**DEPARTMENT OF ECONOMICS**
**JOHANNES KEPLER UNIVERSITY OF LINZ**

# The Shadow Economy in Colombia: Size and Effect on Eonomic Growth

by

Friedrich SCHNEIDER[*)]

Working Paper No. 1319
October 2013

**Johannes Kepler University of Linz**
**Department of Economics**
**Altenberger Strasse 69**
**A-4040 Linz - Auhof, Austria**
**www.econ.jku.at**

friedrich.scheider@jku.at
phone +43 (0)70 2468 -8210, -8209 (fax)

October, 2013
Paper_Colombia_1980-2012_FinalVersion_Oct2013.doc

# THE SHADOW ECONOMY IN COLOMBIA:

# SIZE AND EFFECTS ON ECONOMIC GROWTH

by

Friedrich Schneider*

and

Bettina Hametner**

**Abstract:**

Using the currency demand approach, size and development of Colombia's shadow economy are estimated over the period from 1980 to 2012. The results show a great extent of shadow economic activity varying over time between 27 and 56 % of GDP. The most important factors driving the shadow economy are indirect taxation and unemployment. Analyzing the interaction between shadow and official economy, the shadow economy has a negative effect on the official one. Average growth of real per capita GDP is 1.86% between 1980 and 2012, without shadow economy it would have been higher around 0.12 percentage points on average.

**JEL-Code:** 017, 05, D78, H2, H11, H26

**Key-words**: Colombian shadow economy, currency demand method, taxation, unemployment, interaction between the shadow and official economy.

* Prof. Dr. Dr.h.c.mult. Friedrich Schneider, Department of Economics, Johannes Kepler University Linz, Altenberger Straße 69, A-4040 Linz-Auhof, AUSTRIA, Phone: 0043-732-2468-8210, Fax: -8209, E-mail: friedrich.schneider@jku.at, http://www.econ.jku.at/Schneider

** Mag. Bettina Hametner, Economist, Phone: 0043-664-4844206, E-mail: bettina.hametner@gmx.at

## 1. Introduction

Colombia is a developing country which unfortunately made the headlines in the media because of her drug crime business which negatively influenced Colombia's image by her large-scale cocaine production and trade especially in 1980s and 90s. Our paper, however, only marginally deals with drug trafficking or other illegal (i.e. classical crime) economic activities in Colombia. The main focus of our study is the estimation of the size and the development of the shadow economy over time and its influence on the "official" economic growth of Colombia. To our knowledge these two aspects have not been investigated so far, especially the interaction of the shadow economy with the registered one and here the question whether the shadow economy has a positive or negative effect.

Our paper is divided in six parts. After this short introduction, in part 2 some theoretical considerations about this topic are given, explaining different ways of defining a shadow economy, analyzing the main causes that support underground activity and discussing interactions between formal (registered) and informal (shadow) economy. The following chapter, part 3, gives a brief overview of the economic structure of the country. In part 4, the econometric results of regression models based on the currency-demand approach (to calculate the size of the shadow economy in Colombia) are presented. Based on these results, in part 5 econometric estimations are shown which demonstrate the influence of the shadow economy on the official, i.e. registered one, here on "official" economic growth. In part 6, the study concludes with a summary of the main findings and a brief outlook on possible policies to tackle the problem of underground activities.

## 2. Theoretical background

### 2.1. Defining the shadow economy

Researchers attempting to estimate the size of unregistered economic activity face the problem of defining a shadow economy. One commonly used (working) definition is: All currently unregistered economic activities are counted that contribute to the officially calculated (or observed) Gross National Product.[1] Smith (1994, p. 18) uses the definition "market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP." One of the broadest definitions includes "those economic activities and the income derived from them that circumvent or other wise government regulation, taxation or observation".[2] As these just mentioned definitions still leave open a lot of questions, Table (1) summarizes what could be a reasonable consensus about the definition of the underground (or shadow) economy. From Table (1), it is clear that a broad definition of the shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions – and so includes all economic activities that would generally be taxable were they reported to the tax authorities.[3]

insert table 1

[1] This definition is used, for example, by Feige (1989, 1994), Schneider (1994a, 2003b, 2005), and Frey and Pommerehne (1984). Do-it-yourself activities are not included.
[2] This definition is taken from Del'Anno (2003), Del'Anno and Schneider (2004) and Feige (1989). See also Thomas (1999) and Fleming et al. (2000).
[3] The United Nations together with the European Commission elaborated a framework classifying economic activity non-covered by national accounts systems in 7 types that can be summarized in 4 main groups namely not registered, not surveyed, misreporting and others. For a detailed description of the framework consult United Nations (2008), page 4, Box 1.

