Coca Farming Dynamics: The Colombian Case

Abstract

During the last 20 years, Colombia has had a reputation for being one of the largest producers of coca in the world. However, even when the Colombian cartels ruled the market and were the most innovative and aggressive suppliers, they were not always the largest producers. This work describes the rise and fall of the Colombia coca farming industry, understanding the dynamic of the illegal markets, and the role of the law enforcement. Using a system dynamics approach, and the elements of the economic theory of the criminal firm, our work finds that one of the main causes of the coca farming rise might be attributable to a counterintuitive policy against the dominant cartels' monopoly. As well as the legal markets, in the illegal ones, an increase in competence means an increase in production resulting in decreased prices.

Introduction

Throughout the 1960s, 1970s and 1980s, cocaine became popular in the United States as a drug that signified status among the middle and upper class, providing media and financial opportunities (Thoumi 2005). Consequently, by the middle 1980s, cocaine was already prevalent in most cities where the Colombian drug dealers progressively dominated and expanded their market. Supplying a broad network of dealers, they settled in cities like Miami and New York which became the main entry points to the American market. The drug was initially smuggled from Colombia through the Caribbean islands and later though the Mexican border (Thoumi 2001). Colombian drug trafficking activity "coincided with an accelerated demand-rise in the US, which started an unusual process of accumulation of enormous amounts of money in the hands of the few involved in the activity" (López Restrepo & Camacho Guizado 2003). Two main cartels were conformed (Medellin and Cali) and many other small ones ran their operations across Colombia, Central America and Mexico (Thoumi 2008). Chepesiuk (2005), arguess that in their best moment, the two main criminal organizations owned roughly 80% of the cocaine sold to the American consumers.

Although the Colombian cartels were the main producers of cocaine, they were not the main coca farmers (Thoumi 2008). They also had to smuggle the coca basis form Peruvian and Bolivian farmers, performing very expensive logistics which only the richest cartels could afford (Frontline 2006). To a certain point, the Colombian drug lords came late to coca bush farming, given the fact that by the middle 1980s, the Colombian coca bushes production was about of 9% of the Andean cultivation, and the Peruvian and Bolivian ones were about 61% and 30% respectively (US. Secretary 2010; 2008; 2005; 1997). A very complete scenario was seen fifteen years later, when the Colombian production rose to 76% of the Andean cultivation, while the Peruvian and Bolivian ones competed with each other to supply the rest (United Nations. Office on Drugs and Crime 2010; 2008; 2006). Today, like Figure 1 illustrates, the Colombian cultivation (43%) is close to the Peruvian one (37%), and almost twise that of the Bolivian one.

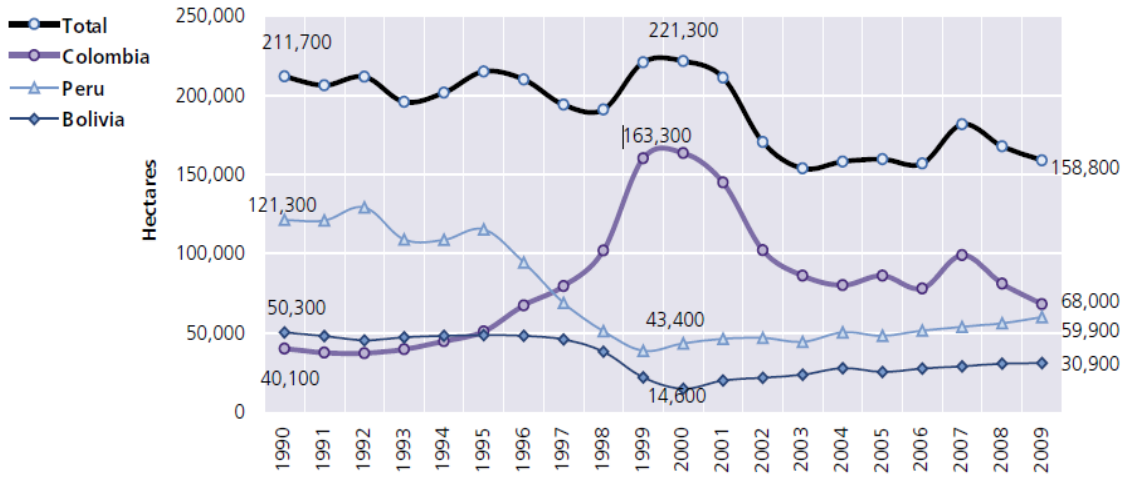

Figure 1. Global coca bush cultivation: United Nations (2010).

