UNITED NATIONS UNIVERSITY
UNU-WIDER
World Institute for Development Economics Research

Working Paper No. 2011/09

Cocaine Cities

Exploring the Relationship between Urban Processes and the Drug Trade in South America

Ignacio A. Navarro*

March 2011

Abstract

The relationship between the cocaine trade and urban land markets in South America has been overlooked by the mainstream economics and urban studies literature. This paper examines two avenues through which the cocaine trade can have a large impact on urban development in producer countries: (i) through an employment multiplier effect similar to that of other legal exports, and (ii) through money laundering using urban real estate. We test our hypotheses using the Bolivian case and find that urban growth patterns are closely related to fluctuations in cocaine production. Further, even though our estimates suggest that the cocaine trade affects urban growth through the two avenues presented in the paper, we find that formal urban employment generated by the cocaine trade has a modest effect on urban growth and most of the effect seems to be explained by money laundering using real estate and other paths.

Keywords: cocaine trade, urban development, money laundering, Bolivia
JEL classification: R11, R14, R31

*Department of Health, Human Services, and Public Policy, California State University; email: inavarro@csumb.edu.

This study has been prepared within the UNU-WIDER project on Development in an Urban World, directed by Jo Beall, Basudeb Guha-Khasnobis, and Ravi Kanbur.

UNU-WIDER gratefully acknowledges the financial contributions to the research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Finland (Ministry for Foreign Affairs), Sweden (Swedish International Development Cooperation Agency—Sida) and the United Kingdom (Department for International Development).

ISSN 1798-7237 ISBN 978-92-9230-372-3

Acknowledgements

The author wishes to thank Dennis Rodgers and participants at the 'Beyond the Tipping Point, Development in an Urban World: Latin America' workshop held in Buenos Aires, May 2009, for their helpful comments and suggestions. All errors and omissions in the paper are the author's sole responsibility.

UNU World Institute for Development Economics Research (UNU-WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Typescript prepared by Liisa Roponen at UNU-WIDER

1 Introduction

Empirical studies that explore the connection between urbanization and crime tend to focus on the localized effects of criminal activity on relative property prices using hedonic methodologies. Most of these studies find an inverse relation between crime levels and property values. In one of first studies of this kind, for example, Thaler (1978) finds that a one standard deviation increase in the incidence of property crime tends to reduce home values by about 3 per cent. In similar manner, Gibbons (2004) finds an average 10 per cent decrease in property values associated with a one standard deviation increase in property crime. Evidence seems to confirm that property in neighbourhoods with relatively higher crime rates tends to have lower values than comparable property located in relatively 'safer' neighbourhoods in the same urban area.

The crime-property value connection is clear at the neighbourhood level, yet little is known about the effect of illicit activities on property values at a macro level, that is, for an entire urban area. Several observers from various disciplines attribute real estate booms in various Latin American regions to the cocaine trade but base their conjectures on anecdotic evidence and offer no quantitative evidence of this connection.

It is noteworthy that the connection between urbanization and the drug trade tends to be vaguely explored by the mainstream economics literature as most studies tend to focus on the drug trade's social costs and fail to consider criminal endeavours as an economic activity with income multiplier effects. Furthermore, most studies that measure the economic effect of the drug trade, focus on either the economic impact of coca production on rural peasants in rural producing communities or at the country level (Painter 1994; De Franco and Godoy 1992), yet the magnitude of the backward and forward linkages between urban centres and coca producing rural centres is still widely unknown.

South American produced cocaine generates several of billions (US$) of yearly expenditures in consumer countries in North America and Europe; undoubtedly, the massive amount of resources moved by the cocaine trade plays an important role in producer economies. This paper explores the link between the cocaine trade and urbanization patterns in a producer economy in South America. Understanding the role of the drug trade, which has been so prevalent for the past 30 years in South America, on urbanization patterns can help not only to understand one major force of Latin American urbanization, but also the consequences this type of growth has on its affected populations. Furthermore, uncovering the economic effects of the drug trade on producer regions is imperative for the formulation of effective policies against drugs as well as for economic development and poverty alleviation and low-income housing strategies.

The paper is organized as follows: the second section provides a brief description of South America's role in the cocaine trade. The third section explores existing literature that describes the connection between the cocaine trade and urbanization patterns in Latin America. The fourth section explores two avenues through which the cocaine trade may directly affect a city's urban growth: (i) the export income multiplier effect and (ii) money laundering using the real estate sector. The fifth section introduces the Bolivian case and provides empirical estimates of how the different channels proposed

in the fourth section affect urban growth in Bolivia's largest cities. The final section concludes.