Our paper uses a more narrow definition of the shadow economy[4]: The shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons:

(1) tax evasion or tax avoidance,

(2) to avoid payment of social security contributions,

(3) to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and/or

(4) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

Hence, this paper does not deal with typical economic activities that are illegal and fit the characteristics of classical crimes like burglary, robbery, drug dealing, etc.[5] The definition used also excludes all non-market based economic activities like neighbour help, household and do-it-yourself work.

## 2.2. ***Theoretical considerations on the main causes for the existence of the shadow economy***

*(1) Tax and social security burdens*

Numerous studies demonstrate that an increasing burden of taxes and social security contributions is one of the main causes for the development and increase of shadow economic activities.[6] The reason is that this form of fiscal intervention has a strong

[4] Compare also the excellent discussion of the definition of the shadow economy in Pedersen (2003, pp. 13-19), who uses a similar definition.

[5] It has to be mentioned at this point that especially for the case of Colombia it would of course be interesting to include illegal economic activities in the calculations of the size of the shadow economy. Unfortunately, due to a lack of reliable data in this respect the authors needed to refrain from basing their estimations of the size of the shadow economy on this broader definition.

[6] See Enste in Bajada/ Schneider (2005), Schneider (2005, 2006), Alm (1996)

influence on individuals' cost-benefit and/or labour-leisure choices because it heavily increases the opportunity cost for legal economic activities and finally reduces the profitability of legal (official) work. The greater the difference between total cost of labour in the official economy and after-tax earnings from work, the greater is the incentive to work in the shadow economy.[7] Figure (1) illustrates the great importance of tax and social security contribution burdens on the size and the development of the shadow economy.[8]

insert figure 1

*(2) Intensity of regulation*

The original objectives of regulations were to avoid market failures, hence the goal was to increase welfare, reducing external effects and redistribution of wealth for higher justice within the population. Labour market regulations mostly for employees' and workers' protection mainly show, at least in the long term, positive effects. However, regulations also lead to the fact that people often consider such interventions of the government as a limitation of their personal freedom. In addition, fullfilling laws normally causes supplementary cost and may therefore have a negative influence on production possibilities and competitivity of individuals and firms. A higher scope of regulation leads in most cases to higher bureaucratic expenditures for individuals and firms as well as for public authorities (Schneider (2000)) and may be a "hotbed" for corruption, particularly in

[7] However, even major tax reforms with major tax rate deductions may not lead to a substancial decrease of the shadow economy (see results for Austria in Schneider (1994b, 1998b)) Such reforms may stabilize the size of the shadow economy and avoid a further increase. Social networks and personal relationships, high profits form irregular activities, and associated investments in real and human capital prevent people from going back to the official economy (for Canada, see Spiro 1993)).

[8] The great importance of tax and social security contribution burdens on the size and development of the shadow economy has also been shown in numerous empirical studies, among others by Schneider (1994b, 2000, 2005) and Johnson et al. (1998a, b).

developing countries. To sum up, individuals often consider increasing intensity of state regulation as cost-rising and freedom-limiting. Therefore, increasing intensity of regulation supports the switch to shadow economic activities.[9]

*(3) Changes in labour market conditions and the employment system*

A rationing (i.e. strong policy intervention) on the official labour market, e.g. reduction of maximum working hours per week, or a decrease of the age for retirement have the effect that people have available much more time which can be used for shadow economic activities. Another argument could be that after such changes people find themselves confronted with circumstances where their desired total working time no longer corresponds to their actual one, so that they have a strong incentive to engage in shadow economic activities. An economic crisis may also lead to a reduction of the work force needed in the official labour market; hence it is common that during recessions the official demand for labour decreases and unemployment rises.[10]

An increase in transfers (e.g. unemployment benefits, pensions, etc.) reduces the incentives to work in the official economy, too. As a consequence, people choose to work less in the official economy and as a result may increase their shadow economic activities.

