The Marijuana Market in Mexico:
A System Dynamics Perspective

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Abstract

The problem of drug trafficking in Mexico and its side effects has led the government to take serious measures regarding drug trafficking. The results of these efforts on policies, initiated back in 2006, have made it clear that it takes a holistic approach to the cartel-related phenomenon. The present work aims to provide information about the financial dynamics of the marijuana market operated by the Mexican cartels, and the possible impact it could have in both the United States and Mexico strategies related with the market control. A dynamic model is used to identify the financial impact of the cartels, and the results are presented through a set of scenarios.

Keywords: legalization, marijuana market, system dynamics, scenario analysis

Introduction

While illicit activities and violence have existed throughout history, there is still difficulty of approaching data that can be used in this business. The illegitimacy of the business makes it impossible to obtain information. Caulkins (2000) states an endless set of problems to study and quantify the production and transit of drugs. The first issue is data collection. The data collection methods such as surveys do not provide accurate information because most of the times the people who are involved do not answer truthfully to the facts, either out of shame or privacy. Secondly, there is reference to a problem associated with the measurement and interpretation of the data, mentioning that the data can describe patterns and tendencies, but often cannot be explained. For example, you can see the correlation between the drug use and violence, but it is difficult to estimate how much will decrease or increased given the causal relationships. It is clear that we need to discover and quantify causal factors.

In this line, Jaen & Dyner (2007), quoting a United Nations report, give an account of the importance of knowing about the structure and dynamics of illicit activities at a national, regional and global level so that they can develop more integrated strategies that consider sectorial and geographical approaches. They propose that given this lack of information there is a certain behavior that can be understood if we study the cartel problem similarly to the legal market as in any market, dominated by basic elements such as price, supply and demand.

This is precisely the problem of public policies with a high impact on a complex system such as is the market of illegal drugs. Caulkins (2000) relates: "The problems associated

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with drugs are complex and to determine the best way to fight them is not always intuitive". Due to the lack of knowledge of how the market structure works, actions are implemented in order to improve the state of the system, that over time are a little counterintuitive. This type of problems then requires an approach that shows not only an aspect of the problem, but also the interaction of the elements and their causal premises in the complex system that accommodates them.

This paper seeks to approach closer to the market performance of marijuana in Mexico based on the financial dynamics of the market and the demand structure, which considers both he Mexican market as well as the United States of America (USA) market.

Background

The theoretical review shows that the dynamics of the illicit drug market has been substantially addressed through Systems Thinking tools and System Dynamics. One of the most relevant studies of the field is the one made by Homer (1993) on the U.S. market for cocaine. Part of the premise that the analytical models are extremely relevant to understand this problem, as well as the market of illicit drugs. He claims that no matter how many limitations they encounter in obtaining reliable quantitative information, experts/decision-makers require models to help them validate their mental models on the structure and behavior of the system. For this purpose the author designed a dynamic model for the cocaine market in the US addressing the phenomenon as an epidemic, trying to represent the behavior of the prevalence of consumption over time during the period from 1976 to 1990. From this base model, he presents an analysis of scenarios that show the behavior of prevalence given a change in trend in the consumption of other drugs such as marijuana and crack.

The U.S. market has also been studied with analytical methods by Rydell and Everingham Cauilkins (1994, 1996). In their study, based on the cocaine market, they demonstrate the evaluation of programs that aim to address the problem, but with different approaches. They assess the impact, to attack the supply through seizures, interdiction and prosecution of drug traficants and drug dealers against the results of a program focused on the treatment and rehabilitation of chronic addicts. They establish that the strategy to combat the networks, leads mainly to increase the business and that it could lead eventually to a decline of consumers. The authors focus on the costs of each of the proposed strategies and conclude, based on analytical models, on the advisability of investing more on treatments for chronic recovery addicts, that in the fight against the offer. They estimate that for every dollar that goes to treatment, costs associated with crime and productivity loss are reduced in $ 7.46. This leads them to propose a restructure within the budget allocated to attack this market to consider the treatment of chronic addicts, recognizing that leading addicts to this level requires a bigger budget.

Moreover, Jaen & Dyner (2007, 2008, 2011) have used System Dynamics to study the illicit drug market in Colombia, logically assuming that this market has conditions to be studied as a licit market. The main hypothesis of this paper is that the destruction of monopolies in illegal markets (like that would happen in a legal market) has an effect on the efficiency and the low prices. For this, the authors discuss police efforts to dismantle the cartels in Colombia, concluding that trying to remove that exclusivity from the cartels

(to be the only sellers), is conducive to a competitive market conditions that facilitate the entry of micro cartels and therefore a decrease in the price of drugs.

The drugs market in the Netherlands has also been the subject of analysis using Systems Thinking. A study by Pruyt (2009) presents a discussion between different policies that should be considered for a future implementation in the market of "soft drugs" in that country. The author reviews the different positions in relation to the problem from a position in favor of a full legalization to the complete opposite, aimed at a more restrictive regulation.

The problem of the cartels in Mexico has also been analyzed by McGee, Joel, & Edson (2011). These authors state that the measures currently taken to counteract the cartels operations, exercising a monopoly on the use of force, are biased about the dimensions of the problem. This initiative, they argue, will never be enough if it is not reinforced by strategies that impinge on the root of the problem such as education, economy, immigration, corruption, among others. These arguments suggest that the Merida Initiative lacks elements to provide a lasting solution in the long run and invite to reform strategies currently used to deal this problem. Another study on the problem in Mexico is the Martinez and Sallach (2011) case about the escalating violence that has been seen in our country. In their study, causal diagrams are used to represent the most important triggers of violence in Mexico's border with the U.S. associated with cartel activity.

The revision of previous work provides evidence to conclude that the systemic thinking and the dynamics of systems are methodologies that have proven useful to represent both qualitative and quantitative dynamic assumptions about a problem as complex as illegal drugs, to be used in the present study.

Premises, objective and scope of the study

This paper seeks to present a study about the financial dynamics specifically related to the marijuana market, considering both the Mexican market as well as the United States of America (U.S.). The approach focuses on the marijuana because of the market structure: is the most commonly used drug in our country and the largest U.S. exports market. While this country is the largest producer of marijuana in the world, about one third of its demand is serviced by the Mexican cartels.

On the other hand, it was noticed that a change in the regulation aimed at liberalization could cause a major impact on their financial dynamics as stated by Hope and Clark (2012). In this regard, the intense discussions that are taking place in some states of the American Union relating to its regulation and legalization, invites us to think about the impact this would have on the Mexican cartels given the volume traded by them.

The present work does not have predictive nature rather seeks to describe the tendency of the leading indicators in the system, given the implementation of certain strategies to be studied through a scenario analysis, considering a time framework that goes from 2011 to 2017.

For this purpose, it has been designed a Causal Loop Diagram (CLD) to establish each scenario hypothesis, and a system dynamic model was design to evaluate each one- The

basic mathematical assumptions have been defined from information collected in the study of "Drug Policy in Mexico, an approach to the financial performance of Mexican cartels" (EGAP, 2012), as well as information gathered from experts in the field.

