models (Anselin et al. 2008) to test our hypotheses. In this way, we conducted an exploratory analysis of spatial data (ESDA), which began by constructing the standardized matrix of queen (distance matrix) weights. We also built Moran's I to analyze the spatial autocorrelation. In general, the null hypothesis for Moran's I states that the attribute analyzed is distributed randomly among the m studied municipalities. According to Table 1, this seems to be the case, as we obtained Moran's I of 12.905 ($p < 0.000$) for coffee share and 9.373 ($p < 0.000$) for coca share. As such,

one may expect that productive and destructive entrepreneurship would be spatially correlated between different municipalities.

To check whether spatial dependence exists or not, we ran several tests to discriminate between the existence of a residual spatial autocorrelation scheme (LM error and RLM error) or a spatial autocorrelation scheme in the dependent variable (LM lag and RLM lag) (Anselin 1988; Anselin and Smirnov 1996). On the one hand, the results in Table 1 indicate that the test for spatial autocorrelation was not significant for productive and destructive entrepreneurship (i.e., coca and coffee share). Therefore, there was an absence of spatial dependence and spatial autocorrelation in the dependent variable. On the other hand, the test for the existence of a residual spatial autocorrelation scheme was statistically significant at 0.005 (robust) and 0.01 (robust) for coca share and was statistically significant at 0.000 (robust) for coca share. Since the robustness tests (RLM lag and RLM error) assessed the robust spatial dependence in the presence of the other tests, we concluded that if the RLM error was statistically significant, it was because there was a possible dependence on the errors, given the erroneous presence of a spatially retarded endogenous variable. Hence, we confirmed that a spatial dependence existed.

Table 1. Spatial independence tests and spatial autocorrelation

test	Models			
	Coffee share		Coca share	
	Statistic	p-value	Statistic	p-value
Moran's I	12.905	0.000	9.373	0.000
Lagrange multiplier	81.017	0.000	40.132	0.000
Robust Lagrange multiplier	0.431	0.511	8.006	0.005
Lagrange multiplier	106.953	0.000	53.570	0.000
Robust Lagrange multiplier	25.666	0.000	21.444	0.001

Note: the diagnoses were made for the year 2010, since this is the year in which the W matrix can capture the most information.

Source: Own elaboration.

Drawing on Muñoz and Kimmitt (2019), we find that agricultural or rural entrepreneurship is often based on spatial networks of information flows. On the positive side, a municipality can benefit from the knowledge of its neighbours to produce a specific product. On the negative side, if the neighbouring municipality grows coca, it indirectly affects the productive coffee crops of the observed municipality for two fundamental reasons. First, the possible indirect effects of glyphosate; and second, illicit crops generate violence and displacement (Camacho and Mejia 2017). Therefore, not only from the methodological

technique but also from the literature, the structure of the spatial autocorrelation was determined by the residuals, i.e., the spatial spillovers are structural, so we concluded that the appropriate methodological approach was a spatial Durbin model (SDM), which is a generalization of the spatial autoregressive model (SAR). Thus, the models to be estimated are the following:

$$P_{mt} = \rho WP_{mt} + X_{mt}\beta + WX_{mt}\theta + \epsilon_{mt} \quad (5)$$

$$D_{mt} = \rho WD_{mt} + X_{mt}\beta + WX_{mt}\theta + \epsilon_{mt} \quad (6)$$

where W represents the standardized matrix of queen (distance matrix) weights. The ρ is the spatial autoregressive parameter. The variable X_{mt} stands for the set of controls expressed in equations 5 and 6, including our two variables of interest E_m and D_{mt-1} , and P_{mt-1} respectively. The θ is a vector of parameters measuring the marginal impact of the explanatory variables from neighbouring observations on the dependent variable. Finally, ϵ_{mt} is the error term expressed as:

$$\epsilon_{mt} = \lambda W + \varepsilon \quad (7)$$

where λ is a scalar spatial error parameter and ε is the white noise error term. According to Golgher and Voss (2016), our estimations from equations 5, 6, and 7 would provide a consistent estimation under the presence of spatial autocorrelation. To test the sensibility of our analysis, we estimated the alternative spatial panel-data models. Albeit scholars such as Bosma and Sternberg (2014) and Stojčić, Pylak, and Alibegović (2022) have developed spatial analyses to study entrepreneurship, so far this type of methodologies has not been used to explore productive entrepreneurship such as coffee crops and destructive entrepreneurship such as coca crops, this was also an additive to lean towards this methodology.

4. Results

4.1 Main findings

To start looking at the results of this research, it is important to analyze some descriptive statistics and initial correlations from Tables 2 and 3. First, it is worth noting that although the literature strongly points out the advantages of coca crops over coffee crops, the mean coffee share surpasses (even doubles) the coca share in the panel municipalities. This indicates the

desire of growers for productive and formal entrepreneurship. Second, a negative correlation between coca and coffee share can be recognized (see Table 3), which meets our expectations.