Another incentive for working in the shadow economy is a rise in the wage rate in the informal sector (e.g. caused by higher demand for illicit work) as this increases the

[9] These theoretical considerations are supported by empirical studies, which show, that increasing intensity of regulation leads to a growing shadow economy (see Schneider (2005), Wagner (1984), Enste (2005) and especially the survey of Schneider and Enste (2002)).

[10] It is hence not surprising that during the worldwide recession in the 70s a general increase in the extent of shadow economic activity was observed (Gijsel (1984)).

profitability of illicit work relative to employment in the official sector. In a similar way, a reduction in the net wage rate in the official economy (e.g. due to an increase in payroll tax) decreases the returns to work in the official economy or the marginal utility of the extension of official working time which may also lead to an increase of shadow economic activity. However, this argumentation is only valid for considerations on a microeconomic basis. According to macroeconomic theory, lower wages lead to higher employment as demand for labour increases and lower unemployment implicates, ceteris paribus, lower activity in the shadow economy.[11]

*(4) Changes in individual values and general attitude towards shadow economic activity*

In all „civilized" societies politicians interfere in the economy in order to "fix" the limits between legality and illegality and to regulate the functioning of economic life. These interventions, however, may not be according to everybodies' idea of morality and understanding of justice (Besozzi (2001)). This means that people have no bad feelings towards „normal" shadow economic activities; people may often find it easy to justify their unofficial supply or demand for goods and services because friends and family members just "do the same" (Schneider (2000, p.8)).

The term „changes in individual values" generally consists of all possible changes in morality of a certain group or a whole country's population relating to their willingness to accept state regulations. They may also change their view of the competence of public authorities, tax morale and the common attitude towards shadow economic activities. In general, if trust of the public authorities is high handling their affairs and if the population

[11] Schneider/ Enste (2002), Wagner (1984), Enste (2005) and Kirchgässner (2006).

shows a positive attitude towards fiscal interventions, one normally expects lower shadow economic activities (Haslinger (1984) and Kirchgässner (2006)). Events like an increase in overall tax burdens which is not accompanied by immediate and visible increases in (social) state services may lower the acceptance and the trust in public authorities and increase the incentive to engage in the shadow economy, partly because in such situations people may feel the need to balance subjectively felt individual welfare losses out themselves.[12]

## 2.3. ***Theoretical reasoning about the interaction between official and inofficial economies***

Obviously there are many interactions between the official (registered) and inofficial (shadow) economies in a country, hence a strict separation of these two parts of the economy is not possible.[13] Therefore it is not surprising that there is a continuous interaction between official and unofficial economy. Naylor (1996) emphasizes that the official part of the economy could never work efficiently if it were totally separated from the unofficial part. A study carried out by the OECD confirms further, that the shadow economy permanently competes with the official economy, on the other hand Lubell (1991) states that the formal and informal economies also complement each other. Other studies (Lubell (1991), Besozzi (2001) and Schneider (2005)) show, that a certain influence of the shadow economy on the efficient functioning and development of the official economy can not be denied.

In principle, these interactions stem from three main topics that are influenced by the shadow economy, namely taxation, general allocations and biased effects of economic

[12] Schneider (2000) and Gretschmann (1984).
[13] Compare Besozzi (2001), Naylor (1996) cited in Besozzi (2001, p.12), Lubell (1991) and Schneider (2005).

policies. The interactions and their effects originating from these three main sources are summarized in the following table.

insert table 2

Various studies (e.g. Schneider (2005 and 2006)) demonstrate the interaction between the official and the shadow economy, still, but their results are discussed controversially, especially, whether positive effects predominate negative ones or vice versa. As these effects among others always depend on the concrete size of the shadow economy, the intensity of interaction between formal and informal sector and the specific economic situation of a country, an answer can only be given after an empirical analysis is undertaken for concrete countries, which we will do for the case of Colombia.