The structure of the market

To understand the dynamics of the market a CLD has been designed to show the most important feedback loops related to the drug market: actions of criminal groups to grow their business as well as the government actions, seeking to influence in criminal groups.

The marijuana market, seen from a market perspective, operates through vertical integration from production, distribution and transfer to the U.S., as well as marketing in the domestic market. On the other hand, actions of government seek to contain, obstruct, block or preclude the movements of organized crime as well as neutralize or disable the actions that they take to confront the activities that the government is taking against them.
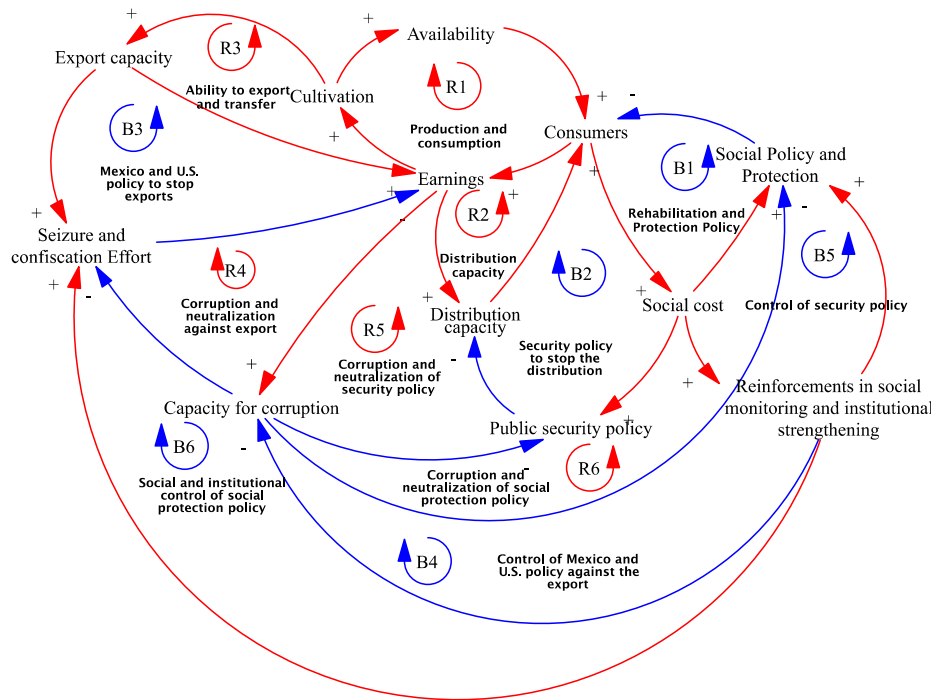

Figure 1.Dynamic processes of drug trafficking and government controls.
Source: Compiled by the expert group

Figure 1 captures the dynamic. It is observed in red the "reinforcing loops". This representation shows the growth dynamics of drug trafficking activities that require strong strategies to curb its growth. These loops are link to the production (R1), the distribution capacity (R2) as well as the ability to export and transfer (R3). To help the business success, it will also be needed to neutralize the actions that the government undertakes against business through corruption (R4, R5, and R6).

The "Balancing loops", in blue, display the strategies and controls of the government to influence this dynamic growth. Within these actions include security policy to stop the

distribution (B2, B3, B4), as well as the policies and social protection and a reinforcement of the social control and the institutional strengthening (B1, B5, B6), this as an effort to decrease the impact of corruption and the social costs of market penetration of criminal groups. Figure 2 shows the reinforcing loops and balancers interacting.

However, the strategies undertaken by the government, in the "Balancing loops", have not led to significant results that can be observed in the finances of criminal groups or the social stability. Then, it is perceived necessary to explore strategies that could have a more direct impact in the weakening of these groups, assuming that this is a dynamic system and that these strategies could have an impact not only on an specific aspect or variable as traditionally it is assumed, but in a set of variables that will change the status of the system.

Scenarios Design

The scenarios design has the following logic: the X-axis (endogenous aspects) shows the strategies that can be made in our country. The Y-axis (exogenous aspects) presents the possible policy of decriminalization policy in U.S. Figure 3 shows the layout of the matrix.

The endogenous dimension focuses on two major lines of action that could carried out in the future: continue with the direct combat of the supply with greater intensity, what could generate a decrease in the operation of the cartels and on the other hand to enter in a dynamic market regulation that could impact a control on the demand of daily users and the transition to other drugs such as heroin or methamphetamine (Homer 1993).

The exogenous dimension in this model is extremely important because the U.S. market represents about 88% of total sales of marijuana and the implications of a possible legalization in the country would have a significant impact, considering that the trends show that more and more states of the American union will be advocating for such a change in the legislation. On the other hand, it is clear from the literature the recognition of the limited effectiveness of a strategy focused mainly on policies to combat supply (Reuter and Kleiman, 1986; Moore and Kleinman, 1989, Kleiman and Saiger, 1990; MacCoun and Reuter, 1997, Kleinman et al, 2011; McGee et al, 2011) which leads to a reflection on more effective strategies for attacking the issues that could arise in the future.

Each scenario presents the dynamic hypothesis of the assumptions of each one as well the results generated by the simulator.

Figure 3.Design scenarios

Scenario 1: Titanic, status quo

This scenario represents the behavioral trend assuming that the cartels are still operating with profits that allow them to continue to grow their business. It is the quadrant where U.S. did not endorse the policy of decriminalization, and Mexico do not intensifies efforts to curb the growth.

In terms of demand, it is assumed that the prevalence will continue to increase, as well as the average price per unit tradable: 3% in Mexico and 2.5% annual USA.

The earnings growth strengthens the operational capabilities of the cartels to meet domestic demand as well as demand in the U.S. Operating expenses mostly from distribution, bribery and money laundering are significant but the industry margins help to pay these expenses, as well as money laundering and having a thriving annual profit. Figure 4 shows the dynamics of the two markets.
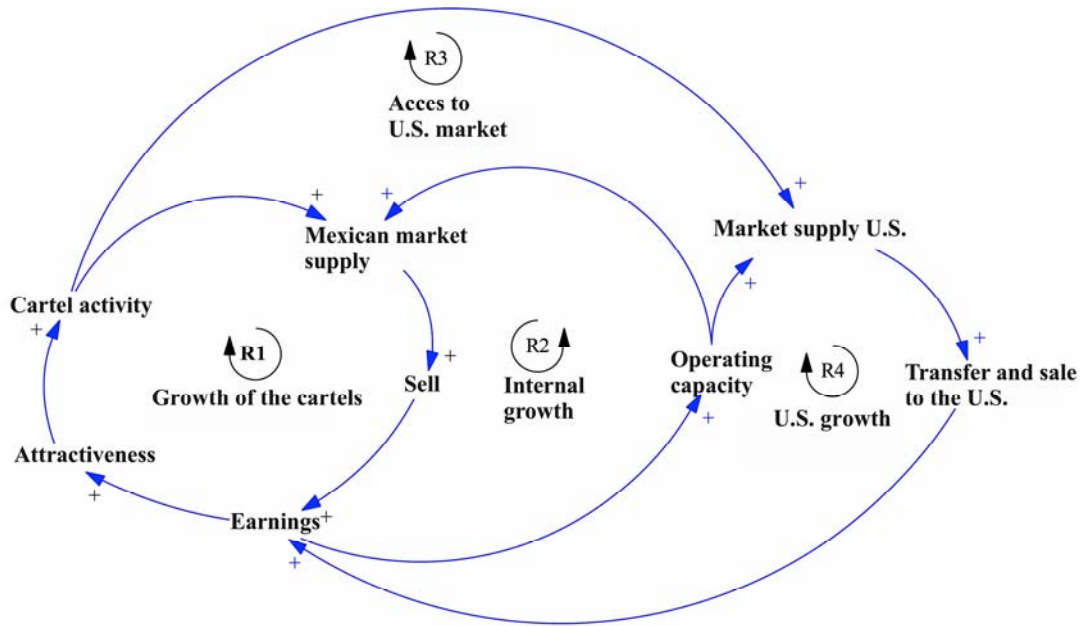
Figure 4.The booming business of the marijuana market

