Abstract

Property rights as crucial institutions for development have long been the focus of academic attention, from a variety of perspectives. However, the effects of the level of formalization of property rights on illegal activities have so far remained absent in the literature. Considering the large scale of the cocaine production market in Colombia and the vast amount of money invested to counter this market in the war on drugs, property rights could be a crucial element in the explanation why certain land plots are utilized to grow coca leafs, and others for other purposes. This study focuses on this relationship, combining the presence of illicit coca leaf plantations with certain levels of property rights in Colombia. Furthermore, it is the first study to disentangle these effects in relation to the consistent violence around illicit crops in Colombia. Taking the specific characteristics of the coca cultivation process into account, we use a dynamic model in combination with the system GMM estimator which allows us to control for individual specific effects and persistent variables, and to introduce lags of endogenous variables as instruments. Additionally, we perform a Granger causality test to establish the correct direction of this relationship. The empirical data stems from unique census dataset covering 892 municipalities in Colombia from 2000 to 2008. Our results suggest that weaker institutional structures of property rights over land have a positive effect on the number of coca leaf plantations. These findings seem to suggest that efforts in the war on drugs should also be focused towards the formalization of property rights.

1 Introduction

A renewed interest has arisen since the publication of Acemoglu and Robinson’s book *Why Nations Fail* towards the role of institutions as crucial elements in the success or failure of a society, thereby explaining phenomena such as growth, inequality, and poverty (Acemoglu, Johnson and Robinson, 2001; Acemoglu, Johnson and Robinson, 2005; Acemoglu and Robinson, 2010; Acemoglu and Robinson, 2012; Acemoglu and Verdier, 1998; Besley, 1995; Besley and Ghatak, 2010; North, 1981; Ostrom, 2009; Rodrik, 1999). As part of the broader concept of (economic) institutions, defined as the framework and rules under which human interaction develops in societies (North, 1981), property rights also embody a social function and its exercise yields further limitations as they are designed to fulfill collective services (Duguit, 1920; Reich, 1964). Property rights play an important part in the story on the role of institutions, through which constructive behavior, but also illicit behavior both on the government side, as well as the citizen side could get incentivized (i.e. illicit activities such as illegal logging, or drug production).

Property rights fall in two general categories: formal and informal. Notwithstanding the origins of this economic institution in Colombia at this day, formal and informal property rights appear however to be coexisting next to each other in the country, although clustering in certain regions. Considering the history of drugs production and the related violence in Colombia, this paper studies the possible relationship between formal or informal property rights on the one hand, and illicit coca crop production and the other, whereby the connection with the apparent violence is introduced in the models as well. Although these concepts have been empirically studied individually and in pairs, the three have never been combined to disentangle these relationships. Furthermore, since *Why Nations Fail* the renewed discussion has focused on the direction of the relationships between institutions and certain behavior. These relationships are the particular focus of this study, whereby insights are supplied as to the role of a certain institution in the presence of illicit coca crop fields and violence in Colombia.

Colombia has been plagued for decades by illicit drug production, violence, guerilla and the opposing paramilitary groups, and instable governments with their war on drugs. The cocaine production and exporting market has played a central role in this. The demand and resulting profits for this product are enormous. The global cocaine market in 2009 was estimated in US$ 89 billion (2011 US dollars), with 14 to 20.5 million yearly users (United Nations, 2011). Before 1995, most of the coca fields to produce the raw paste were located in Peru and Bolivia, with the processing plants in Colombia. Since then, a shift of these fields has been observed to neighboring Colombia. This was due to two factors: first, the flight interdiction program implemented by the government of Peru with the help of the government of the United States resulted in large decrease in coca paste supply to Colombia. Secondly, with the fall of communism in the 90s, the financial support for the left-wing guerillas in Colombia dissolved (Thoumi, 2002). Both factors resulted in the cross-border relocation of coca production fields close to the processing fields in Colombia. By 2010, the growth of the coca production fields in Colombia decreased considerably again to 1995 levels, due to the implementation of counter narcotics programs of the Colombian government.

The production process to produce the end product cocaine takes place in four stages: planting, growing and harvesting of coca leafs, extraction of coca paste, transformation into cocaine base, and finally the conversion of cocaine base into cocaine hydrochloride. The process starts in regions of Bolivia, Colombia and Peru where biological and environmental conditions are optimal for growing the plant and moreover, a culture of coca farming has profound roots in indigenous communities. Most species and varieties of coca plants grow below 1,500 meters, they are perennial, harvested on average four times per year and reach full maturity between 12 and 24 months after sowing the seeds (Bray and Dollery, 1983; Drug Enforcement Administration, 1993; Hanna, 1974; Mejía and Posada, 2008; Morello and Matteucci, 2001; Moreno-Sánchez, Kraybill and Thompson, 2003; Riley, 1993).

The *War On Drugs* of the Colombian government against the cocaine industry takes place throughout the whole process. Some of the main policies include seizure of raw materials for production, manual and aerial eradication of coca fields, destruction of production plants and laboratories, interdiction of drug shipments, as well as promotion of alternative development and crop substitution programs (Mejía and Posada, 2008). Most of these policies are encouraged and financed jointly by producing and consuming countries. An example of this was Plan Colombia, which originated in 1998 as a bilateral cooperation program with an annual spending of US$ 1.7 billion (2011 US dollars) between the governments of Colombia and the United States to fight against illegal drugs and organized crime (National Planning Department, 2006).