## 3. The economic structure of Colombia – an overview

For a long time, Colombia was known as one of the most important coffee exporters worldwide, but agriculture is no longer as important for the country's economy as it used to be in the 20th century, when the economy was traditionally based on agriculture. Production and service sector are gaining importance: in 2011 these sectors contributed 23 % and 54 % to GDP respectively. On the one hand, this development is due to several policy reforms and stimulation programms (initiatives to boost tourism, free trade agreements with economies worldwide, etc.), on the other hand the improved security situation (continuous peace negotiations with guerilla-groups) incresed the inflows of foreign direct investment. Another part of the economy that developed rapidly in the last decade is mineral extraction with a contribution to GDP of 8% in 2011 where great part of the production goes for

export; in 2011, crude oil and petroleum products accounted for nearly 50 % and coal for 15 % of Colombia's exports.[14]

Until the beginning of the 90s, the country's economic structure was characterized by a strategy of import substitution. Then, Colombia's government decided to restructure its economic position and to open, at least slightly, its boarders to allow for more international trade. At the same time a completely new constitution was enforced, leading to mayor changes in legislation, especially to liberalizations in the labour market and the banking sector and to an increase in social services. In 1994 the crawling peg of the Colombian peso to the US dollar was changed into a regime of floating exchange rate. To sum up, the 1990s was a decade of complete economic restructuring in Colombia which showed positive effects on the growth rate of GDP at the beginning of the decade. However, from the mid 90s on, the country suffered from stagnating growth rates and slumped into its biggest recession of the last century in 1998 which was mainly due to a heavy crisis in the banking and financial sector. This last point may also be related to a financial crisis in Brazil in the same year, as Colombia's economic performance traditionally has always been dependent on its neighbour countries' developments, who traditionally are, apart from the US, important trading partners of the country.

Since the turn of the millenium growth of real GDP has constantly been increasing reaching 6.9 % in 2007, with only one slump to 1.7 % in 2009 due to the global financial crisis.[15]

[14] Data source: Departamento Administrativo Nacional de Estadística DANE (July 2013)
[15] Data source: Departamento Administrativo Nacional de Estadística DANE (July 2013)

Outlooks suggest that GDP growth will be around 4.5 % in the years until 2015.[16] An important downside risk, however, is a declining external impulse triggered by the sluggish US recovery, Europe's structural crisis and the growth deceleration in China. Colombia's government is aware of the difficult economic environment and worked out a a long-term programme – PIPE – to boost productivity and employment, including labour tax cuts, zero trade tariffs for a great number of products, subsidies for the industries mostly hit by the strong peso of recent years, lower energy prices, infrastructure investments, etc.

With resprect to the shadow economy, Colombia's government began to actively deal with this issue already at the beginning of the 1970s. The first estimate based on a survey of Bogotá, was done in 1974 and calculated that at least 43 % of the working age population in Bogotá engaged in shadow economic activities.[17] From then on, surveys have been executed regularly, mainly based on personal interviews or other microeconomic data. These investigations continuously gave high estimates of the shadow economy in the cities as well as aggregated for the whole country. The calulations lie on average between 40 and 60 %.[18] Based on these results, the Colombian government lanced lots of programms trying to integrate the "informal workforce" into the official economy. These programms have mainly been based on basic social aids and educational trainings.

Finally, when giving an overview of the Colombian economy, one cannot refuse to see the flourishing business of drugs and smuggling. The drug business, which has always been

[16] Ministerio de Hacienda y Crédito Público
[17] Oficina de Investigaciones Socio Económicas y Legales Ltda., Bogotá.
[18] Arango, Misas, Lopez (2005). The surveys only deal with "traditional" informal activities, illegal economic activities like drug trafficking are excluded.

existent to some extent, exploded in the 1980s when the famous Colombian drug cartels came into play and began organizing a whole chain of cultivation, processing and sale of mainly cocaine. The exent of drug trafficking is estimated to have been around 7 % of GDP or 70 % of Colombia's exports in the early 1980s with a decreasing trend leading to estimates for the end of the 90s to around 3 % of GDP or 25 % of exports.[19] Recent estimations for the new millenium calculate the value of cocaine production to 1.9 % of GDP in 2000 constantly decreasing to 0.4 % of GDP in 2011.[20] Figure 2 shows the evolution of the area used for coca cultivation and estimated revenues from coca cultivation in Colombia over the period 1977-2012 and 1992-2010 respectively.

insert figure 2

Somehow related to this important illegal part of Colombia's economy are the guerrillas (the main two groups are FARC and ELN) which have been quite of a problem for a long time. It can not be denied that the guerillas contributed to general insecurity and political instability of the country. Therefore the ongoing peace negotiations with a better security situation are honoured by international investors increasing capital inflows and institutions like rating agencies which keep upgrading the country's rating leading, amongst others, to lower refinancing costs of public debt.