The dynamic model shows how the total sales (curve 1) grow up to 1.050 million, approximately. There is also a difference between domestic sales (curve 2) and international (curve 3), where it can be observed the relevance of the international market vs. the domestic revenues: the last represents a 12% of total sales, by 2017 it would reach an annual profit of about $ 250 million from selling of marijuana.

Graph 1.Sales trend behavior

Graph 2 shows that total sales will continue to grow, as well as the rate sales/profit annually (curve 3) from 15% to 17% in the simulation horizon.

Graph 2.Ratio Total sales/annual profit scenario 1

The **Titanic** scenario shows that the finances of the marijuana market will continue strengthen the cartels, which will penetrate the institutions and programs designed to fight and prosecute them, leading government´s strategies to sink as the famous transatlantic, due to the available resources for the diversification of the criminal activities.

Scenario 2: Sleeping with the Enemy, decriminalization in USA

This scenario reflects how the legislation in some states of the U.S. opens up the possibility of the legal production and distribution of marijuana. It is the quadrant where exogenous actions are taken, but we stay in our country doing nothing.

As a result the participation of the Mexican cartels in providing marijuana will diminish from the current 33% up to 20%. This will also impact on a gradual annual reduction in the price of Mexican marijuana in USA.

The marijuana that is not exported remains in the Mexican market causing the supply to go up, what will be a decrease in the price. This dynamics can be seen in Figure 5.
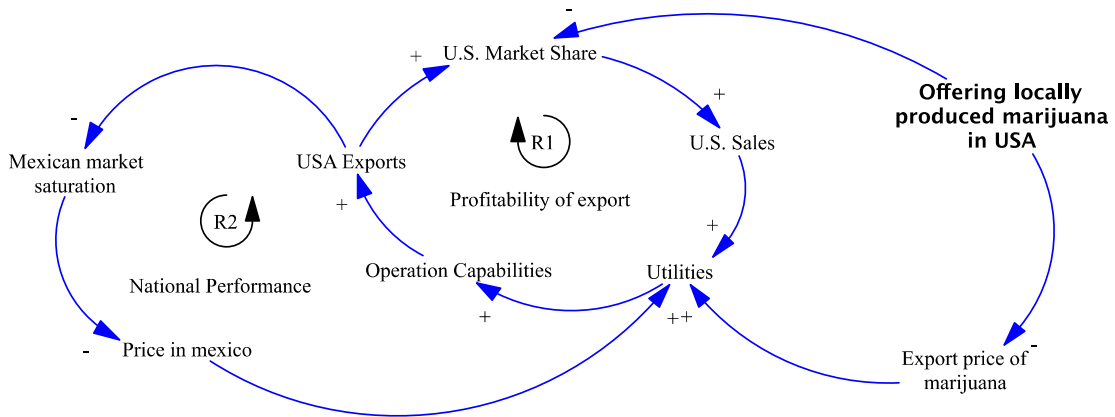
Figure 5.Impact on the market due to decriminalization in the U.S.

Graph 3.Fall of international sales of marijuana

The implications that the U.S. allows the decriminalization of marijuana production and distribution in some states are causing the market share gradually decreased from 33% to 20%. This also has an effect on the decrease of price in both the U.S. market and in our country. As seen in Graph 3 how international sales decrease (curve 3), and domestic sales (curve 2) are still generating but there is already a decline trend perceived in 2017 due to the impact of falling prices.

Graph 4.Trend of annual profits due to falling U.S. market, Stage 2

This drop in sales and prices causes, as anticipated, a decrease in annual profit. Figure 4 shows this effect where the low tendency is observed in curve 2 and therefore a decrease in the reason profit / sales (curve 3).

The Sleeping with the Enemy scenario shows the importance of the North American market in the profits of cartels that export marijuana, as stated in Scenario 1. However, this is precisely the reason why is needed to seek endogenous strategies that enable them to confront the actions of cartels and prevent that the Mexican society continue *sleeping with the enemy*.

Scenario 3: Rambo Reloaded, attacking supply and controlling demand

This scenario considers two strategies to attack the supply of marijuana in Mexican territory: the first one focus on to increase effort and resources to combat the drug supply, the second one focus on to destabilize the cartel monopoly in the provision of this drug thought a legal regulated market. It is the quadrant where U.S. continues with its prohibitionist policy and our country could move to strategies for attacking the supply and demand control. It is analyzed in first term each of these strategies and propose is made with the combination of the two of them.

Rambo Special Attacks: Efficient prohibitionist policy

This strategy is that the government has a monopoly on the use of force to attack the cartels across the supply chain. The actions of the police forces lead to a greater eradication, seizure and interdiction of marijuana. These actions cause an increase in the costs associated with the industry, which make a more expensive business and take a growing

share of the earnings. The impact is also felt in the increased price of marijuana that will lead to a decrease in quantity demand.

Another major expense that significantly impacts business profits involves money laundering. This scenario assumes that the policy to pursue, identify, disrupt and dismantle money laundering reinforces its operation, obtaining significant results.