2 Coca and cocaine in South America

Cocaine hydrochloride (HCL) is a powerful drug made with an alkaloid extracted from the coca plant leaf. Even though cocaine alkaloids were not isolated until the late nineteenth century, South America's relationship with coca and the coca trade can be traced back to pre-colonial times. In fact, one of the first things Americo Vespucci witnessed on his first arrival to South America in 1499 was a group of indigenous people chewing coca leaves (Karch 2006) further, there is evidence of human use of coca from at least 3000 BC (Antonil 1978). To this day, coca leaves are chewed by indigenous populations, mostly of Aimara and Quechua decent, to alleviate the effects of altitude sickness and hunger, and to produce other derivatives such as coca tea or 'mate', but the majority of coca grown in South America is believed to be used for the production of Cocaine hydrochloride (UNODC 2004).

Latin America's relationship with cocaine production and trade dates to the 1970s when demand for cocaine increased in the United States and Europe. According to the United Nation's Office on Drugs and Crime (UNODC), virtually all of the coca used for cocaine production is grown in three countries: Colombia, Peru, and Bolivia (UNODC 2008). Table 1 shows the potential cocaine production for each of the major producer countries based on estimates of yearly coca plantations. The table illustrates that cocaine production in South America ranged between 800 and 1,008 metric tons between 1997 and 2007. Although there was some variation in each of the three countries' share of potential cocaine production, Table 1 shows that Colombia was consistently the largest potential cocaine producer in the 1997-2007 period (with about 2/3 of the region's potential yearly cocaine production), and Bolivia had the smallest share of potential cocaine production (about 10 per cent).

Even though there is no agreement on the actual size of the cocaine trade and the actual number tends to be surrounded by a political tilt (Thoumi 2005), conservative estimates suggest that cocaine generates between US$35−115 billion per year (Reuter and Greenfield 2001). This means that if a country like Bolivia (which produces about 10 per cent of the world's cocaine) receives about 1 per cent of the world's drug trade proceeds, it would receive between US$0.3−1.15 billion per year. That figure represents

Table 1
Potential cocaine production in South America by country (in metric tons)
1997-2007

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bolivia	200	150	70	43	60	60	79	98	80	94	104
Colombia	350	435	680	695	617	580	550	640	640	610	600
Peru	325	240	175	141	150	160	230	270	260	280	290
Total	875	825	925	879	827	800	859	1,008	980	984	994

Source: UNODC (2008).

about 3−10 per cent of its GDP.[1] In other words, even by conservative estimates, producer countries receive a considerable influx of dollars from the drug trade. What is the impact of this influx on urbanization patterns? The following sections explore relevant literature on the topic and attempt to answer this question theoretically and empirically.

3 Cocaine trafficking and urbanization patterns

The observation of an existing link between cocaine trafficking and urban growth patterns in selected urban centres is not new. Several studies point out this connection with different degrees of detail and reveal that geographic locations that participate in the cocaine trafficking business at different points in the production/distribution chain tend to have, in general, different urban growth and real estate patterns than places that do not.

Hylton (2007), for example, makes a persuasive case of how the cocaine business has been a major component on Medellin's rapid urban transformation and unprecedented growth. He argues that the urban transformation was caused by the cocaine business having a profound impact on Medellin's political and economic processes. Among the economic forces brought by cocaine exports Hylton finds that the cocaine industry led by Pablo Escobar and the Medellin cartel replaced the troubled coffee economy and created a 'rising class' of traffickers that either directly worked for the cocaine industry or worked in the smuggled goods commerce industry fuelled by money laundering proceeds of the cocaine trade. In that sense, Hylton argues that cocaine transformed Medellin by providing a rise in narco-capital that was translated in higher economic and political power for people directly or indirectly involved in the business. This power was ultimately translated in a visible effect on the city's real estate sector through increased jobs and cocaine export earnings. Shams (1992), and Painter (1994) make a strikingly similar argument about the effect of cocaine exports in city of Cochabamba, Bolivia.

Medellin's and Cochabamba's cases are noteworthy because they are located in a cocaine producing region, but other studies completed in geographic locations that serve as transhipment points for the cocaine trade find a similar connection between the cocaine business and local real estate sectors. Labaton (1989) and Corben (2006) make the argument that the city of Miami, which served as the point of entry of South American cocaine to the USA in the late 1970s, had an impressive real estate boom caused by the cocaine trade. They describe how real estate was especially used by drug organizations as an effective avenue to launder drug money.