The fate of the main Colombian drug cartels came with their expansion and its social and economic influence, which coincides with a high increase in the homicide ratios. A continuous expansion of violence and terrorist threats shocked the Colombian nation into awareness of its long connivance with the fast enrichment. The society and government reacted by getting support from US in terms of military training and technology (Sauloy and Bonniec 1994). By 1992-93, the most outstanding members of the Medellín cartel were in jail or dead. The Colombian government then went ahead against the Cali cartel with all the experience of being fought a bloody batttle against the Medellin cartel. By the mid 1990s, the two main members of the Cali cartel were sent to prison and their structure seriously damaged. Immediately following this "the Norte del Valle cartel incorporated the Cali cartel's routes and social networks" (Colombia. Vicepresidency 2006), and an unintended increase in the coca bushes

cultivation unleashed a worse scenario with more actors and violence involved: the guerrillas and paramilitaries war (Duncan 2006A; 2006B).

The outbreak in the coca bush cultivation in Colombia came in the very year when the Cali cartel was dismantled (Thoumi 2008; Duncan 2006A; López Restrepo & Camacho Guizado 2003). At such point, this organization had the most powerful trafficking structure in United States (Chepesiuk 2005), and also the biggest political influence in Colombia. Is it possible to establish a causality between the big organization dismantling and the increase of the coca hectares? Our hypothesis stresses that the outbreak in the amount of Colombian coca hectares was a counter intuitive result of a policy against the Cali cartel. The purpose of this work is to explain our hypothesis, the theory involved, the results and conclusions. The paper is organized as follows: section two presents some of the key aspects of the literature for the criminal organization dynamics. Section three shows our dynamic hypothesis for explaining the phenomenon and its validation. Section four presents our conclusions.

2. The Need for Dynamics Models of Drug Markes

Peter Reuter wrote a very remarkable paper which stresses the need of Dynamic Models for understanding the drug markets behavior (Reuter 2001). However, his work is not the first one notticing the dynamic structure of the drugs markets and also the inconvenience of using the traditional models in order to understand them. Caulkins (2001) argues that the drug markets are one of the most complex and changing socio-economic systems. At least in US, he says there is not another illegal market which can be compared. Yacin (2004) for instance, stresses the need for studying some characteristics of addiction using epidemic models, and Beherens, et al. (1999) explains the presence of endogenous behavior for predicting the number of new consumers. The very System Dynamics literature has its contribution with the works by Gardiner and Shreckengost (1987) and Homer (1993), about the estimation of imports of heroin to the US and consumption of cocaine in the US.

The need for dynamic models has been even more visible when it is necessary to explain the counter intuitive effects of some law enforcement policies against the illegal drug markets (Caulkins & Reuter 2006; Caulkins and Tragler 2004; Kleiman 1993; Kleiman y Reuter 1986). Lee's work (1993) for instance, explains how after the decriminalization of marihuana consumption, came an unexpected decrease in demand. Scott and Jensen (2001) shows how under certain conditions, a law enforcement policy can rise up the criminals' "marketing", increasing the number of addicts and consumption. Fiorentini and Peltzman (1995) argue that anyone of the best policies against the organized crime suggest a direct attack, while Cellentani, Marrelli and Martina (1995) conclude that a direct attack on organized crime increases its profits and its capabilities for generating more violence and corruption. There are more examples

about this particular issue of unintended consequences of law enforcement interventions (Garupa 2007; Poret and Tejedo 2006; Poret 2002; Garoupa 1997). What they have in common is the description of how the system's structure is misunderstood, revealing unintended causalities whose negative impact on the system only can be noticed when the policy is already implemented.