Overall, the strategies evaluated with this policy to attack the supply will cause criminals to not gain the necessary profits to maintain and grow their business. This dynamics is shown in Figure 5.
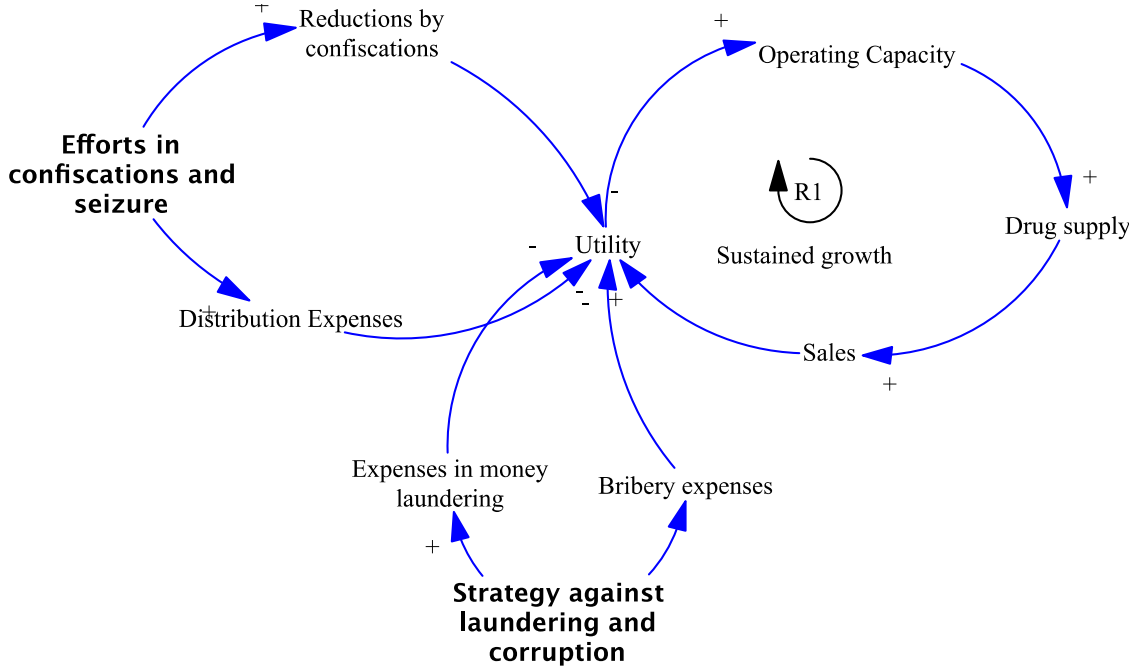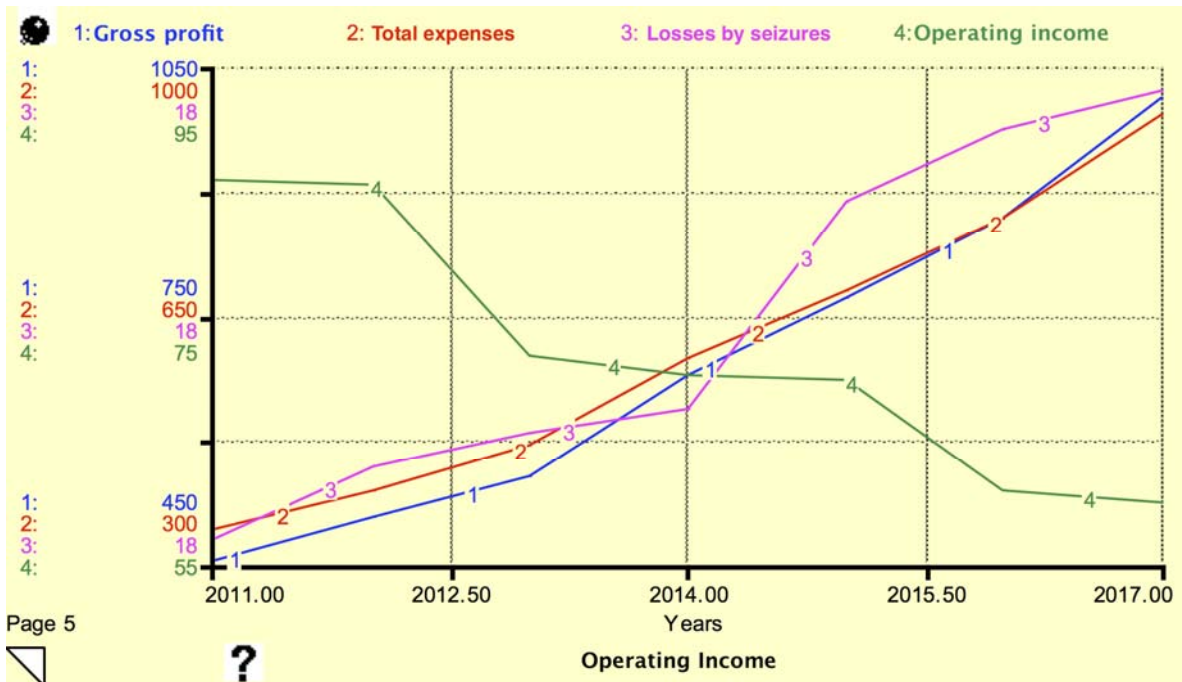

Figure 5.Dynamic impact on the finances of the illicit drug market to an efficient prohibitionist policy

The strategy "Rambo attacks the Offer" is more expensive in the cartels operation, intensifying existing actions by 20%. These actions will affect their distribution and system costs. Among these interventions are the disrupt of marijuana, the seizure of assets and forfeiture of drug; these are carried out both in our country and in the U.S. but we have to recognize that most drug seizures occur in the U.S. of the total reported only 7% corresponds to actions within our country. Now let's review how the system responds to an increase in these actions around 20%.

Graph 5 shows the growth of the total expenditure (curve 2) and the impact of losses by disrupts, seizures and forfeitures (curve 3). These are significant enough to cause a reduction in gross profit (curve 1) because although it has a growing trend, is not enough to compensate for the losses. The increase in prices is not enough to compensate for the losses, same that will be reflected in the downward trend of operating income (curve 4), which ends around 60 million at the end of the simulation.

Graph 5.Impact of actions to attack supply scenario 2.

Such operating income will still be a significant hit because the costs of money laundering increased due to the intensification of the strategy to combat laundering. By removing the operational utility to these costs, there is an annual utility punished but still with a positive response.

Graph 6 displays that the strategy to pursue with more emphasis an increase of 20% will lead to important results. Sales continue to grow (curve 1), this means that an increase in the price led to a marginal loss in demand which were no significant due to the major sales are carried out in the U.S. market and in this regard it has no impact on the price and that Mexican cartels do not have enough market share to influence it. Furthermore, the annual profit (curve 2) goes into decline, reaching a value of $ 46 million at the end of the simulation. Finally, the trend profit / sales (curve 3) shows clearly the effect of the strategy reaching levels of 4%.

Graph 6.Impact of actions to attack supply scenario 2.

It is concluded that a 20% increase in the efficiency of eradication, confiscation and seizure in order to attack

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Now let's review a more aggressive strategy, considering that the resources and capabilities will increase by 50% in eradication activities, disrupting and dismantling criminal organizations.

The results show an increase of 50% showing an impact on the cost of the order of 1,200 million, as shown in Graph 7 (curve 2). Gross profit is growing but around 2015 the amount of the expenditure is greater than the gross profit so they begin to take losses in that year, which at the end of the simulation horizon it comes to be about 170 million.

It means that with an annual profit that becomes negative, the accumulated earnings represented in the net profit, begin to decrease. This means that to sustain the illegal activities they would need to anchor with profits from other areas of this illicit market. This certainly creates risk of increased violence. Their analysis requires of other instruments.

Graph 7.Impact of actions to attack the supply, increasing capacity by 50%.