The cocaine trade-land markets connection is not only observed in large cities but also in small rural towns throughout Latin America. McDonald (2005), for instance, finds that land markets in rural Mexico, which serves as the main transhipment point of South American cocaine exports to the United States, have been profoundly changed by the cocaine trade. McDonald's study of the Buena Vista village in rural Mexico reflects

[1] According to the World Bank's Development Report, Bolivia's GDP for 2006 was US$11.1 billion.

similar patters as those observed by Hylton (2007) in Medellin in terms of increased income and power for individuals related to the cocaine trade. However, McDonald uncovers another aspect of how the drug trade affects land markets: he finds that the cocaine trade not only affects land prices through increased direct or indirect jobs or as a means of money laundering, but also as the only viable investment for individuals in the trade to increase their local status and power. The McDonald analysis shows that the cocaine trade inflates land values in Buena Vista not only through the higher personal incomes it created for people in the village, but also because land is the main measure of success and status in rural towns and it is also the most lucrative investment. Thus, competition for a limited amount of land inflates prices, further deteriorating the prospects of those farmers not involved in the cocaine trade.

The pattern of investment of drug proceeds in real estate and home improvements seems to be a common finding in selected urban and rural and urban research in recent anthropology literature. Dennis (2003) for instance, finds the same investment patterns of cocaine related proceeds in a Miskitu village in Nicaragua. Mainly he finds that cocaine that washes up in the shores of Sandy Bay, as smugglers are forced to dump cocaine shipments from boats destined to the United States as they are caught by local authorities and sold to other local smugglers, are almost exclusively used for home improvements and land. Likewise, at the neighbourhood level, Rodgers (2007) describes the transformation of the Managua neighbourhood caused by home improvements and investments in real estate done by drug distributors or *pusheros.*

In conclusion, there is ample evidence of a connection between the cocaine trade and real estate markets in selected Latin American rural areas, in neighbourhoods, and in entire urban centres related to the cocaine trade in various points in the production/distribution chain. No attempts have been made, however, to quantify these effects at the city level, or to uncover explicitly the specific economic processes that underlie such connection. The next sections explore these economic processes and test them using the case of Bolivia.

4 The economic effects of cocaine production on urban centres

This section of the paper explores the connection between cocaine production and urban land values, which in turn guide urbanization patterns. The first part explores the cocaine production-land prices nexus by considering cocaine production as an export base activity, with the capacity to bring income into a region just like any export oriented licit economic activity. The second part describes how the real estate markets can fluctuate when a local real estate market is used as an avenue for money laundering.

The cocaine trade may have contributed to urbanization in countries like Colombia in other ways as well. The violence generated by Narco-Guerrilla movements is known to have caused the displacement of thousands of rural peasants into urban areas, accelerating urbanization patterns. Arboleda and Correa (2003) document this phenomenon extensively and describe narco-guerrilla effects on internal migration patterns. While acknowledging such a clear link between urbanization and the drug trade, we concentrate on the pure economic effects of cocaine production through money laundering and income effects. We isolate these effects empirically by

considering a country that has not suffered narco-guerrilla-caused displacements into urban areas to avoid these other confounding effects.

4.1 Cocaine production as a basic sector in a regional economy

Standard regional economic analysis classifies production activities into basic and non-basic sectors; the former includes production of goods to be sold primarily outside of the region. The non-basic sector, on the other hand, includes goods produced for sale inside the region. Regional economic theory predicts a multiplier effect from export base activities, that as sales in the basic sector of the economy increase as a result of increase in demand for products in the region's basic sector, the income generated from the additional exports exceeds the original increase in export income because a portion of each additional unit of income generated by exports is spent on local sector goods. This, in turn, generates income for the local sector of the economy. When applied to cocaine exports, the theory predicts that as the demand for cocaine expands in consumer regions, income in producer regions tends to increase directly through the additional exports and indirectly through the regional multiplier effect.

Increases in local exports not only increase income and employment, they also tend to increase land values in the city. The relationship between regional income and land values is straightforward and well established in the mainstream urban economic theory (Wheaton 1974). Higher incomes attract labour from other regions, increasing land and housing prices. The relationship has empirical support as well. McCue and Belsky (2007), for example, find the unemployment rate to be one of the main predictors of short-term home price declines in a sample of USA metropolitan areas.