## 4. ***Empirical estimates of the size of the shadow economy in Colombia***

### 4.1. ***Estimation method and variables***

[19] Steiner (1998)
[20] Echeverry (2013)

Different methods to estimate the size of the shadow economy have been elaborated. They can basically be divided in two groups: direct and indirect approaches. Direct, also called micro approaches use survey or interview data of a representative sample of the population to calculate the size of the shadow economy. For example the European Commission together with the United Nations Organisation and the OECD published a handbook describing a micro method of interviewing and surveying that should be quite helpful to estimate the non-observed economy in national accounts accurately and should especially contribute to make data of shadow economic activity comparable over time and countries. [21] Another way of estimating the size of the shadow economy is to use macro-data of the economy (for instance national accounts, labour market data, energy input, etc.) and to calculate the size of the non-observed economy indirectly using econometric methods. One of these econometric or indirect approaches is the so-called currency demand approach[22]. We have chosen this approach for Colombia as for the application of this method the most reliable and complete dataset was available.[23] We are aware of the weaknesses of this approach (compare appendix A, where they are discussed in detail), but we still argue that this approach is the most suitable in this case, because we have a consistent data set, the results are quite robust, and as the other only alternative, the MIMIC approach "produces" only relative results, we still would have to use another method to calibrate the values into absolute ones, most like the currency demand approach. Two variations of the currency demand model have been applied, which also have been estimated: The first uses as

[21] United Nations (2008)
[22] For a detailed description and criticism on the currency-demand method see appendix A.
[23] Due to the lack of available results from personal interviews and the impossibility of doing surveys ourselves, micro approaches for estimating the size of the shadow economy could not be used. We could not apply discrepancy methods either as we had no access to the necessary data. Physical input approaches have not been considered as they did not seem a good approach to describe the Colombian shadow economy where a large part of the informal activity is trade in simple goods whose production and distribution only need marginal input of electricity.

dependent variable, the currency demand per capita (*CDC*), the second uses as dependent variable the ratio of cash holdings to checkable deposits (*CD*). Using these two different specifications of the dependent variable, robustness and reliability of the estimation results can be examined. The independent variables used to explain the official currency demand are:

(1) the real Gross Domestic Product per capita (*GDPPC*),

(2) the yearly average interest rate on deposits of 90 days (*IRD*),

(3) the yearly average market exchange rate of the Colombian Peso to the US dollar (*ER*)

The variables included in the model for explaining the currency demand induced by shadow economic activities are

(4) the average effective direct (*TY*) and indirect (*TC*) tax rates (tax on income and VAT)[24],

(5) the unemployment rate (*UNEMP*), and

(6) the real expenditures for public employees in % of GDP (*EPE*) and the number of new laws issued per year (*LAW*) as proxies for the intensity of regulation and control.[25]

*Estimation equation for model 1 based on currency demand per capita:*

$$\ln CDC_t = \beta_0 + \beta_1 \times \ln GDPPC_t + \beta_2 \times IRD_t + \beta_3 \times \ln ER_t + \beta_4 \times TY_t + \beta_5 \times TC_t + \beta_6 \times UNEMP_t + \beta_7 \times EPE_t + \beta_8 \times \ln LAW_t + u_t \quad (1)$$

*Estimation equation for model 2 based on the ratio of cash holdings to checkable deposits:*

[24] Another tax which certainly distorts the amount of cash is the financial transaction tax which exists in Colombia since the deep crisis of the end of the century. Botero (2013) shows, that the presence of this tax has created distortions in the demand for cash.

[25] For a detailed description of the variables used see appendix B., Table 7

$$\ln CD_t = \beta_1 \times \ln GDPPC_t + \beta_2 \times IRD_t + \beta_3 \times \ln ER_t + \beta_4 \times TY_t + \beta_5 \times TC_t + \beta_6 \times UNEMP_t + \beta_7 \times EPE_t + \beta_8 \times \ln LAW_t + u_t \quad (2)$$

Based on monetary theory, the real GDP per capita and the market exchange rate are expected to have a positive effect on the dependent variable in both equations, whereas the interest rate should have a negative impact. From the above theoretical considerations on the factors influencing the size and development of shadow economic activity, the coefficients of direct and indirect taxation, the unemployment rate and the proxy variables for the intensity of regulation are expected to have positive signs. To summarize, for both equations we derive for the independent variables the following signs[26]:

$$\beta_1 > 0, \beta_2 < 0, \beta_3 > 0; \beta_4, \beta_5, \beta_6, \beta_7 and \beta_8 > 0$$