The strategy **"Rambo attacks the Offer",** intensifying actions by 50%, would undermine the cartels profits significantly as shown in Graph 7, but would not have a significant impact on demand. This dimension of the strategy is to hit the enemy where it hurts, in their finances but it may have side effects, particularly in the demand for other drugs and other illicit activities. Let's look at a demand-side strategy.

Rambo Attacks Demand: Regulation, Market operated by the government

In this strategy **"Rambo controls the market"** the government creates a legal distribution network in Mexico to have a direct approach on the consumer market and the most vulnerable groups. This involves penetrating the market through a distribution channel operated by legal clinics, pharmacies and other institutions approved to sell marijuana at a price that considers only the costs of production and distribution as well as taxes in an order of magnitude to those tobacco industries. It is assumed that there is a time to position the channel in the market, that for the year 2017 could meet 40% of the market and allow the government to control the market price to prevent price adjustments to generate new sources of income for cartels. Indeed it is stated that both the prices of the legal market as the illegal market will remain fixed in that period. Figure 8 shows this dynamic.
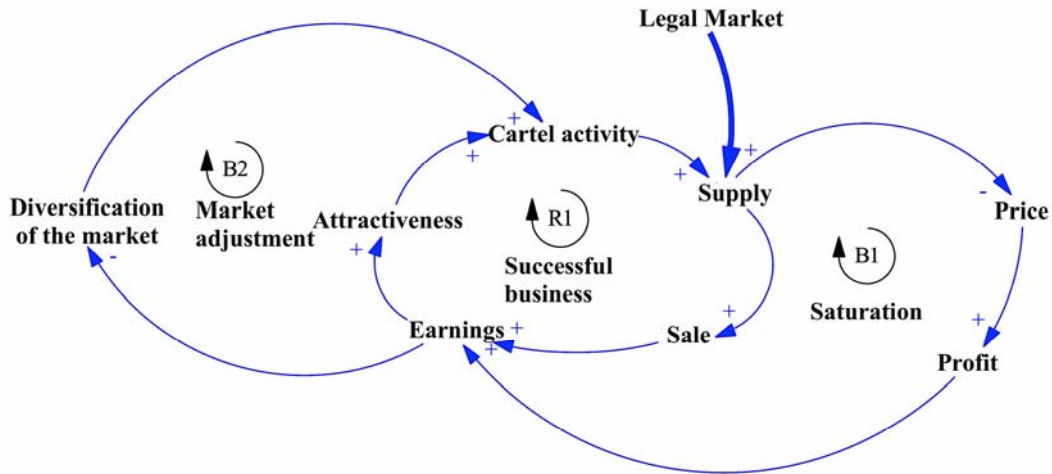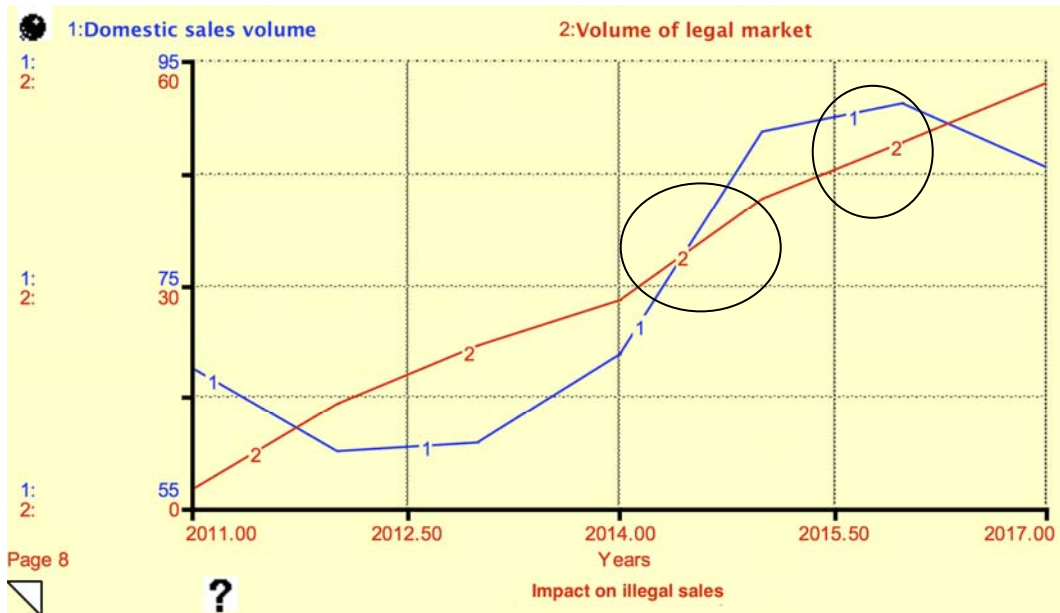
Figure 8.Dynamics of the illicit drug market under market intervention

This strategy seeks to reduce the effect of local monopoly created by the cartels for the market control. The most important characteristics of a monopoly reflect very well the dynamics of the illegal drug market (Jaén and Dyner, 2007): 1) leads to a higher price and lower production, 2) generates economic inefficiency. Assuming the above the destruction of the monopolies in both legal and illegal markets, have the same effect: increase efficiency and reduce prices.

Given this, the strategy of controlling the market is going directly into the competence and will enter to change the market monopoly control to directly impact on the price, very consistent with what Buchanan (1973) states: the monopoly in the sale of products and services is socially inefficient because it restricts the supply to increase the price and therefore profits. If a monopoly in the provision of goods is undesirable in the production of "no goods" (those such as the marijuana that generates significant costs to individuals and communities) will be socially desirable.

However, one should not underestimate the cartels reaction to market loss. It would be expected that the cartels will look for a way to recover the profits that has led the new player who enter in to the market focusing in other business units or with a jealousy guard in their market. This strategy requires a risk agenda that helps illustrate the impact of the same in a comprehensive manner thus anticipating the side effects.

Moreover, there is usually a price deterrent impact: higher prices reduce consumption. However, the drug has a low elasticity and therefore an effect on the price increase does not have a very high impact on the demand (elasticity) but will be assumed that a reduction in the prevalence of the order of 0.65 to 0.75%. Let's look at the model the impact of this strategy.

Graph 8.Impact on domestic sales due to legal production

The entrance to the market for the provision of legal drugs is not immediate. There is a curve of entrance that starts with a firm step with a 3% of the market until they reach a market share participation of 40% in five years. This entrance stops the growth of the drugs supply from the cartels, as shown in Graph 8 which contrasts the domestic sales volume of cartels (curve 1) against the volume of marijuana legal market (curve 2), both in tons. The curves show that the national illegal sales begin to be beaten by the legal market and will continue with a trend growing until 2014, where the increase in demand cannot be handled by the legal market and is captured by the recovering of the illegal market growth trend. As the legal market penetration is growing rapidly, it will take another two years for the market to take the illegality enough to put it on a downward trend.

This strategy impacts directly in the sales volume, which is expressed in dollars, shown in Graph 9, where there is a decline of national legal sales (curve 1), which will be recovered due to the market growth. The legal offer puts pressure on stopping the rising price of the illegal drug taking legal market at a price that represents a quarter of the black market cost. Illegal domestic sales reach a maximum of $ 68 million (curve 1) and start to decline reaching $ 62 million in 2017.