The review of this literature allows us to understand why the Colombian case might be analyzed under that perspective, given the fact that illegal drug markets are systems, which respond in an either intuitive or counter intuitive way to the effect of policies. In other words, the literature review lets us launch the hypothesis that perhaps the outbreak of the Colombian coca crops might be an unintended consequence of an intervention on the illegal system.

In the Colombia case, an important number of Colombian scholars in the field (e.g. Duncan 2006B; López Restrepo and Camacho Guizado 2003; Thoumi 2005; Vargas 2004) argue that the Cali cartel dismantling policy gave way to a new generation of criminals. They indicate that the fall of the cartel, promoted the surge of many small gangs, which were poor and atomized compared with big cartels, as well as vulnerable to police forces and other traffickers. In other words, the fight against organized crime contributed to the formation of a large number of smaller organizations called "cartelitos" (small cartels) (Jacobo 2003), bringing more firms into the illegal industry. It is not obvious to establish the causality between a concentrated industry and the amount of coca bushes cultivated, however, there is a theory which might give light to the possibility of such a causality.

Figure 2, depicts the Buchanan's Defense of organized crime theory. The horizontal axis represents the resources devoted to law enforcement while the vertical axis the resources used by criminal activity. C curve, draws the criminal response. Z, is the initial equilibrium. Under a criminal monopoly, Cm represents the supply curve (criminal response) and Zm a new equilibrium. Buchanan (Buchanan 1973), states:

> "Monopoly in the sale of ordinary goods and services is socially inefficient because it restricts output or supply. The monopolist uses restriction as the means to increase market price, which in turn, provides a possible source of monopoly profit. This elementary argument provides the foundation for collective or governmental efforts to enforce competition. If monopoly in the supply of "goods" is socially undesirable, monopoly in the supply of "bads" should be socially desirable, precisely because of the output restriction."

As law enforcement impedes monopolization and concentration, fragmentation and competence emerge. A consequence of that theory is the negative effect between

concentration and violence, and therefore, the situation with the Colombian organized crime was quite similar. During the early 1980s the Colombian cocaine industry was characterized by its high degree of concentration and integration (Krauthausen 1998; Thoumi 2008). Coca basis was imported from Bolivia or Peru, processed in some remote laboratories in Colombia and smuggled to the US.

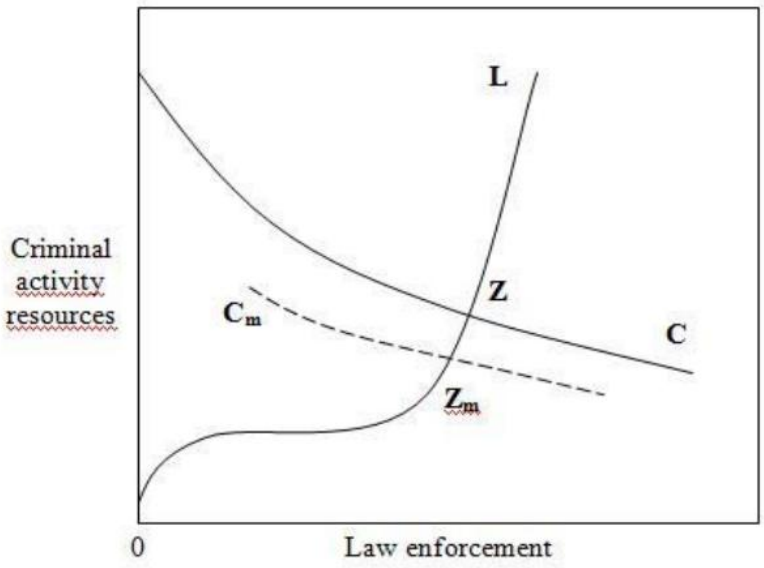

Figure 2. Criminal's Monopoly Equilibrium. Source: Buchanan (1973).