Table 2. Summary statistics

Variables	Mean	SD	Min	Max	P25	P50	P75	p99	N
Coffee share	0.001	0.002	0.000	0.022	0.000	0.000	0.001	0.011	2552.000
Coca Share	0.000	0.001	0.000	0.019	0.000	0.000	0.000	0.005	2552.000
Extensionists	0.302	0.459	0.000	1.000	0.000	0.000	1.000	1.000	2552.000
FPI	58.097	10.473	0.000	89.430	53.810	58.075	63.200	81.200	2552.000
Transfer income	69.013	18.600	0.000	99.379	59.911	72.525	82.364	96.156	2552.000
Displaced	330.641	881.370	0.000	12394	24.000	86.000	282.000	4337.000	2552.000
Displaced received	409.520	1970.968	0.000	42591	15.000	56.000	166.000	8112.000	2552.000
Saving capacity	20.824	37.503	-964.650	100.000	10.715	26.306	39.269	70.256	2552.000
Amount of debt	9.173	12.601	-0.000	160.851	1.116	5.564	12.126	59.297	2552.000
Andina	0.759	0.428	0.000	1.000	1.000	1.000	1.000	1.000	2552.000
Caribe	0.009	0.092	0.000	1.000	0.000	0.000	0.000	0.000	2552.000
Pacifica	0.228	0.420	0.000	1.000	0.000	0.000	0.000	1.000	2552.000
Orinoquia	0.004	0.066	0.000	1.000	0.000	0.000	0.000	0.000	2552.000

Note: N is the observations. P25, P50, P75, and P99 correspond to the respective percentiles.

Source: Own elaboration.

Table 3. Correlation matrix

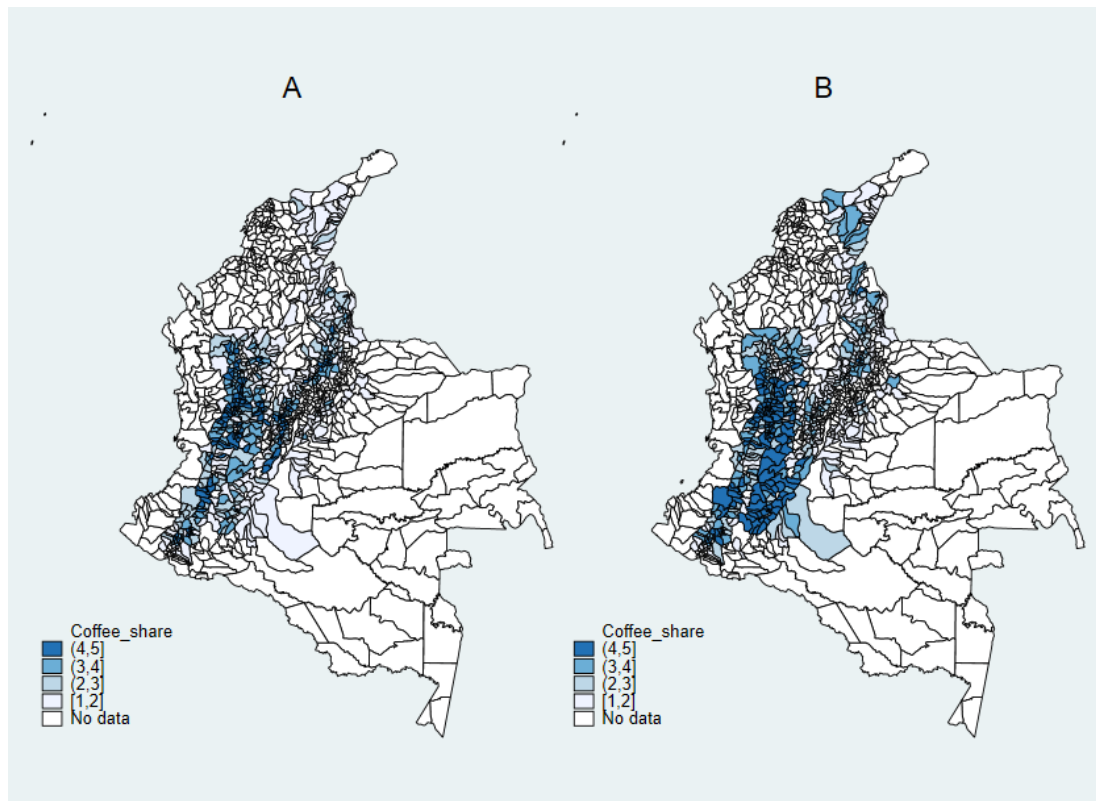
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Coffee share	1.000												
(2) Coca share	-0.079*	1.000											
(3) Extensionists	0.348*	-0.103*	1.000										
(4) FPI	0.081*	0.034	0.006	1.000									
(5) Transfer income	0.018	0.059*	-0.064*	-0.041	1.000								
(6) Displaced	-0.047	0.088*	0.082*	-0.025	-0.074*	1.000							
(7) Displaced received	-0.035	-0.014	0.003	0.099*	-0.238*	0.519*	1.000						
(8) Saving capacity	0.063*	0.048	-0.014	0.495*	-0.112*	0.016	0.076*	1.000					
(9) Amount of debt	0.036	-0.005	0.031	-0.100*	-0.258*	0.076*	0.237*	-0.046	1.000				
(10) Andina	0.047	-0.011	-0.002	-0.085*	0.130*	-0.010	-0.020	-0.052*	-0.070*	1.000			
(11) Caribe	-0.045	-0.018	-0.061*	-0.019	0.066*	-0.028	-0.016	-0.016	-0.045	-0.165*	1.000		
(12) Pacifica	-0.034	0.018	0.000	0.087*	-0.142*	0.019	0.026	0.058*	0.088*	-0.965*	-0.051	1.000	
(13) Orinoquia	-0.031	-0.013	0.100*	0.022	-0.033	-0.016	-0.013	-0.004	-0.046	-0.117*	-0.006	-0.036	1.000