## 4.2. ***Estimation results***

Table (3) shows the regression results for the two estimations based on the currency demand method. In our regressions we use yearly data for the period from 1980 to 2012. For model 1, we use the natural logarithm of currency demand per capita. Furthermore, an AR-model has been specified to correct for first and second order autocorrelation, detected by conventional tests. For model 2, we specify an AR(1)-model with the natural logarithm of the ratio of cash holdings to checkable deposits as dependent variable. [27]

insert table 3

[26] Due to space reasons we do not explicitly formulate testable hypotheses like "the higher the tax burden, the higher is the shadow economy, ceteris paribus". I think this is clearly shown with the derived signs.
[27] For test results detecting autocorrelations see table 3

In model 1, based on the currency demand per capita, all coefficients of the independent variables show the theoretically expected signs and all of them, exept the coefficient on income tax, are of high statistical significance. Model 2 replicates the outcomes of model 1 but it has to be mentioned that the results are not that clear as only the coefficients of two of the explanatory variables, GDP per capita and the unemploymentrate, are statistically significant on a 5 % level. Interestingly in this model, GDP per capita comes with an inexpected but significant negative coefficient, meaning that an increase in GDP per capita leads to a decrease in the ratio of cash holdings to ceckable deposits. An explanation for this can be that over the past decades the rise in GDP per capita has gone hand in hand with an increasing importance of checking accounts compared to cash holdings. In general, we believe that the fact that a ratio always has two components that can change is the main reason why the outcomes are not that clear and significant as in model 1.

The variables explaining currency demand induced by shadow economic activities (direct and indirect tax rates: *TY, TC* and the unemployment rate: *UNEMP*) show the expected signs: The positive relation between rising unemployment, as well as increasing direct and indirect tax rates and the dependent variables are in line with our hypothesis that these factors support the growth of underground activities and hence have a positive impact on currency demand. Tax on consumption (*TC*) and the unemployment rate (*UNEMP*) have by far the most important quantitative influence on the dependent variable and are highly statistically significant in both equations. An increase of one percentage point in the indirect average net tax rate (*TC*) increases currency demand per capita by 3.8 % and the ratio of cash holdings to checkable deposits by 2.5 %, an increase of one percentage point of the unemployment rate (UNEMP) increases cash demand by 1.3 % and the cash/deposits ratio

by 2.2 %, ceteris paribus. The direct average net tax rate (*TY*), also considered as an important factor to explain unregistered money demand, although it seems to have the expected positive influence on the dependent variables, does not reveal statistical significance in neither model. Moreover, the impact of the tax rate on income is much smaller than that of the tax rate on consumption. But as income taxation theoretically is one of the strongest reasons for shadow economic activity we tested the robustness of our models replacing the net effective direct tax rate by total direct tax revenues in % of GDP (*TYGDP*) in an alternative estimation. In this variation of our main models the coefficient on direct taxation comes up with reasonable statistical significance (see table (4)).

insert table (4)

However, we decided to stick to our original models in the following reasoning and simulations as the variable "total direct tax revenues" for our purposes here is somewhat difficult to argue, since it may vary for two reasons: Firstly because of varying tax rates, secondly because tax collection becomes more or less effective (a factor we already control for by the variables *EPE* and *LAW*). Still, these alternative estimations fulfil the purpose to check that the theoretical reasoning about the importance of income taxation on hidden economy is accurate.

In our main models above, also the proxies for intensity of regulation and control by public authorities (*EPE*: real expenditures for public employees in % of GDP and *LAW*: the number of new laws issued per year) show the expected positive effect on currency demand; only in model 2, the coefficient on LAW appears with a negative but very small

and statistically insignificant value. This finding is supported by our above theoretical argumentation that higher intervention in the market through stronger regulation increases the size of the shadow economy and consequently the demand for cash.