In summary, urban and regional economic theory can explain the direct effects of cocaine production and land values on producer urban areas. Increasing income resulting from exports of illicit substances draws additional population into the cocaine producing region, increasing housing demand and housing prices. This income effect of cocaine production explains at least part of the relation between drug production and land prices. In addition, though, the illicit nature of the drug trade makes real estate investments especially attractive as means of money laundering. We turn to this aspect of the relation between drug production and housing prices in the next section.

4.2 Money laundering and the real estate market

As explained in the previous section, home prices are likely affected by the cocaine trade directly though employment and income effects. The real estate market, however, also has the potential to serve as a medium for money laundering and thus may be sensitive to changes in illicit activity through this different channel.

Money laundering is defined as the process of masking the illegal origin of money. Since drug related activities tend to generate large amounts of cash, the need for mechanisms to avoid suspicions about the origin of drug money becomes increasingly important as income from illicit sources increases. Money laundering usually comprises three steps: placing, layering, and integration. In the placing stage, money launderers introduce money into the financial system through various ways to avoid detection. The

layering stage involves removing the money from the normal flow of institutional and legal monitoring and control to make tracking difficult for law enforcing agencies. In the final step, integration, the money re-enters the economy in the form of a legitimate transaction. Because real estate transactions usually involve large sums of money, they are generally used in the second and third steps in the money laundering cycle. It is worth noting, that before money laundering became subject to elaborate criminal investigation, money launderers did not even have to resort to elaborated techniques. As a result, real estate was usually used only in the integrating step. Thus, drug dealers would just buy property using family members or friends to acquire real estate, boats, luxury cars or other high price items in cash. The city of Miami at the highest point of the cocaine boom during the 1980s represents an example of this phenomenon, when the one in five real estate transactions were paid in full and in cash (Labaton 1989). Nowadays, money laundering using real estate is still heavily used but it is not as straightforward as it used to be several decades ago due to increased regulations and more sophisticated international enforcement techniques (Financial Crimes Enforcement Network (FCEN 2008).

According to a Financial Action Task Force (FATF) report (2008), money laundering using real estate transactions can be varied but usually involves the money launderer, a financial institution providing a mortgage, and a third party (either a person or a company). In its simplest version, money launderers use a third party to acquire mortgage loans to buy real estate. The mortgage loan payments are later honoured periodically using direct transfers of drug money from offshore accounts or by money wires either directly to the bank or through the third party. These payments are usually below amounts that would trigger suspicion and thus serve as a way to layer and integrate laundered money (FATF 2008). The simple scheme described above is usually riskier in places where financial crime control is relatively more sophisticated, and thus requires some modification. One of those modifications is that of real estate under-valuation. Under such a scheme, a money launderer acquires a mortgage to buy real estate for an amount below the property's market value. The money launderer, however, pays the real market value for the property using the mortgage loan and an 'under-the-table payment' using illicit funds. When the money launderer later sells the property at market value, the illicit money is declared as capital gains and is integrated back into the legal economy.

The money laundering techniques described above are not by any means the only ones used for laundering illicit funds using real estate transactions, but illustrate how the real estate market can serve as a relatively simple avenue to launder large amounts of drug money.[2] Furthermore, the examples above illustrate how the demand for real estate can be artificially inflated when money-laundering activity increases in a local market. This increase in demand, in turn, directly affects short-term real estate prices. Thus, we expect increases in money laundering activities to produce higher local real estate prices and construction activity and vice versa.

This section explained how changes in drug production could cause fluctuations in real estate prices in a producer region though direct and indirect paths. Both the traditional export base income effect and the money laundering effect tend to increase real estate

---

2 The examples presented in this section are simplified and for illustrative purposes. For a more comprehensive list of money laundering techniques using real estate, review FATF (2008), and FCEN (2008).

prices as production of drugs increases in a particular region. The next section explores this connection empirically using the case of Bolivia.

5 Drug producing regions: the Bolivian case

According to the US government estimates, each kilogram of pure cocaine requires between 315 kg and 370 kg of Bolivian sun-dried coca leaves, which in turn require about 0.11 and 0.15 hectares of coca plantations per year[3] (UNODC 2008). In 2007, Bolivia grew enough coca to produce between 192 and 262 metric tons of cocaine (28,900 hectares) (UNODC 2008).