* Shows significance at the .01 level

Source: Own elaboration.

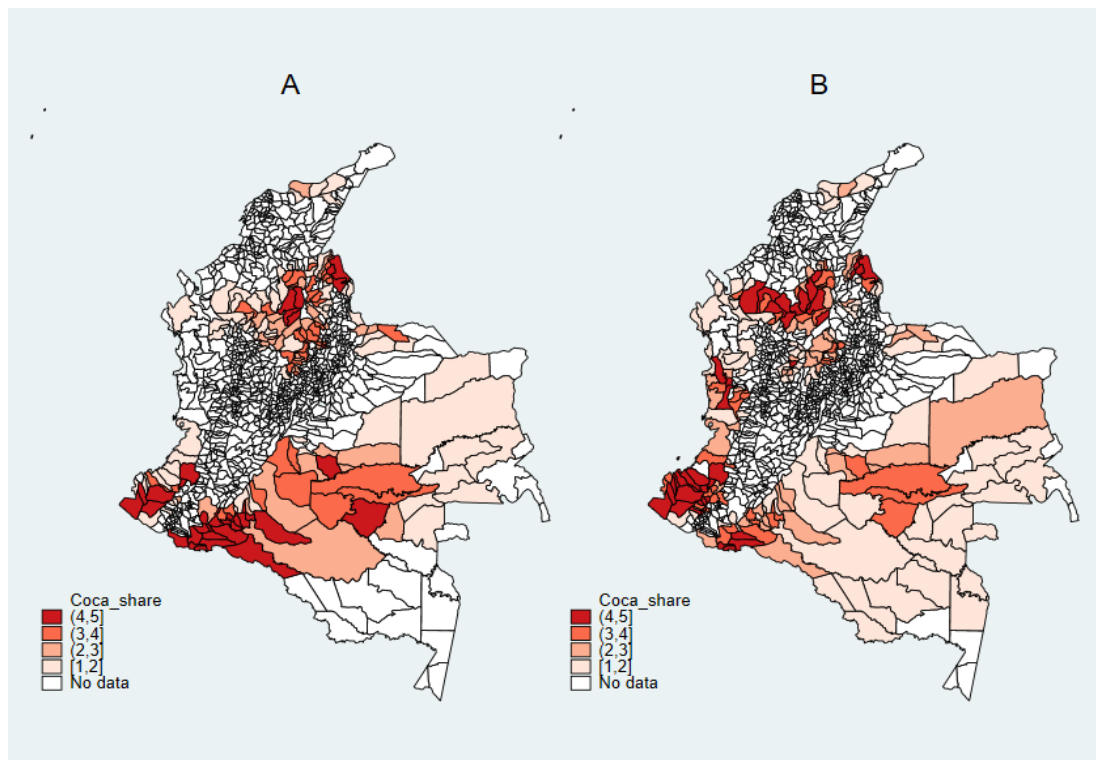
As Colombia is characterized by different regions with proper land for crops, it was important to examine the spatial distribution to see whether coca and coffee had similar patterns. Figure 1 shows the spatial distribution of coffee share in quartiles in 2000 and 2010. New coffee crop as a share of total hectares presents a significant increase on average from 0.04% in 2000 to 0.15% in 2010. It is also interesting to observe how the coffee crop share was higher in the municipalities located in the Colombian mountain ranges, starting at the "grass nodes" until the Sierra Nevada de Santa Marta. This illustrated the importance of altitude for this type of crop. Figure 2 shows the spatial distribution of coca share and the significant decrease in the area of cultivation over the period: from an average of 0.021% in 2000 to 0.018% in 2010. It is worth noting that the Colombian government has endeavoured to combat these illicit crops through aerial crop eradication (Camacho and Mejia 2017; Ibanez and Klasen 2017).

Figure 1. New coffee cultivation as a share of the territorial extension (hectares) in the Colombian municipalities in 2000 and 2010 (in quartiles)



Source: Own elaboration based on SICA.