The main power position in the market was the route owner, a trafficker who controlled the shipments from an isolated laboratory to the market place. The cocaine market was, and still is, a free market with low relative barriers to enter. Many illegal businessmen might buy coca basis in Bolivia or Peru and resell it in Colombia. Many others could process coca into cocaine powder as the main traffickers' outsourcing, nevertheless, very few of them could have the logistics for shipping it from Colombia to the US (Krauthausen 1998). The real vocation of the main Colombian cartels until 1995 was controlling and managing their routes. The route owner coordinates the smuggling network and decides who his partners are. There was a natural network monopoly where the route owner had the privilege to decide who went with him into the illegal business. Routes are fiercely owned by traffickers which have the sole power to use it. A market with several route owners require a guarantee between neighbors to prevent negative externalities as the result of law enforcement. In addition, not many traffickers can manage the risks associated for smuggling cocaine across several countries. The best route is the safest one (Krauthausen 1998).

According to the reviewed literature, Colombia had a very concentrated market for shipping cocaine to the US. After the Medellin cartel's dismantling, the power and concentration reached for the Cali cartel was even more. All of these elements justify

the need for a model to better understand what would happened under the circumstances when the illegal system is hit by a law enforcement intervention.

3. The Dynamic Hypothesis

The dynamic hyphothesis lies on two main assumptions: the basis that in the illegal drug industry there are big, medium and small firms, and to consider the Andean coca hectares production like a closed system, which means, no coca cultivation from a different country. The size of a firm depends on its production capacity, which means the capacity of attending and keeping its demand. Violence is the usual means for doing that. According to the theory of the criminal firms (Rubin 1973), as in the legal markets, in the illegal ones, firms compete with each other for a share of the market. Big firms will be taking market's share from the medium ones, and medium ones from the small ones. In the long run, one possible scenario would be that in a given market, there can only coexist big and small firms. If the nature of the firms is to attend to its demand, Figure 3 depicts the way that the firms opperate by taking the market's share away from their competitors.

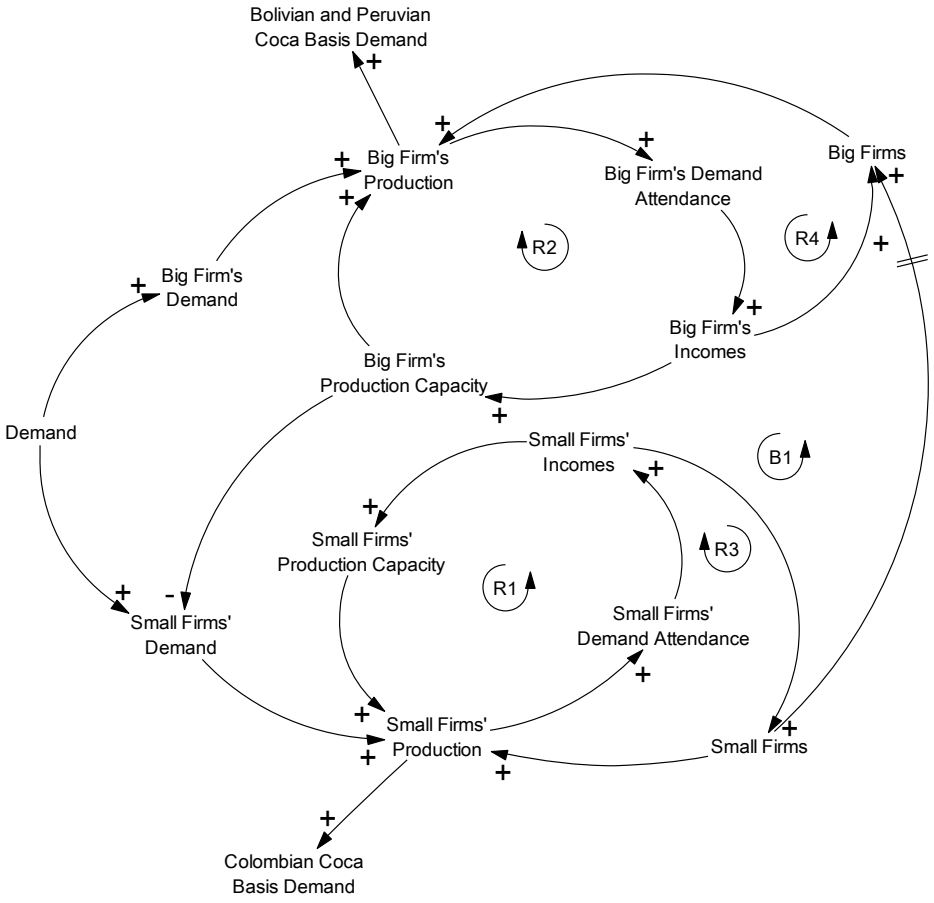

Figure 3. Competition in the illegal markets.