During the 1930s, about 97 per cent of coca production in Bolivia was concentrated in the Yungas region in the state of La Paz and 2 per cent came from the Chapare region in the state of Cochabamba. By the 1960s, however, the ranking of regions in terms of proportion of total production was inverted and Cochabamba became the largest Bolivian coca producer (De Franco and Godoy 1992). Two factors contributed to the emergence of Chapare as the Bolivian leading coca producer: Its favoured terrain, (more abundant rivers and flatter terrain than Yungas); and a policy of colonization of Bolivia's lowlands that encouraged migration of peasants to the eastern parts of Bolivia following the land revolution in 1952 (De Franco and Godoy 1992).

Until the 1970s, most of Bolivia's coca production was destined for traditional uses inside its borders, but a surge in world demand for cocaine opened the door for cocaine exports that generated higher incomes than any other agricultural product. The fall in cotton and sugar prices in the late 1970s, coupled with one of Bolivia's worst economic crisis during the 1980s further prompted Bolivian farmers to migrate to the Chapare region to farm coca and to produce cocaine (Painter 1994).

The economic and social impact of coca production and the cocaine trade in the rural Chapare region in the 1970's and early 1980's has been the subject of many studies and is amply documented,[4] but the cocaine trade's impact on Bolivia's economy as a whole and on its urban centres in particular is less understood. De Franco and Godoy (1992) estimate that a 10 per cent increase in coca production leads to an increase in real personal income for urban workers of 0.55 per cent using a computable general equilibrium model. Their results suggest only modest backward and forward linkages between rural producer centres of coca and urban centres. Painter (1994), on the other hand, uses anecdotal evidence to argue that there are much stronger economic ties between the rural Chapare and its nearest urban centre, the city of Cochabamba.[5] Painter's argument suggests that a large portion of cocaine dollars originating in the Chapare region are laundered in Cochabamba's urban economy and that a large portion of Cochabamba's production and services provide intermediate inputs to the cocaine trade generated in the Chapare, yet he provides little evidence to measure such a relation. On the same vein, Shams (1992) attributes construction booms in Cochabamba and Santa Cruz to the cocaine trade, yet fails to provide any empirical evidence as well.

---

3 Using yield estimates from the Bolivian region of Chapare.

4 See Healy (1986).

5 The city of Cochabamba is located at approximately 100 miles from the Chapare region.

As the previous section argues, the extent to which cocaine production affects urban centres and land markets in particular is a function of the real income generated by the cocaine trade in the urban centre though exports and multiplier effects but also of the amount money laundered through the real estate market. Unfortunately, direct measures of money laundering and economic linkages at the regional level are non–existent in Bolivia. Nonetheless, as argued above, fluctuations in the real estate market can offer interesting insights into these connections.

5.1 Data and empirical models

In order to quantify the relationship between the real estate market fluctuations and cocaine production in Bolivia we rely on two key indicators: (i) yearly urban construction activity, and (ii) yearly coca production estimates. Fortunately series for these two indicators are available since 1997. The sections that follow describe the data and the econometric approach used in detail.

Construction activity measures

In order to test for construction activity and cocaine production we use data on construction permits by city from the Bolivian National Institute of Statistics.[6] As Table 2 shows, construction activity trends tend to be very similar across Bolivia's largest cities. Construction was at its highest point for all cities in 1998, and experiences a significant drop by 2002. Between 2002 and 2007 Santa Cruz and La Paz experience a steady increase while the City of Cochabamba experiences a decline in 2006.

Table 2
Approved construction permits by city (m^2)

Year	Cochabamba	La Paz	Santa Cruz
1998	445,582	1,095,535	638,547
1999	525,170	960,553	491,999
2000	364,431	548,588	271,188
2001	260,933	408,850	129,636
2002	254,601	323,027	122,295
2003	302,295	410,641	185,430
2004	391,129	613,689	246,536
2005	566,692	696,150	292,026
2006	379,811	799,020	368,542
2007	355,144	954,240	404,022

Source: INE (2008).

Cocaine production data

Measuring the cocaine trade presents several challenges. The illicit nature of cocaine, and in some cases of coca plantations, makes estimation of cocaine production a costly and sometimes politically sensitive endeavour (Thoumi 2005). For this reason, accurate data on cocaine production are limited to a few governments and large organizations of which the United Nations Office on Drugs and Crime (UNODC 2008) represents one

6 Estadísticas De La Actividad De La Construcción, 1998-2007 (INE 2008).

the most reliable (Mejia and Posada 2008). The UNODC uses satellite images to monitor illegal crops in producer countries and complements its estimates with yield and price-monitoring surveys collected by several country offices in conjunction with government agencies in producer countries.