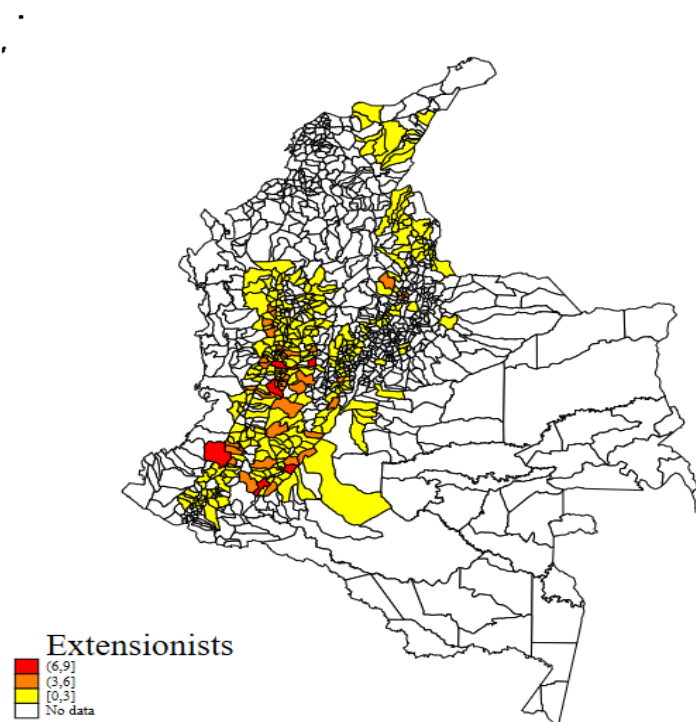
Figure 2. New coca cultivation as a share of the territorial extension (hectares) in the Colombian municipalities in 2000 and 2010 (in quartiles)



Source: Own elaboration based on UNODC-SIMCI.

To identify how destructive entrepreneurship (new coca crops share) affects productive entrepreneurial (new coffee crops share) activity in the Colombian municipalities, and vice versa, Table 4 shows the estimated coefficients for the parameters of the coca and coffee share and the control variables that characterize the municipalities. In Models 1 and 2, The dependent variable is the share of coffee crops in the total number of hectares in the municipality m , whereas in models 3 and 4 the dependent variable is the share of coca crops. Models 1 and 3 present the results for the within estimator by OLS specification. Models 3 and 4 show the same specification, but the estimation results were obtained through the spatial Durbin model. Consequently, we can confirm that the relationship between our models and the respective dependent and independent variables was strong. We also provide the AIC and BIC information criteria (Akaike 1974; Schwarz 1978). These are other measures that allow us to identify how well the data fit the models. Although Models 3 and 4 have better results concerning the information criteria, the difference between the spatial models was not too large. It should be mentioned that the AIC and BIC information criteria do not require the assumption that such models are true or correct, only how well they fit the data. It is also important to bear in mind that comparisons between the information criteria of different models are adequate if models are compared using the same structure and technique.

Figure 3. Extensionists in the Colombian municipalities (2010)



Source: Own elaboration based on FNC.

Regarding the hypotheses testing, we suggested in hypothesis 1 that there exists a negative interplay between destructive (new coca crops share) and productive entrepreneurship (new coffee crops share). The results in Table 4 support this, which is consistent with Ibañez et al. (2013) and Ibanez and Klasen (2017). When the share of new coca crops in the previous period increased by 1%, the share of coffee cultivation in the current period decreased by 0.22% (Model 1), and when the share of coffee crops in the previous period increased by 1%, the share of coca crops in the current period decreased by 0.04% (Model 3). This means that although there is a negative interplay between destructive and productive entrepreneurship, the effect of destructive entrepreneurship on productive entrepreneurship is greater.

The altitude of the municipalities should be considered when examining these results, that is why municipalities at an altitude between 800 and 1,600 meters above sea level were analyzed to assess productive entrepreneurship. This is decisive in our estimation for all models (1-4). But, what happens when we look at spatial effects? Model 2 indicates that with a 1% increase in the share of coca crops in neighbouring municipalities in the previous period, the share of coffee crops in the current period decreased by 0.05%, and when the opposite occurs (model 4), the share of coffee crops decreased by 0.01%. This suggests that under both linear and spatial estimation, hypothesis 1 is supported. Our results, which reveal a direct and significant negative effect of coca crops on coffee crops, confirm the findings of Ibañez et al. (2013), but they also reveal that a negative interplay in this relationship exists.

Table 4. The double causality between coffee and coca share.