Graph 9.Impact on domestic sales due to legal production

It is also interesting to note the comparison between the profits of both businesses: legal business regulated by the government and the black market operated by the cartels. While the two are seen growing, as shown in Graph 10, the legal utility has a higher growth rate, although it seems very little in magnitude: the illegal use will reach $ 107 million against $ 8 million legal market. We have to keep in mind that the public policy of the government does not seek to capture in the legal economy the big returns of organized crime, but to control the market that serves the vulnerable demand and eventually lead to society towards lower levels of drug consumption.

Graph 10.Comparative profit in both markets

Table 1 shows a summary of financial indicators, where it notes that the cartel operating income is still significant. The growing legal marijuana supply that goes up to a 40% helps to cause a drop in total sales, as shown in Table 1, but it's compensated by the growth in demand that cannot be captured by the legal market.

Table 1.Comparison of the finances of the illegal market and marijuana Source: Self Elaboration from the simulation results

Time	Drugs demand in Mexico	Legal Sales Tons	Illegal sales Mx*	Legal domestic sales **	Illegal domestic sales	Legal market share	Operating profit "legal"	Operating profit "Ilegal"	Annual profit "legal"	Annual profit "Ilegal"
2011	69.23	2.08	67.15	0.38	49.67	0.003	0,29	86.73	***	***
2012	73.26	13.45	59.81	2.49	44.24	0,18	1.88	91.68	0.29	69.39
2013	81.96	21.41	60.55	3.96	44.79	0.26	3	98.53	1.88	73.34
2014	96.21	27.63	68.59	5.11	50.73	0.29	3.87	106.46	3	78.83
2015	130.08	41.44	88.63	7.66	65.56	0,32	5.8	117.58	3.87	85.16
2016	140.06	49.03	91.03	9.07	67.33	0,35	6.86	126.01	5.8	94.07
2017	142.32	56.93	85.39	10.53	63.16	0,4	7.97	133.7	6.86	100.8

* Tonne
** Millions of dollars
*** Are presented through 2012 as a result of the conditions of 2011

Therefore, this requires more effort (public policy) of this strategy Rambo Attacks to penetrate the demand for legal offer and create the infrastructure that allows to accelerate that growth. How much would the legal supply need to grow to unbalance finance illegal market? We will make a run with an extremely high value, to give us an idea if it is possible, by increasing the involvement of the legal market up to 70% we would achieve annual impact the revenue of the illegal market. Graph 11 shows that even taking this market, the annual revenue will continue growing (curve 2) even dough the fall in domestic sales (curve 4). This means that this strategy might be appropriate to destabilize the market and meet the demands of vulnerable groups but not to keep the cartels out of the game, due to the importance of the U.S. market in sales, which in this scenario represent 90% of the total sales.

Graph 11.Aggressive market penetration to 70%

The policy implications arising from this strategy are significant. Unlike the strategy of a larger effort to combat the supply, this strategy requires creating a public infrastructure for
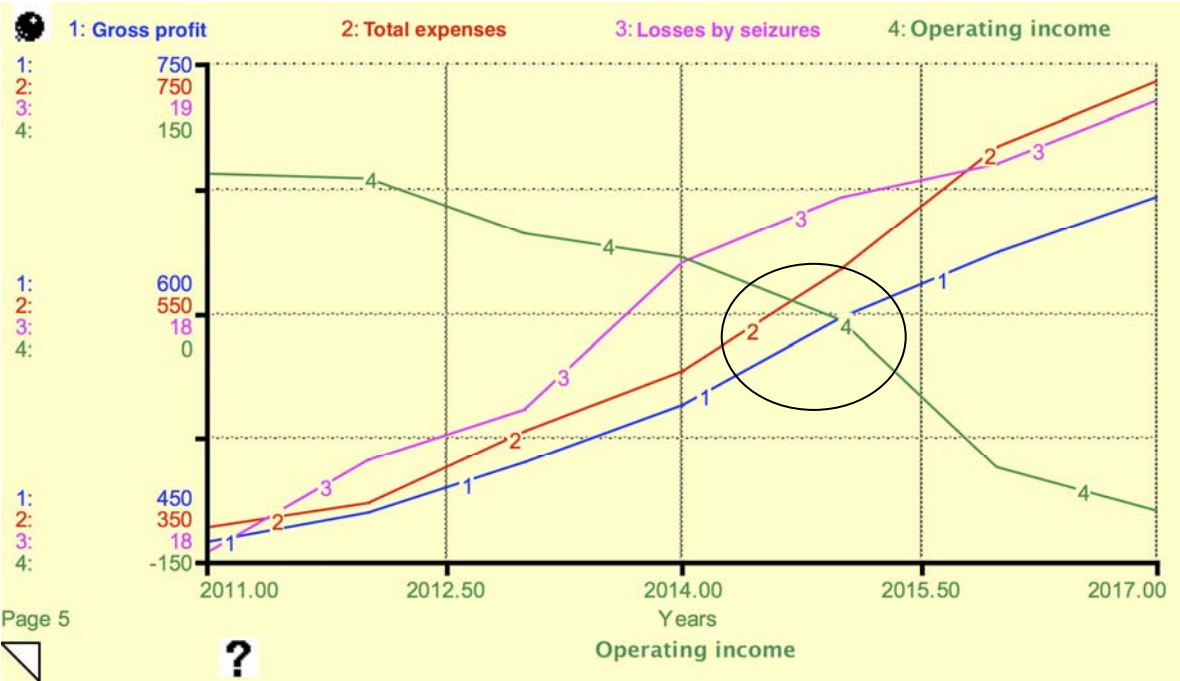
the production and distribution of marijuana, solid enough and carefully shielded to avoid being co-opted by the crime or subject to monopolies of the legal market, and agents of the State operate that to levels of efficiency.

Now let's review what happens when Rambo decides to act simultaneously attacking supply and controlling demand. These combinations of strategies are the premises for scenario 3 presented below.

Scenario 3: Rambo Reloaded

The strategy of increasing efforts to combat showed some significant results to influence in the business of marijuana cartels in a 20% growth, but it was more significant to the 50% intensify, leading to the cartels to lose in the year due to the increase in their costs, among other things, the increase in eradication, dismantle and money laundering. Furthermore, the strategy of breaking the monopoly of cartels by providing marijuana addicts taking 40% of the market shows a decline in sales, but it is insignificant in terms of profits.

The combination of both strategies will increase the operating costs of cartels leading to an increase in prices and a proportional loss of the market due the entrance of the legal marijuana with a fixed price. Now let's review what the behavior of the system under these premises.

Graph 12.Impact on operating profit putting together strategies

By combining strategies, operating income fall precipitously getting negative values from 2014, as seen in Graph 12 (curve 4). The gross profit has already a growing trend that continues to follow the market but it is not enough for the growing trend in the level of expenditure (curve 2).