As the theory suggests, the market by itself has a tendency to be concentrated, even when violence plays a very relevant role in order to dismiss conflicts and competition (Buchanan 1973; Rubin 1973). In the model, cycle B1 reveals how big firms can co-opt market's share from the small firms. Reinforcement cycles (R1, R2) depict the production capacity's increase given the incomes. Cycles R3 and R4, present the fact that given some level of incomes, there are more firms disposed to enter the market.

Nevertheless, competition is not just between big firms and small firms. There is also competition among the big firms and the incoming big firms. As any market, an increase in demand means a decrease in prices. Additionaly, firms can not increase their market's share indefinitely. According to Poret and Tejedo (2006) and Poret (2002), the probability of being captured depends on the market's share taken due to the amount of illegal transactions. A firm with a large share in the market, is a firm who needs a lot of illegal transactions in order to run and keep its business. In other words, to be big, is to be visible to the law enforcement. Figure 4, illustrates the competition among the firms and the probability of being captured in function of the amount of illegal transactions.

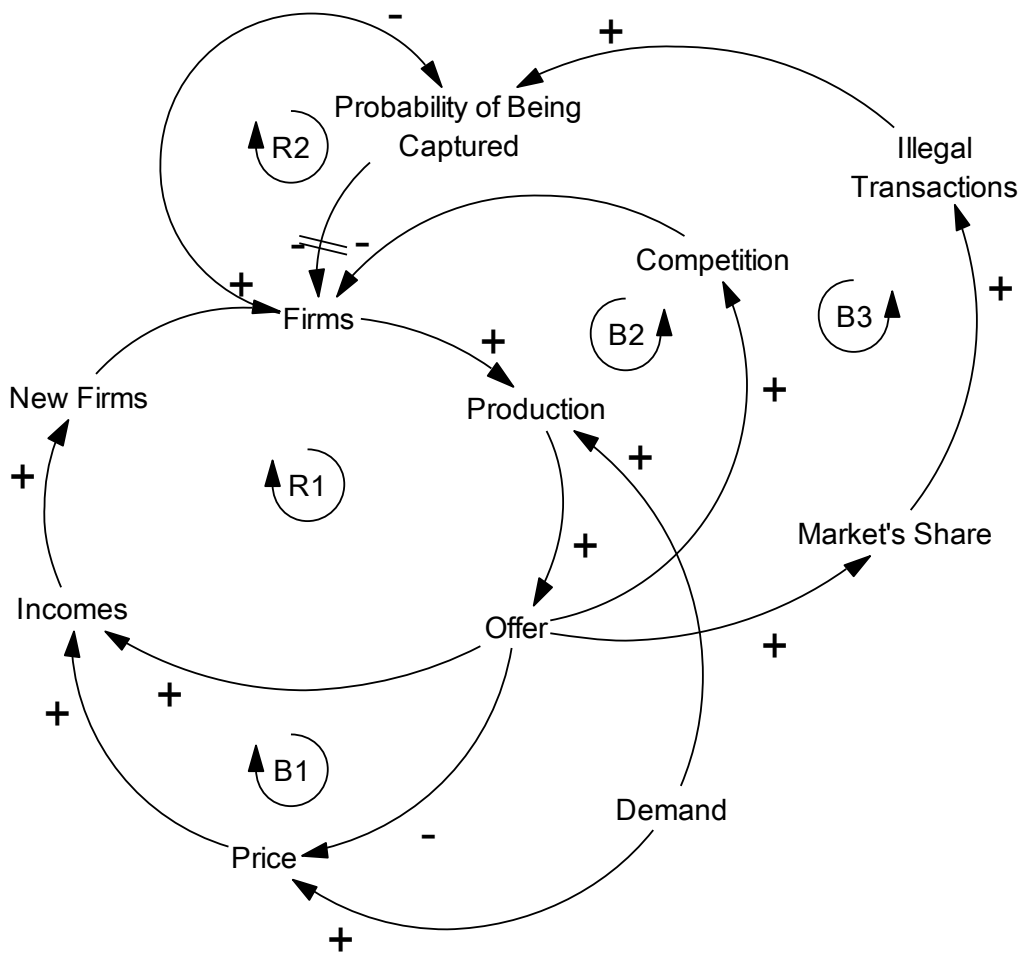

Figure 4. Illegal firms' competition and law enforcement.