	Coffee share		Coca share	
	(1) OLS	(2) SDM	(3) OLS	(4) SDM
Coca share lagged	-0.2224*** (0.0318)	-0.0554*** (0.0138)		
Coffee share lagged			-0.0453*** (0.0067)	-0.0164** (0.0063)
Fiscal performance indicator	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000* (0.0000)	0.0000 (0.0000)
Transfer income %	-0.0000 (0.0000)	0.0000 (0.0000)	0.0000*** (0.0000)	-0.0000 (0.0000)
Displaced	0.0000 (0.0000)	0.0000 (0.0000)	0.0000** (0.0000)	0.0000 (0.0000)

Displaced received	-0.0000** (0.0000)	0.0000 (0.0000)	-0.0000** (0.0000)	-0.0000 (0.0000)
Saving capacity	-0.0000 (0.0000)	0.0000 (0.0000)	0.0000+ (0.0000)	-0.0000 (0.0000)
Amount of debt	0.0000*** (0.0000)	-0.0000 (0.0000)	0.0000*** (0.0000)	0.0000 (0.0000)
Constant	-0.0008** (0.0003)	-0.0044*** (0.0012)	-0.0006*** (0.0002)	-0.0009+ (0.0005)
Spatial rho		0.6693*** (0.0515)		0.2456*** (0.0497)
Variance lgt_theta		-0.9890*** (0.0879)		-0.8687*** (0.0868)
sigma2_c		0.0000*** (0.0000)		0.0000* (0.0000)
Year FE	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
N	2320	2320	2320	2320
R-sq	0.078	0.081	0.039	0.087
AIC	-22013	-24066	-25837	-27122
BIC	-21898	-23876	-25722	-26932

Note: Standard errors in parentheses + 0.10 * p<0.05, ** p<0.01 and *** p<0.001. Robust standard errors clustered by municipalities. The regional fixed effects variables refer to dummy variables to determine whether the municipality is from the Andina, Pacifica, Caribe or Orinoquia regions.

Source: Own elaboration.

Table 5. Baseline results of interaction effects in the interplay between destructive entrepreneurship and productive entrepreneurial activity

	Coffee share				Coca share			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		SDM		OLS		SDM	
Extensionists	0.0018*** (0.0001)	0.0018*** (0.0001)	0.0013*** (0.0002)	0.0013*** (0.0002)	-0.0002*** (0.0000)	-0.0003*** (0.0000)	-0.0002* (0.0001)	-0.0002* (0.0001)
Coca share lagged		-0.1029***		-0.0450***				

			(0.0174)		(0.0134)				
Coca share*exten lagged			-1.2826**		-0.2465*				
			(0.4350)		(0.0965)				
Coffee share lagged								-0.1074***	-0.0350*
								(0.0174)	(0.0156)
Coffee share*exten lagged								0.0968***	0.0231+
								(0.0169)	(0.0130)
Fiscal performance indicator	-0.0000	-0.0000	-0.0000	-0.0000	0.0000*	0.0000*	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Transfer income %	0.0000	0.0000	0.0000	0.0000	0.0000**	0.0000**	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Displaced	-0.0000***	-0.0000***	0.0000	0.0000	0.0000**	0.0000**	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Displaced received	-0.0000	-0.0000	0.0000	0.0000	-0.0000**	-0.0000**	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Saving capacity	-0.0000	-0.0000	0.0000	0.0000	0.0000+	0.0000*	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Amount of debt	0.0000***	0.0000***	-0.0000	-0.0000	0.0000**	0.0000***	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Constant	-0.0025***	-0.0025***	-0.0035***	-0.0037***	-0.0003*	-0.0003*	-0.0010+	-0.0012+	-0.0012+
	(0.0003)	(0.0003)	(0.0011)	(0.0011)	(0.0001)	(0.0001)	(0.0005)	(0.0006)	(0.0006)
Spatial rho			0.6654***	0.6653***			0.2426***	0.2421***	
			(0.0507)	(0.0507)			(0.0497)	(0.0498)	
Variance lgt_theta			-0.8402***	-0.8367***			-0.8562***	-0.8545***	
			(0.0913)	(0.0916)			(0.0848)	(0.0843)	
sigma2_e			0.0000***	0.0000***			0.0000*	0.0000*	
			(0.0000)	(0.0000)			(0.0000)	(0.0000)	
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	2320	2320	2320	2320	2320	2320	2320	2320	2320
R-sq	0.204	0.211	0.212	0.213	0.045	0.053	0.099	0.101	
AIC	-22354	-22371	-24112	-24108	-25850	-25866	-27125	-27120	
BIC	-22239	-22245	-23922	-23896	-25735	-25740	-26935	-26907	

Note: Standard errors in parentheses + 0.10 * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$. Robust standard errors clustered by municipalities. The regional fixed effects variables refer to dummy variables to determine whether the municipality is from the Andina, Pacifica, Caribe, or Orinoquia regions.

Source: Own elaboration.

4.2. The role of extensionists in productive and destructive entrepreneurship

In the second set of hypotheses, we introduced the variable extensionists and sought to identify whether it has effects on productive and destructive entrepreneurship (hypothesis 2a) and how it influences the existing crowding out effect process between the two entrepreneurship (hypothesis 2b).

From both OLS and SDM estimation, support is found for hypothesis 2a (see Table 5). Taking into consideration the spatial models, models 3 and 7 indicate that with the presence (more than two extensionists per municipality) of extensionism in neighbouring municipalities, the coffee crops share increased by 0.0013% and the coca crops share decreased by 0.0002%. It is worth noting that the significance of the effect of the extensionists on coca share is lower ($p < 0.05$) than that on coffee crops share ($p < 0.001$), which makes sense, since the institutional programme of the extensionists is designed to provide technical accompaniment to coffee growers, but does not focus on socializing with coca growers. One thing to note is the consistency in the specification, regardless of the type of estimation, whether linear or spatial.