This paper focuses on two UNCDC statistics compiled for coca producing regions, including Bolivia, on a yearly basis since 1997: coca production and cocaine production potential. Coca production statistics reflect the amount of land destined for coca plantation in hectares, while cocaine production potential introduces other factors such as legal consumption of coca and regional yield estimates to estimate the amount of coca used to produce cocaine.

As the second column in Table 3 reveals, Bolivia experienced a steady decline in coca leaf production between 1997 and 2000. This decline may be explained by the large political and economic investments on eradication measures followed by President Hugo Banzer Suarez during his term of government. In 2001 however, by the end of Banzer's era, coca cultivation increased steadily amidst episodes of great political instability. Interestingly, coca production showed an 8.3 per cent decrease mainly driven by changes in coca production in the Chapare region in 2005. The US department of state attributes this decrease to a government policy that limited coca cultivation to one 'cato' (equivalent to 0.16 ha.) per family carried by President Mesa (UNODC 2006). By 2006, however, amidst the rise of Evo Morales (then leader of the Bolivian coca movement) to the Bolivian presidency, new coca plantations increased rapidly in the Chapare region (by 8.2 per cent in 2006) and the trend continued in 2007.

Table 3
Bolivia's coca production estimates 1997-2007

Year	Coca production (ha)	Growth (%)	Cocaine potential (metric tons)	Growth (%)
1997	45,800		200	-
1998	38,000	-17.03	150	-25.00
1999	21,800	-42.63	70	-53.30
2000	14,600	-33.03	43	-38.60
2001	19,900	36.30	60	39.50
2002	21,600	8.54	60	0.00
2003	23,600	9.26	79	31.70
2004	27,700	17.37	98	24.10
2005	25,400	-8.30	80	-18.40
2006	27,500	8.27	94	17.50
2007	28,900	5.09	104	10.64

Source: UNODC (2008)

The UNODC's cocaine potential statistics uses coca production estimates but subtracts the amount of coca destined for traditional uses (i.e, not for cocaine production). Bolivian law currently allows 12,000 hectares of coca plantations to satisfy demand for traditional uses. Plantations in excess of the legal limit are destined for cocaine production. It is worth noting that most of the 12,000 Ha concessions of coca production allowed by law are located in the Yungas region. As a result, most of the coca coming out Chapare region is directly linked with cocaine production (UNODC 2008). Column 4 in Table 3 shows the cocaine potential statistic for Bolivia in the 1997-2007 period. The potential for cocaine production shows a similar trend to that of total coca

production; however, since cocaine production is mainly attributed to coca cultivated in the Chapare region, the changes in cocaine production potential shown in table 3 are more dramatic than changes in total coca production That explains why, despite coca plantation at the national level decreasing by about 8 per cent during 2005, the actual potential for cocaine estimate decreased by about 18 per cent.

Cocaine production and construction in Bolivia's largest cities

Table 4 presents a series of regression models to estimate the effects of cocaine production on urban construction in the cities of Cochabamba, La Paz and Santa Cruz for the 1997-2007 period. Model 1 shows the regression estimates of the natural logarithm of approved construction permits on potential cocaine production controlling for city-specific fixed effects. The coefficient on the lagged value of cocaine production potential indicates that, controlling for city-specific effects, a 1 per cent increase in cocaine production increases, on average, construction activity in the following year by about 0.8 per cent ($p<0.01$). Further, cocaine production alone tends to explain about 42 per cent of the variation in construction activity in Bolivia's main cities.

Separating income multiplier from money laundering effects

It is important to note that the regression coefficients in model 1 are estimates of the *total* effect of cocaine production on urban construction. However, as discussed in previous sections of the paper, this total effect can be divided into (i) employment effects arising from the income multiplier derived from cocaine exports and (ii) the money laundering effect that produces artificial shifts in demand for housing.