Figure 4 illustrates the paradox of the illegal firms. They have to grow in order to survive their competitors. But once a succesful big firm defeats its competitors it has to face the law enforcement pressure (Garupa 2007; 1997). Of course, the law enforcement's action against the big firms can be delayed in time, due to the means that they have in order to avoid capture. Some of them are legal, as hire reputed lawyers, but ussualy their strategies come from bribing and threatening, to change the constitutional laws, or even supporting a presidential candidate (Chepesiuk 2005). In the case of the law enforcement's action on small firms, there is also a delayed effect, but not for their capability of bribing or threatening, but as a consequence of their little visibility in the market. Hence, a market without big firms suggest a market with a large number of small firms. A market with more competition and competitors, which means more difficulties for the law enforcement in order to cope with it.

In 1995 Colombia had the scenario of being a very concentrated industry, in the hands of a few known powerful drug lords like the Cali cartel, which imported coca basis from Peru and Bolivia. The richest cartel dominated the logistics for smuggling the cocaine into US territory, choosing their partners in the local arena. They enjoyed their apparent immunity given their political influence. Aside, there were a large number of limited resources small firms buying coca basis from the local farmers and attempting to establish their own routes, or looking for an opportunity to associate with the big cartels.

Suddenly, given the American government and Colombian nation pressure, the Cali cartel's drug lords where sent to prision, and the Colombian government started an agressive campaign against this organization (Colombia. Vicepresidency 2006; Chepesiuk 2005). If we take the Figure 3 's diagram, and suddenly remove the big firms demand attendance, we will have a market which needs to be attended, and a bunch of small firms which finally will have the opportunity to increase their market share. As those organizations do not have the means for importing the coca basis from Peru and Bolivia, they then demand it from the local production.

With all those elements of our dynamic hypothesis, we create a stocks and flows model in order to resemble the described scenario and the Colombian government intervention. For simplification, we add the Peruvian and Bolivian hectares together. Figure 5, depicts how our model can explain the main dynamics of the Colombian outbreak and the Peruvian and Bolivian drop. It is important to clarify that the work presented here is simplified for the purppose of the presentation and that there is another set of more detailled elements not included in this paper which allowed us to model this situation. They are regarding the production capacity of each type of firm, the capacity of production of the coca farmers, and the manual and aerial eradication policy. But in essence, the main elements for performing this simulation come from the dynamics hypothesis explained in the diagrams 3 and 4.

Looking at the graphs in Figure 5, we can see that the model is doing relatively well until 2001. Our analysis suggests that it is able to capture the main structure of the market, although there are some elements of coca hectares productivity and demand which have changed during the last years which led us to miscalculate the total Andean cultives. Especially, the model is weak predicting the Bolivian and Peruvian aggregated production after 2001. The model is assigning more than expected coca hectares to the Peruvian and Bolivian cultivation while the Colombian production is decreasing. We believe that this lack of prediction is due to the fact that the global demand for cocaine has apparently decreased in the last ten years (United Nations. Office on Drugs and Crime 2010), and the model is calculating the needed hectares with a constant demand after 1985.