However, models 4 and 8 reveal something interesting, and that is the rejection of hypothesis 2b. Model 4 shows that with the presence of extensionism in neighbouring municipalities, the 1% increase in the coca crops share in these municipalities in the previous period generated a 1.38% ($-1.2826 + (-0.1029)$) decrease in the coffee crops share. Model 8 shows that with the presence of extensionists in neighbouring municipalities, the 1% increase in the share of coffee cultivation in these municipalities in the previous period generated a 0.0119% ($-0.0350 + (0.023)$) decrease in the share of coca cultivation, following Garcia-Yi (2014). Although the effect of model 8 can be seen as a necessary condition, it is not a sufficient condition to weaken the negative interplay between the share of coca and coffee crops.

Compared to Mitiku et al. (2018) and Sibelet and Ba (2012), our results reveal that productive entrepreneurship requires more technical support from the government (i.e., extensionists), this is why some municipalities without this institutional presence could still benefit from these characteristics. Something to consider in the results is the favourable supply chain that facilitates the possible cultivation of coffee crops in the presence of extensionists, given that good soil conditions, the altitude of the region, and easy access to credit are necessary to grow coffee crops (de Roux 2020).

4.3. Robustness check

The results of the present study show that municipality variables, such as altitude, government transfers, and displacement, played an important role in the specification. We also performed additional types of robustness checks by estimating our model using different spatial panel approaches. Table A1 in the Appendix allows us to appreciate autoregressive spatial models (SARs) and spatial error models (SEMs) (Anselin et al. 2008). Both types were carried out with the queen contiguity matrix.

Models 1-4 show consistency with the baseline results, that is: 1) There is a negative exchange between the coffee and coca crops share; 2) extensionism encourages the coffee crops share in the municipalities and discourages the coca crops share; 3) extensionism does not mitigate the negative interplay between the coca and coffee crops share. Furthermore, it is important to highlight the improvement in the significance of the estimator in the models where the coca crops share is the dependent variable (2 and 4). These results ensure two conditions: first, an appropriate choice of model specification; and second, the correct use of the type of estimates, i.e., spatial estimates.

5. Discussion and conclusions

This study explored two key aspects, the negative interplay between destructive entrepreneurship (i.e., coca crops share) and productive entrepreneurship (i.e., coffee crops share) in the rural municipalities of Colombia, and the role of institutions (extensionists) in such interplay. Drawing on Baumol (1990) and Minniti (2016), we noted that institutions are key elements in motivating one type of production or the other. For this reason, we used institutional economics (North 1990) as the main foundation on which to evaluate the moderating effect of institutions on the interplay between destructive entrepreneurship and productive entrepreneurial activity. We used an OLS and then a spatial Durbin model estimation to overcome spatial issues regarding both forms of entrepreneurship, trying to unveil a double causality.

Three main results were obtained. First, the study confirmed the negative interplay between destructive entrepreneurship (i.e., new coca crops share) and productive entrepreneurship (i.e., new coffee crops share) in Colombian municipalities between 2000 and 2010. The results strongly support the findings by Camacho and Mejia (2017) and Ibañez et al. (2013). The second result affirms what has been stated in the literature, and is that (formal) institutions strengthen productive entrepreneurship and weaken destructive entrepreneurship

(Henrekson and Sanandaji 2011). The results allow us to identify that those extensionists not only show a direct effect at the municipal level but also that the spatial dependence allows us to identify the diffusion of the effect in other municipalities. That is, in the presence of extensionists in neighbouring municipalities, the coffee crops share increased but that of coca crops decreased. However, is this institutional presence enough to address the negative interplay between both types of entrepreneurship? Apparently, not. Our third result is possibly the most important because it affirms that there does not exist an effect weakening the negative interplay between coca and coffee crops, through the institutional presence of the FNC as extensionists. It is also worth considering that many efforts were made in the first decade of the 21st century to eliminate illicit crops through the process of aerial eradication (Camacho and Mejia 2017; Ibanez and Klasem 2017). However, this process generated negative externalities for licit crops and the health of the population (Rincón-Ruiz et al. 2016). Thanks to these results, we derive a series of implications for theory, literature, and policy.