We separate these effects by introducing measures of city employment collected by the Bolivian National Institute of Statistics (INE) for each city to isolate the effects of cocaine exports that are not related to employment. As the second model in Table 4 shows, the coefficient on the lagged cocaine production potential drops slightly from .79 in the first model to 0.69 when employment measures (lagged and current) are introduced in the model. This indicates that only a small portion of the effect of cocaine production on construction in Bolivia's main cities can be explained by formal employment created by the cocaine trade (direct and indirect) and the majority may be explained by money laundering activities that use the real estate sector.[7]

Models 3 and 4 are variations on model 2 that control for the possibility that construction permits and cocaine production might follow the same patterns over time. Model 3 introduces a time trend variable and model 4 uses standardized de-trended measures of construction permits cocaine production.[8] Thus coefficients in models 3 and 4 represent the association between fluctuations in construction activity and fluctuations in cocaine production. The results are remarkably strong. As model 4 shows, controlling for employment and city specifics, a one standard deviation fluctuation in cocaine production in Bolivia tends to produce a fluctuation of .74

---

7 Using a path diagram analysis (not shown) in the construction permit models, we estimate that only about 13 per cent of the effect of cocaine production on construction permits in Bolivia's main cities could be explained by employment effects.

8 The de-trended variables were obtained by dividing the series of each city by their smoothed series. The smoothed series were obtained using a standard symmetric moving average smoother of five periods.

standard deviations in construction activity. Further, the within R square in model 4 reflects that 82 per cent of the variation in the fluctuations on construction permits in Bolivia's main cities can be explained by city-specific effects, fluctuations in employment, and cocaine production; 50 percentage points of that variation can be accounted by cocaine production alone.

Table 4
Fixed effects regression estimates
construction permits on lagged cocaine production potential
(Cochabamba, La Paz, Santa Cruz)

	1	2	3	4
	Ln (Construction permits)	Ln (Construction permits)	Ln (Construction permits)	De-trended (Construction permits) (standardized coefficients)
Ln (cocaine production potential (lag1)	0.786	0.687	0.617	0.757
	[0.00]	[0.00]	[0.00]	[0.00]
	(0.05)	(0.07)	(0.04)	(0.06)
Ln (local employment index)		0.030	0.040	0.18
		[0.03]	[0.03]	[0.04]
		(0.01)	(0.04)	(0.04)
Ln (local employment index) (lag1)		0.035	0.046	0.219
		[0.01]	[0.02]	[0.02]
		(0.07)	(0.04)	(0.12)
Trend variable			-0.019	
			[0.39]	
			(0.41)	
Constant	9.34	3.31	40.06	-5.65
	[0.00]	[0.07]	[0.36]	[0.00]
	(0.01)	(0.12)	(0.37)	(0.08)
Observations	30	30	30	30
R-squared (within)	0.7	0.8	0.81	0.83

Note: P values (robust for heteroscedasticity) in brackets;
P values (robust for hetersocedasticity and serial correlation) in parentheses.

6 Conclusions

This paper explored the connection between drug production and land markets in Bolivia. Even though this link has been observed in several studies and different geographic locations across Latin America since the 1980s, this is the first attempt to explicitly uncover the economic processes that may explain such a link and to measure it quantitatively. The empirical results presented here reveal that Bolivia's construction activity in its main cities is largely influenced by cocaine production. Our estimates show that, between 1997 and 2007, about 50 per cent of the variation in construction fluctuations in Bolivia's main cities is explained by fluctuations in cocaine production alone. These findings provide evidence of the importance of the drug economy for

Bolivia's urban economies. Interestingly, however, only a modest part of the effect of the cocaine economy on real estate markets can be explained by the number of formal sector direct and indirect jobs it creates in urban areas. On the contrary, our findings suggest that most of the effect of the drug economy on land markets might be explained by direct investments in real estate from those involved in the business, either for money laundering purposes or because real estate represents a secure investment and a symbol of status as suggested by McDonald's (2005) work in Mexican rural villages or Labaton (1989) in the case of Miami. Another possibility is that our measure of employment is not picking up the effects of employment in the informal sector which can be affected directly by cocaine exports in the form of increased commerce of smuggled goods as suggested by Hylton's (2007) perceptions about Medellin's experience. In any case, it is clear that the drug economy is fundamentally integrated with the legal construction and real estate economy in urban Bolivia, as evidenced by the finding that less than 50 per cent of the variations in fluctuations in urban construction are explained by non-cocaine related economic activity.

These findings pose an extremely challenging scenario for both economic development and law enforcement policies for countries like Bolivia. On one hand, drug eradication though law enforcement policies that cut drug exports can potentially cause busts in real estate markets and cause civil unrest. On the other hand, free reign for narcotrafficking activities inflate land prices, making it harder for the poor to access urban spaces and increases violence levels. These are tough choices to make, especially in a fragile political environment like that of Bolivia.

References

Antonil (1978). *Mama Coca*. London: Hassle Free Press.