Although not without any success, these programmes have proven to be limited when it comes to decreasing the number and area of coca crop plantations, as well as disturbing the finances and influence of the organized crime behind it. Recent studies favor alternatives that focus on increasing households' income from legal activities. These alternatives include technical assistance, agricultural loans and more secure forms of property rights (Grossman and Mejía, 2008; Ibañez, 2010; Mejía and Restrepo, 2008; Moreno-Sánchez *et al.,* 2003; U.S. Government Accountability Office, 2008).

The scientific foundation for the direct relationship between the promotion of property rights and decreasing the discussion to grow and produce coca crops on an individual’s land plot has remained absent so far. Property rights have been studied in relation to many economic outcomes. Findings show that improvements in property rights can boost wages, productivity, and open up the possibilities for individuals to invest, with in turn results in potential higher income of the rural households (Besley, 1995; Besley and Burgess, 2000; Deininger, Ayalew and Yamano, 2008; Deininger and Jin, 2006; Acemoglu and Robinson, 2012; Demsetz, 1967). The effects of weak property rights have also been subject of investigation is several studies. Findings show that this could hinder law enforcement of government bodies, and increase social tensions, which in turn could generate violence and facilitate illegal recruitment, forced displacement, land appropriation, and the development of other illegal activities in conflict areas (André and Platteau, 1998; Binswinger, Deininger and Feder, 1995; Collier and Hoeffler, 1998, 2004; Deininger, 2003; Deininger, Jin and Nagarajan, 2007; Fernández, 2010; Velásquez, 2007).

This study acknowledges this niche by analyzing the relationship between the presence of illicit coca crops and the level of formality of the property rights over land, in order to provide a wider understanding of the role of institutions in development and the underlying mechanisms behind coca crop planting. We hypothesize that more formal structures of property rights have a negative effect on the presence of coca crop plantations, since governments are able to exert law enforcement, and households increase potential income out of legal agricultural yield while they are less willing to take part in illegal activities (CHANGE WITH RESPECT TO CHAPTER II?). Therefore, we study the determinants of the presence of illicit coca plantations focusing on the effect of the informality index of property rights over land. With asking this question, we aim to contribute to the debate on the importance of institutions in macro-economic phenomena, as well as supply policymakers in the *War On Drugs* with insights that could help to steer more effective policies.

The empirical data in this study stems from a unique census-dataset on sub-national level from Colombia covering the period from 2000 to 2008. This data is enriched with data on the presence of coca fields from the United Nations Office on Drugs and Crime (UNODC), which is estimated for every municipality. To measure the level of formality of the property rights, a proxy variable was devised. This proxy is based upon the safeness in land ownership as defined in Colombian legislation. More concrete, we use the informality index of property rights over land constructed by Ibañez and Muñoz-Mora (2010) with data from the cadastral database of the Geographical Institute Agustín Codazzi. The index is a ratio per municipality between the cadastral land area without legal title over the total cadastral area of a municipality corrected for non-private property. We acknowledge, that this index may not reflect the full sense of property rights, as it does not reflect the ability to exercise these rights. However, considering the data available, we argue that this index is a good approximation to start with.

We propose a dynamic specification, following Arellano and Bond (1991) and Blundell and Bond (1998). This is driven by several considerations. Firstly, coca plants are perennial and reach full maturity between 12 and 24 months after sowing the seeds. There is a source of persistence in the presence of illicit coca plantations as past realizations of areas with coca crops affect the current one, which could possibly cause omitted variables bias. Secondly, Colombian municipalities are heterogeneous which points at the existence of fixed individual effects. Finally, the available data shows a large number of individual units of observation, but small *T*. As a result, common approaches such as OLS and Fixed Effects estimators are biased and inconsistent (Nickel, 1981; Sevestre and Trognon, 1985). Instead, we use the System GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator allows us to control for individual specific effects. Furthermore, it enables us to introduce lags of endogenous variables as instruments. This System GMM proves to perform better than similar estimators in the presence of persistent variables (Blundell and Bond, 1998; Blundel, Bond and Windmeijer, 2000). The estimations are complemented with a wide range of geographic, political, land, and socio-economic controls which have been identified in previous, related studies. Additionally, this estimator is also used in the Granger causality test to identify the causality linkage between the presence of illicit coca plantations and the informality index of property rights (Granger, 1969; Granger, 2003; Holtz-Eakin, Newey and Rosen, 1989).

Results suggest that weaker structures of property rights have positive effects on the levels of coca leaf plantations. With all controls included, we find a positive effect of 0,849 percent in coca fields presence per 1.000 hectares, when the ratio of informal properties in a municipality increases by 1 percent. This relation is robust to several specifications, alternative measures of institutions, distinct subsamples and overidentification and serial correlation tests. Additionally, results of the Granger causality test show that higher levels of the informality index of property rights “Granger cause” an increase in the presence of coca leaf plantations, whereas the converse causality relationship is rejected. MORE RESULTS PLUS POLICY IMPLICATIONS.

The paper is structured as follows. Section two provides the context of this study, which first puts the topic in its broader context of the role of institutions, after which the individual elements of property rights, coca crops, violence, and Colombia will be discussed through the literature. Section three outlines the identification and empirical strategy, our hypotheses, describes the data, and discusses the descriptive evidence. The econometric results, along with the Granger test results are presented in section four, which is followed by a discussion of the robustness of the findings. Section five concludes by discussing the policy implications and possibilities for future research.