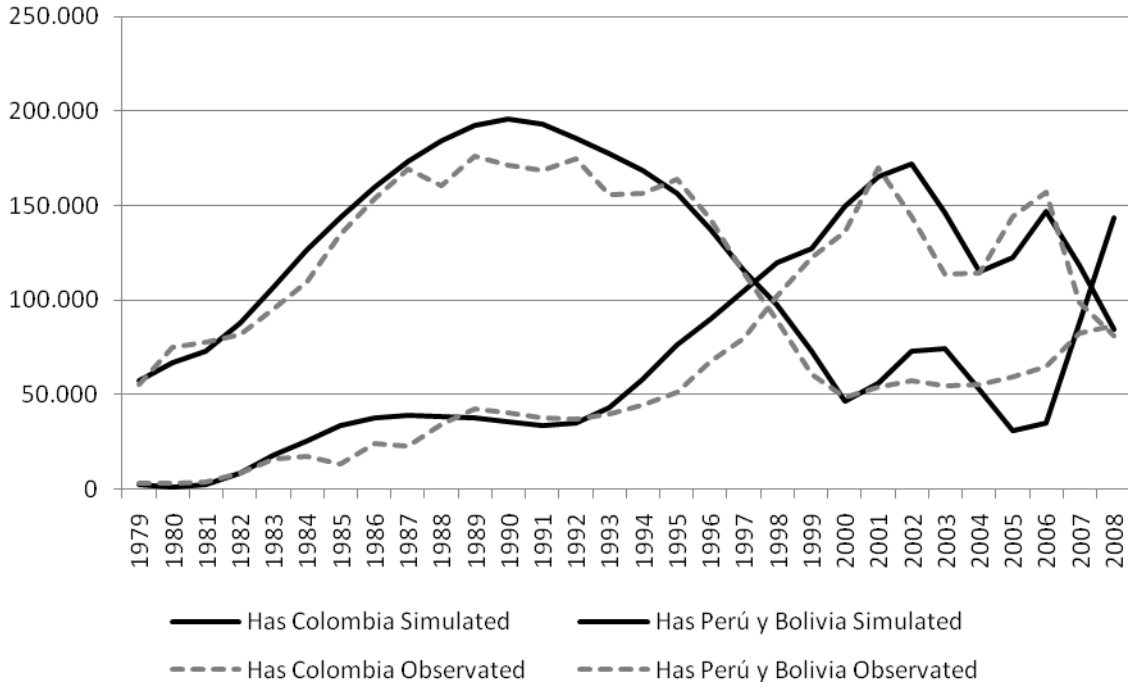

Figure 5. Global coca bush cultivation simulated vs observated.

Finaly, it is relevant to clarify that if we consider a dynamic hypothesis for understanding the Colombian outbreak and Peruvian and Bolivian drop phenomenon, the model just needs the eradication policy results for understand the later Colombian behavior after 2001. The model can explain these dynamics due to the agressive eradication policy, and the second Colombian outbreak in 2004 can be explained by the decrease in eradication during that year (US. State Secretary 2010; United Nations. Office on Drugs and Crime 2010).

After the fall of the Colombian cartels, the new route owners are now the Mexican cartels, and the logistics of the whole route begins in a remote coca farm in Colombia, Peru or Bolivia, passing by Venezuela, and reaching the American market through the Mexican border (US. State Secretary 2010; United Nations. Office on Drugs and Crime 2010) Jacobo 2003). The war for the best routes is now in Mexico, and how the Mexican government manages its interventions will determine the length of that war and the magnitude of the violence.

4. Conclusions

One of the main purpposes of this work is to convey the traditional Colombian and international analysis about the drug problems to the system dynamics approach. The first step is to identify the problems and try to perform convincing or at least seminal explanations. Our first conclusion about this research is the existence of a dynamic problem whose behavior is a counter intuitive result after a direct intervention on the system. We assume that this result was unexpected and unwanted, and for that reason we argue its nature as a dynamic problem.

The dynamic hypothesis finds how it is possible to explain the Colombian outbreak in coca bush cultivation, given the structure of competition among the firms, and the role of the law enforcement. What the model shows is how the criminal industry has a tendency to be concentrated and how the action of the authorities impedes such degree of concentration. In the Colombian case, the government intervention atomized the industry giving opportunities to many illegal impresarios. Their consumption of the Colombian coca boosted the local industry reaching levels never seen before, and unleashing a high levels of violence in the Colombian jungles.

There are many ethical considerations and trade-offs between having an atomized or concentrated criminal market. For the Colombian market, such a case-wise analysis is beyond this paper. What we can argue, is the fact that the Colombian illegal drug market structure is quite similar to that exposed by the theory, and maybe for that reason its behavior could be anticipated.

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