5.1. Implications for the literature on institutions, as well as productive and destructive entrepreneurship in rural areas

First, we brought empirical facts and analyses around the literature on destructive entrepreneurship (Antony et al. 2017; Desai et al. 2013; Minniti 2016; Shepherd et al. 2024; Sobel 2008), which takes place in Colombian rural areas. For example, a vast amount of the literature has highlighted the fact that these effects may vary depending on the conditions of the regions where such a relationship exists (Ibañez et al. 2013; Muñoz-Mora et al. 2018; Smith et al. 2017). In this sense, we fill the first gap in this literature, which consists of quantifying and unveiling the direct negative effect that coffee crops have on coca crops in Colombian municipalities, since the inverse effect has been widely studied. So far, much research has focused on the theoretical part and the stylized facts, thus enabling us to contribute to the literature by bringing these insights into the conversation of coffee vs. coca crops (Munoz-Mora et al. 2018), as well as destructive vs. productive entrepreneurship (Desai et al. 2013; Matos and Hall 2020). We complimented the idea that entrepreneurs' impaired regulation when making entrepreneurial decisions can result in destructive actions (Shepherd et al. 2024). We suggested that extensionists, as institutions (or stakeholders), reduce the trade-off between destructive and productive entrepreneurship. However, engaged institutions alone are insufficient to enhance productive entrepreneurial action when the rural area is dominated by destructive entrepreneurship.

Second, we also offered insights into the state presence in rural areas and its capacity to mitigate harmful agricultural activities, which is aligned with the institutional framework (North 1990). It is suggested that governments' endeavours are undermined not only because of a wrong policy design (Arshed et al. 2014; Fotopoulos and Storey 2019) but also because of the destructive behaviour observed through corruption (Boudreaux et al. 2018; Dejardin and Laurent 2024). Whilst Colombia suffers lots of problems of corruption (Fergusson 2013), two policies have been effective in the agricultural sector: the coca eradication policy (Camacho and Mejia 2017) and the extensionists policy (Munoz et al. 2018). We contribute to the latter with evidence by showing that the extensionists of the FNC (as a sort of institution) significantly drive the emergence and growth of coffee crops. The presence of illegal and/or informal activities makes entrepreneurs adapt to survive in a market (Desai et al. 2013; Smith et al. 2017). Albeit we agree with Desai et al. (2013) on the low efficacy of formalization policies when destructive entrepreneurial activities are present, we have shown that formal institutions in the form of extensionists play an important role in providing a more stable environment for coffee farmers.

However, and finally, we also contributed to rural entrepreneurship literature (Muñoz and Kimmit 2019) by focusing our analysis on peripheral areas, where most of our variables of interest occur. Hence, as Welter (2011) suggests, entrepreneurs are embedded in historical, temporal, institutional, spatial, and social contexts, especially in rural environments (Muñoz and Kimmitt 2019). We provided insights into how the strategic allocation and presence of formal institutions moderate externalities of destructive entrepreneurship such as coca crops. Aligned with the idea of low state capacity, we observed that farmers face important trade-offs when it comes to the production of coca vs. coffee. It supposes that the presence of extensionists provides knowledge, advice, and support to produce coffee. Yet, the reality in rural areas leads farmers to react to other economic incentives stemming from illegal markets, of which coca leaves are part (Munoz-Mora et al. 2018; Prem et al. 2023). Our evidence could suggest that the current institutions are insufficient to break down the trade-off. In this regard, the notion of both formal and informal institutions (North 1990) might fall short in rural areas, leaving space for other theoretical approaches such as those provided by Welter et al. (2017), who support the idea that everyday entrepreneurship, typically found in rural zones of developing countries, requires a different policy approach that takes a different direction as compared to innovation or technology-based entrepreneurship.

5.2. Implications for entrepreneurship policy

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Given our contextual setting, it is natural to follow Welter et al.'s (2017) dialogue to discuss policy strategies that encourage entrepreneurs and farmers to produce licit agricultural products. In this regard, extensionists become a policy mechanism to intervene in coffee production and avoid market temptations coming from illicit activities such as coca production. Our results highlight the idea that extensionism (in the form of advice and technical support) is fundamental in the process of the generation, productivity, and maintenance of coffee crops. Whilst the policy consists of providing specialized advice to manage and grow coffee, integrative mechanisms are also needed to go beyond and overcome a potential trade-off between coffee and coca.

In rural settings, the institutional context plays a vital role in shaping the entrepreneurial landscape. For example, policies aimed at fostering productive entrepreneurship in rural areas should focus on creating a conducive environment rather than solely maximizing entrepreneurship indicators. This approach involves building a system that supports and nurtures productive entrepreneurial activities, ultimately leading to sustainable economic development.

Features specific to rural areas, such as limited access to resources like financing, educated workforce, and infrastructure, need to be integrated into policy frameworks to capture the local nuances of entrepreneurship (Aguilar 2021). Additionally, policies should aim to prevent rural exodus and attract urban entrepreneurs to exploit opportunities in rural regions (Mahn et al. 2022). This is particularly true in the Colombian context as universities (such as Universidad Nacional de Colombia, Universidad de Antioquia, Universidad del Valle, Universidad Industrial de Santander, etc.) offer a variety of academic programmes through regionalization strategies that equip people with knowledge and skills to tackle social and economic issues in rural areas.

Hence, policy interventions should focus on skill-building initiatives tailored to rural contexts to support entrepreneurship-focused economic development (Lyons et al. 2019). By addressing the specific needs and challenges of rural entrepreneurs, such as access to resources and market limitations, policies can effectively promote entrepreneurship in these areas. Emphasizing the role of social capital in rural entrepreneurial intentions can also be instrumental in driving economic development and addressing poverty in rural communities (Ali and Yousuf 2019).