Arboleda, J., and E. Correa (2003). 'Forced Internal Displacement'. In M. Giugale, O. Lafourcade, and C. Luff (eds), *Colombia: the Economic Foundation of Peace*. Washington, DC: World Bank.

Corben, B. (2006). 'Cocaine Cowboys'. Documentary film by Magnolia Pictures.

De Franco, M., and R. Godoy (1992). 'The Economic Consequences of Cocaine Production in Bolivia: Historical, Local and Macroeconomic Perspectives'. *Journal of Latin American Studies*, 24 (1): 392.

Dennis P. A. (2003). 'Cocaine in Miskitu Villages'. *Ethnology*, 42 (2): 161-72.

FATF (Financial Action Task Force) (2008). 'Money Laundering & Terrorist Financing Risk Assessment Strategies'. Paris: Financial Action Task Force.

FCEN (Financial Crimes Enforcement Network) (2008). 'Suspected Money Laundering in the Residential Real Estate Industry. An Assessment Based upon Suspicious Activity Report Filing Analysis'. Financial Crimes Enforcement Network.

Gibbons, S. (2004). 'The Costs of Urban Property Crime'. *The Economic Journal*, 144 (499): 441-63.

Hylton, F. (2007). 'Medellín's Makeover'. *New Left Review*, 44: 71-89.

Healy, K. (1986). 'The Boom within the Crisis: Some Recent Effects of Foreign Cocaine Markets on Bolivian Rural Society and Economy'. In D. Pacini and C. Franquemont (eds), *Coca and Cocaine: Effects on People and Policy in Latin America*. Boston: Cultural Survival.

INE (Instituto Nacional de Estadistica) (2008). *Stadísticas de la Actividad de la Construcción 1998-2007*. La Paz: INE.

Karch, S. B. (2006). *A Brief History of Cocaine*. New York: CRC Press.

Labaton, S. (1989). 'The Cost of Drug Abuse: $60 Billion a Year'. *New York Times*, 5 December.

McCue, D., and E. S. Belsky (2007). 'Why Do House Prices Fall? Perspectives on the Historical Drivers of Large Nominal House Price Declines'. W07-3. Cambridge: Joint Center for Housing Studies Harvard University.

McDonald, J. (2005). 'The Narcoeconomy and Small-town, Rural Mexico'. *Human Organization*, 64 (2): 115-25.

Mejia, D. and C. E. Posada (2008). 'Cocaine Production and Trafficking: What Do We Know?'. WB Policy Research Working Paper 4618. Washington, DC: World Bank.

Painter, J. (1994). *Bolivia and Coca - A Study in Dependency, in Studies on the Impact of the Illegal Drug Trade*. Boulder: Lynne Rienner.

Reuter, P., and V. Greenfield (2001). 'Measuring Global Drug Markets; How Good Are the Numbers and why Should We Care about Them'. *World Economics*, 2 (4): 155-73.

Rodgers, D. (2007). 'Managua'. In K. Koonings and D. Kruijt (eds), *Fractured Cities: Social Exclusion, Urban Violence and Contested Spaces in Latin America*. London: Zed.

Shams, R. (1992). 'The Drugs Economy and Anti-Drug Policy in Developing Countries'. *Intereconomics*, 27 (3): 139-44.

Thaler, R. (1978). 'A Note on the Value of Crime Control: Evidence from the Property Market'. *Journal of Urban Economics*, 5 (1): 137-45.

Thoumi, F. E. (2005). 'The Numbers Game: Let's All Guess the Size of the Illegal Drug Industry!'. *Journal of Drug Issues*, Winter: 185-200.

UNODC (United Nations Office on Drug and Crime) (2004). 'Bolivia Coca Cultivation Survey 2003'. Illicit Crop Monitoring Programme Reports. Available at: www.unodc.org/pdf/bolivia/bolivia_coca_survey_2003.pdf.

UNODC (2006). 'Coca Cultivation Surveys for Bolivia, Peru and Colombia'. Illicit Crop Monitoring Programme Reports. Available at: www.unodc.org/unodc/en/crop-monitoring/index.html.

UNODC (2008). 'Coca Cultivation in the Andean Region for 2007: A Survey of Bolivia Colombia and Peru'. Illicit Crop Monitoring Programme Reports. Available at: www.unodc.org/unodc/en/crop-monitoring/index.html.

Wheaton, W. C. (1974). 'A Comparative Static Analysis of Urban Spatial Structure'. *Journal of Economic Theory*, 9 (2): 223-37.