### *4.2.1 Estimation results including drug business as explanatory factor for cash demand*

We are aware that economic crime, mainly drug trafficking and production, is present to a great extent in Colombia, but we generally want to stick to the narrow definition of the shadow economy (as pointed out in chapter 2.1.) in this paper. Firstly, because reliable time series data describing drug business and other economic crime is hardly available. Secondly, we believe that traditional factors like higher taxation which normally lead to higher activity in the informal sector do not have this same influence on economic activity as criminal businesses like coca production[28]. However, we have experienced much criticism because of basing our research on the narrow definition of the shadow economy. Therefore, we decided to offer a variation our first model including the only data series describing the evolution of drug business in Colombia available to us for a reasonable time period which is the area of coca cultivation (*ACC*). The expectation is that this variable has a positive and rather great influence on cash demand as drug business uses cash not bank accounts for money transaction.

The results (see table 5, var. 1 left) show that, as we expect by theoretical argumentation, the area used for coca cultivation has a positive effect on our dependent variable cash demand. Unfortunately, it is not statistically significant and of small magnitude: A 1 %

[28] A first attempt to show that the currency demand function may be biased has been undertaken in a study by Ardizzi et al. (2013) for Italy.

increase of the area increases cash demand by only 0.02 %. So it seems that all the other variables included to describe unregistered demand for cash have per se a much greater effect than the criminal component. We believe that this result is biased as, due to unavailability of more detailed data series, we cannot control for price and productivity changes in coca production and trade over time in this model.

Yet, especially the price and productivity component must be an important factor in drug business. The United Nations Office on Drugs and Crime offers data on price and productivity developments in Colombia's coca business for the period 1992-2010. Although this is a rather short time period, we run another estimation variant of our original cash demand model including the estimated total revenues from Colombian coca production (*COC*) as explanatory variable (regression results see table 5, var. 2 right). It is interesting to see, that in this variant it seems that only drug business explains unregistered cash demand while all other variables included for describing shadow economic activity (taxation, unemployment, regulation) are not statistically significant in this model. A 1 % increase of the revenues from coca business raises cash demand by 0.1 %. This outcome is interesting, firstly because one may be surprised by this rather small effect compared to the much larger and statistically highly significant aggregated influence of traditional factors describing the hidden economy like taxation and unemployment in our original model. Secondly, the results of this last estimation may lead to the conclusion that the one and only factor describing unregistered demand for cash in Colombia in the last 2 decades was drug business.

Insert table (5)

The two model variants including criminal activity presented above are not satisfactory to us. The data for the criminal part of the economy in variant one does not include the important price and productivity component and the data series in variant two which allows us to control for price and productivity of in coca production is too short in our point of view; possibly this short sample period leads to biased outcomes as we only have 18 observations for 8 explanatory variables. Although both model variants show a positive influence of drug business on cash demand, we decided to stick to our main models based on the narrow definition of a shadow economy and specified above in chapter 4.1 in the following of this paper. However, this exercise of extending our models for criminal components shows that the numbers resulting from our simulations on the size of the shadow economy below may possibly underestimate the volume or at least give the lower band of its size.

### 4.3. ***Calculation of the size of the shadow economy***

The next step is to undertake simulations, where the values of the variables used to explain the currency demand induced by shadow economic activities (*TY, TC, UNEMP, EPE, LAW*) are held on their lowest levels, in order to calculate the theoretical („official“) currency demand per capita. The difference between the real observed and the calculated theoretical demand for money basically gives the estimated currency demand per capita induced by shadow economic activities. These results multiplied by the velocity of money in the official economy provide value added figures of the estimated size of the shadow economy which can be shown as a percentage of GDP.

However, it has to be mentioned that here two main restrictions of the monetary approach come into play which have been taken explicitely into account and corrected for in our simulations on the size of the shadow economy presented below: First, the assumption of the same velocity of money in the registered and the shadow economy is only valid when income elasticity is equal to one. If this is not the case, calculations of the size of the shadow economy have to be adjusted by a correction factor which is based on the long-run income elasticity of money. Secondly, estimations of the income elasticity of money are in general based on short-run, i.e. dynamic model specifications, to be concrete, they include the lagged dependent variable. Therefore, such short-run models have to be adjusted for calculating the long-run income elasticity of money.[29] The estimate of the implicit long-run income elasticity for Colombia gives a value of 1.8. This value has been taken to correct the estimations of the size of the shadow economy presented below.[30]

Figure (3) shows the simulation results of our two main models for the size of the shadow economy in Colombia. As the results of the model variant we specified based on a broader definition of shadow economy in cap. IV.C. are not statistically significant for the most interesting variable in this case, namely coca production, we refrain from including the simulations on the size of the shadow economy based on this model in the chart below. Besides, the values for the size do not differ a lot from the ones calculated based on the original model (without coca cultivation as explanatory variable), which is obviously due to the small coefficient of the variable *ACC*.