The alignment of knowledge, infrastructure, markets, and institutions (both formal and informal) for entrepreneurship whilst solving activities that worsen societal problems entails an orchestration that helps the accurate accumulation and management of resources. The aim

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here is to support farmers, reducing the incentives for them to produce coca. Certainly, this is a relevant challenge as the Colombian reality requires more effective institutions that mitigate the negative effects of coca crops. There exist important examples of the positive effect of government policies on coffee crops, which have been demonstrated through certification, financing, or peace-building initiatives (Miklian and Medina Bickel 2020; Sibelet and Ba 2012). This should be part of an integrative policy that reduces coca production whilst incentivizing coffee or any other licit product. Coca eradication can be one option. The evidence, though, shows that there are cheaper and more socially impactful ways than eradication through glyphosate (Camacho and Mejia 2017). Furthermore, these results show us that innovative methodologies such as spatial analyses are of great help in understanding complex effects, which would be impossible to calculate through simpler methodologies.

Finally, albeit we focused on destructive and productive entrepreneurship, including extensionists (as institutions), other aspects, such as a better financial system, might also be important in defining productive activities, something that should be taken into account by policymakers. Thus, it is important to highlight that there is still a long way to go in the existing interplay between coca and coffee crops. Through these results, one interpretation comes to mind. It is necessary to introduce monetary incentives in the decisions of the agents, surely the impossibility of extensionists to weaken this negative interrelationship is because it is still more profitable to grow coca than growing coffee, and this is something that cannot be set aside.

5.3. Limitations and future research lines

Future research might be interested in exploring other institutions that participate in the entrepreneurial process (Aparicio et al. 2016; Welter 2011). For example, how the religious affiliations of both destructive and productive entrepreneurs might condition decisions based on ethical standards (Audretsch et al. 2013). The influence of different native dialects on the substitution interplay between destructive and productive entrepreneurship is also an important institutional aspect to consider (Tang et al. 2021). Similarly, the effects of some sociocultural characteristics (e.g., associativeness, cooperation, voluntary spirit) within each municipality might also determine the potential substitution between destructive and productive entrepreneurship in rural areas (Muñoz and Kimmitt 2019). Further research can contemplate and prove a potential complementarity (or low degree of substitutability) between destructive and productive entrepreneurship as farmers might decide to produce both (Muñoz-Mora et al. 2018). Additional research efforts may dive deeper into the transnational effects of destructive

entrepreneurship. For example, Dávalos et al. (2009) have shown the powerful worldwide impact of Colombia as a major producer of coca leaf on the market dynamics of coca. Finally, important attempts could emerge from better-capturing entrepreneurs rather than entrepreneurial activities. In our case, due to data availability, we approached both productive and destructive entrepreneurship through new coffee and coca crops, respectively. Yet, future research can identify entrepreneurs (or farmers) instead of land, which would give additional information about entry dynamics.

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Appendix

Table A1. Robustness checks for spatial models

Variables	SAR		SEM	
	(1) Coffee share	(2) Coca share	(3) Coffee share	(4) Coca share
Extensionists	0.0013*** (0.0002)	-0.0002** (0.0001)	0.0016*** (0.0003)	-0.0002** (0.0001)
Coca share lagged	-0.0526*** (0.0128)		-0.0534*** (0.0141)	
Coca share*exten lagged	-0.2990*** (0.0756)		-0.2918*** (0.0771)	
Coffee share lagged		-0.0289* (0.0136)		-0.0349* (0.0143)
Coffee share*exten lagged		0.0201+ (0.0120)		0.0239* (0.0121)
Fiscal performance indicator	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)
Transfer income %	-0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)
Displaced	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
Displaced received	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)
Saving capacity	-0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)
Amount of debt	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)

Constant	-0.0016*** (0.0003)	0.0001 (0.0001)	-0.0022*** (0.0005)	0.0001 (0.0001)
Spatial rho	0.6654*** (0.0515)	0.2549*** (0.0493)		
lambda			0.6978*** (0.0593)	0.2389*** (0.0518)
Variance lgt_theta	-0.8266*** (0.0934)	-0.9277*** (0.0909)		
sigma2_e	0.0000*** (0.0000)	0.0000* (0.0000)	0.0000*** (0.0000)	0.0000* (0.0000)
ln_phi			0.1514 (0.1884)	0.2031 (0.1432)
Year FE	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
Observations	2320	2320	2320	2320
R-squared	0.222	0.027	0.194	0.032
AIC	-24122.8366	-27109.5624	-24075.4051	-27094.2024
BIC	-23984.8528	-26971.5786	-23931.6721	-26950.4693

Note: Standard errors in parentheses + 0.10 * p<0.05, ** p<0.01 and *** p<0.001. Robust standard errors clustered by municipalities. The regional fixed effects variables refer to dummy variables to determine whether the municipality is from the Andina, Pacifica, Caribe, or Orinoquia regions.

Source: Own elaboration.