Graph 13.Impact on annual profit putting together strategies
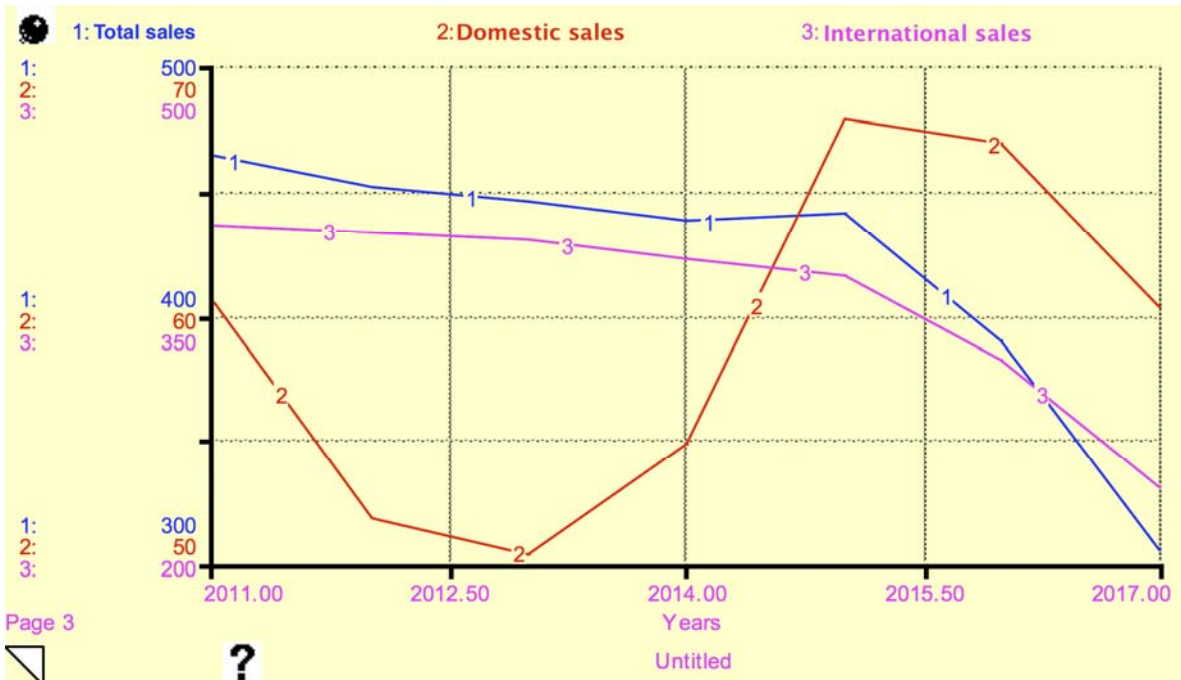
The combination of these two strategies will impact on the annual profit. Shown in Graph 13, annual income will be decreasing to reach negative values. Another important indicator is the reason sales / annual profit, that shows a decreasing trend (curve 3), which may suggest that it has a significant impact on the business of marijuana so is no longer a business for the cartels.

In summary, the Rambo scenario shows that a strengthening of institutions designed to minimize corruption and bribery as well as an effort in the seizure and money laundering are the most powerful tools of Rambo to weaken the marijuana market operated by the cartels.
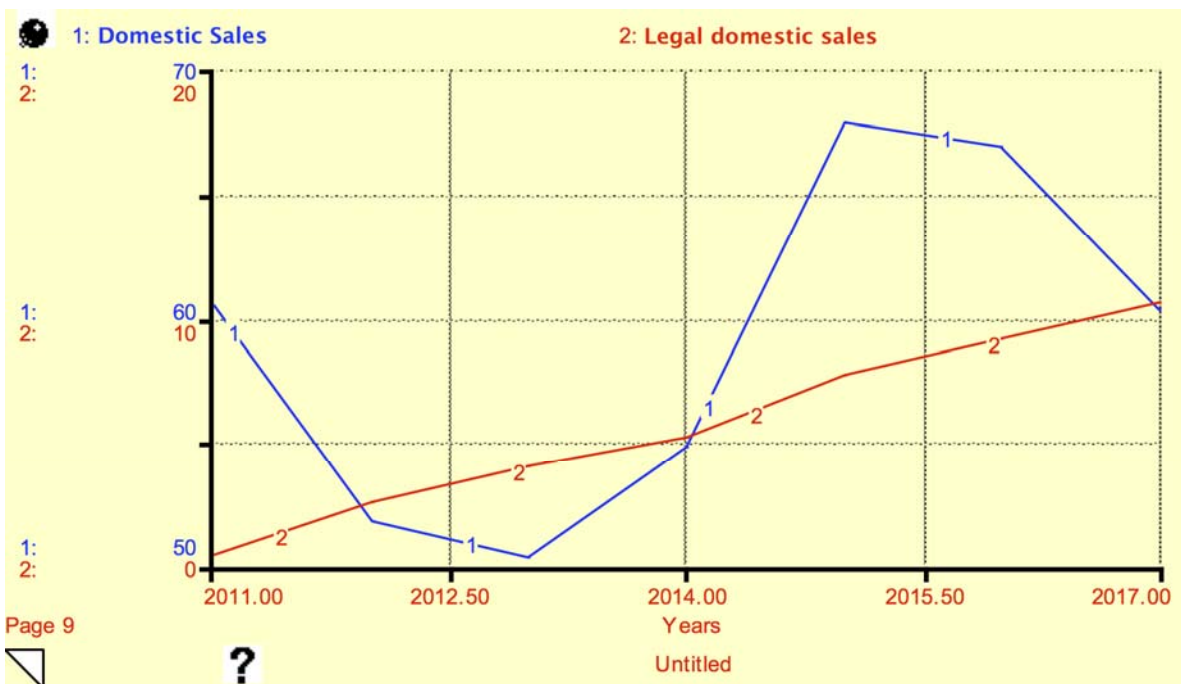
Scenario 4: Good As It Gets, all together now.

This scenario captures the combination of endogenous and exogenous elements: it addresses the problem holistically, taking strategies to regulate supply and demand control while the United States is heading to a policy of decriminalization in line with Mexican politics.

This run shows a blow to international sales as shown in Graph 14 (curve 3). The total sales (curve 1) are impacted by the trend of international sales, while domestic sales will be impacted by the market penetration of legal drug, same as shown in Graph 15 (curve 2).
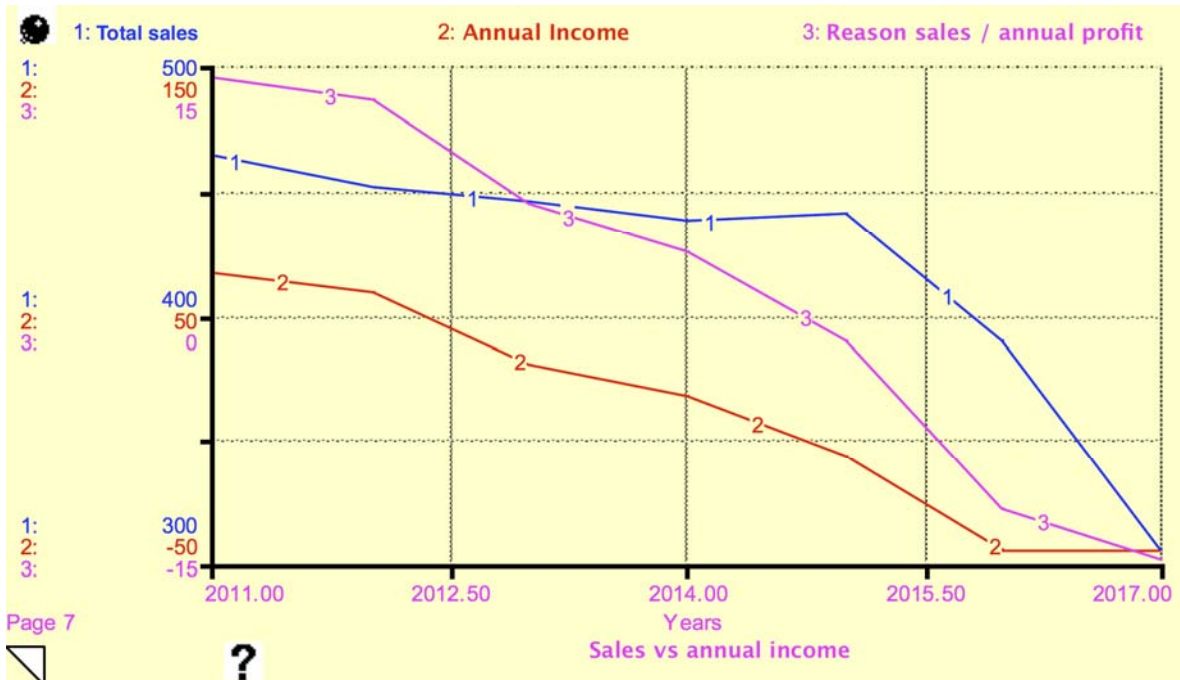
Graph 14.Impact on putting together sales strategies

Graph 15.Domestic sales fall

There is then a financial blow to cartels that sell marijuana, making their business less and less profitable, as shown in Graph 16. The annual income (curve 2) is reaching negative values as well as the reason sales / annual profit (curve 3) due to the loss of market share in both Mexico and in the U.S. and the collapse of prices.

Graph 16 Impact and decreasing trend in annual profit

Discussion

To present an idea of the impact of each of the scenarios, a table was made to show the results of total sales, annual income and an indicator that demonstrates the proportion of annual profit with sales.

In perspective, it is evident in scenario one **Titanic** that the trend shows a strengthening of the cartels in the marijuana market demand; different actions for different results. The growing trend of profits from the sale of marijuana gives us an insight to a market of $ 160 million. This scenario demonstrates the need to operate more effectively.

Scenario two **Sleeping with the Enemy** is an exercise to assess the impact that would have on the cartels that provide a possible marijuana decriminalization. It is mentioned as an exercise because each country is responsible for its internal policy but is perceived obliged to assess the impact of their actions on the system as a whole. A policy of decriminalization would lead to lower annual profits to 50 million by 2017.

Scenario three **Rambo Reloaded** has two endogenous strategies that could affect the slope of annual profits at the end of the simulation horizon. These are strategies that require a comprehensive design and assessment of their impact on the system. This exercise is not intended to dimension these scopes, just show the impact on the financial structure of the cartels in the market for marijuana.
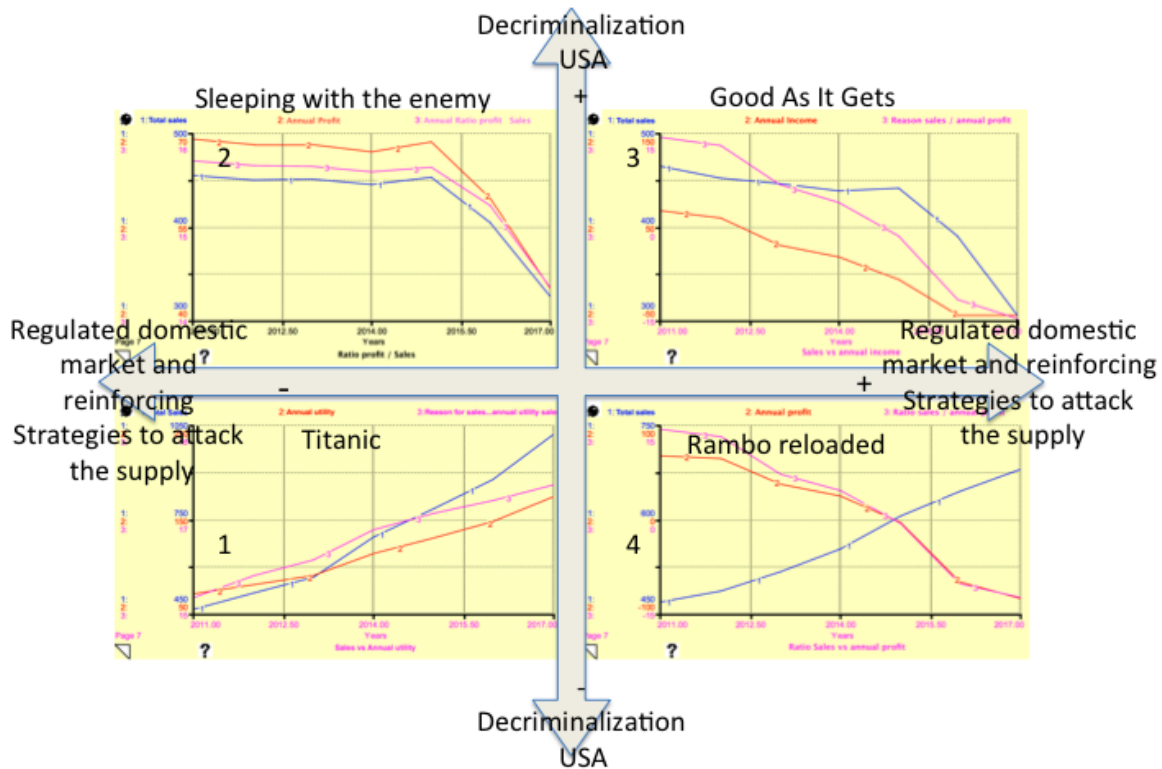
Figure 9.Scenario Comparison Matrix

Finally Scenario 4 is the best one, **Good as It Gets** shows that when both exogenous and endogenous strategies come together, they cause a financial crisis in relation to cartels marijuana market. The annual profits fall to take negative values at the end of the simulation period. One fact is clear: marijuana is not a good business anymore.

Final remarks

In the light of these findings, this essay has been very helpful to visualize the trend of the cartels illegal activities. This prospective exercise, with all the limitations of the information availability, points more than a precise prediction of factors, a view for the impact in trends that would have specific strategies in this market.

This work contributes to the study of the dynamics of the illegal markets in providing not only dynamic assumptions embodied in terms of causal loop diagrams, but results of a model of system thinking simulation that allows to test the theories behind the strategies.

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