[29] For a detailed discussion on possible corrections with respect to the restrictions mentioned see Ahumada, Alvaredo, Canavese (2007)

[30] Without this correction the simulations would overestimate the size of the shadow economy: The average size of the shadow economy between 1980 and 2012 is 43 % for the models where the adjustment has been done whereas the average without correction would be 47 %.

Still, we want to give the reader the possibility to compare outcomes based on narrow and broader definitions of the shadow economy. So we also show the simulation results from our model variant 2[31] including the estimated coca revenues as explanatory variable and figures based on a MIMIC model based on a broader definition of the shadow economy, i.e. including drug trafficking and smuggling, carried out by the Colombian Central Bank[32], although they only cover the time period 1979-2002.

insert figure 3

The estimated size of the shadow economy based on model 1 gives an average of 45 % of GDP during the whole period under consideration, with higher values from the mid-80s (maximum in 1987 with 56 %) to the mid 90s, and showing an obviously decreasing trend from the end of the 90s on (minimum in 2008: 36 %) with another slight increase during the recent world financial crisis in 2009. The estimations based on model 2 show an increasing trend from the beginning of the 80s until the end of the century, keeping the level during the first decade of the new millenium and also another slight increase during the recent crisis. The average size of the shadow economy calculated using model 2 is 42 %, giving the lowest value (27 %) in 1981 and the maximum (53 %) in 2000. The estimates based on the variation of model 1 including revenues from coca business give slightly higher values for

[31] We do not include the estimation results based on model variant 1 including drug business as the outcomes do not differ a lot from the ones resulting from the original model 1 (cash demand per capita).
[32] Arango, Misas and López who carried out the cited study for the Colombian Central Bank estimated a MIMIC model. As simulations of the size of the shadow economy based on MIMIC models only give index numbers a second, absolute estimation for the size of the shadow economy for at least one point in time is needed to convert the indices in absolute numbers. In this case, the figures fall back on an estimate based on the currency demand method by Schneider (2002) giving a size of the Colombian shadow economy of 39 % of GDP for 1999/2000.

the size of the shadow economy in the new millennium but much lower ones at the beginning of the observation period in the mid-90s.

Comparing the development with the estimates by the Colombian Central Bank based on the MIMIC approach and considering a broader definition of the shadow economy, the most obvious deviations are the extremely strong increase at the beginning of the 80s from around 30 % to 55 % in only 3 years. This may be due to the organization of drug trafficants in cartels and the beginning of drug trafficking on a large scale during the 80s. This rise is reversed at the end of the 80s and the size of the shadow economy keeps decreasing until 1997, increasing then again slightly. For completeness, it has to be mentioned that only the development of the shadow economy reflects the inclusion of illegal economic activities into the MIMIC estimations. One has to be aware that the conversion of the MIMIC indices in real numbers is based on the estimates of the size of the shadow economy from the outcomes of a currency demand model based on the narrow definition of the shadow economy equal to the one taken for the estimation presented in this paper. Therefore, the relative numbers in % of GDP shown in the chart above do not include illegal economic activity neither.

The outcomes resulting from the above simulations correspond to the general expectations: One expects a generally high level of the shadow economy in Colombia given its relatively unstable economic and political situation, the low participation on the labour market, the high level of poverty among the population with mostly low or no professional qualification. The declining tendency of the size of the shadow economy shown in model 1 and the end of the rise shown by model 2 since the turn of the millenium can be attributed

to some political stabilization and the beginning of the country's integration into the global market since then and the general economic expansion world-wide until 2009.

Finally, some remarks about the size and development of the Colombian shadow economy in comparison with the one of other South and Middle American countries are done; the results are presented in appendix C , Table (8). The sizes of the shadow economy for 21 Central and South American countries (including Colombia) are shown. The method used here is the MIMIC approach and the MIMIC estimation is shown in Schneider (2007).[33] Averaging the figures over all 21 Central and South American countries the shadow economy increased from 41.1% in the year 1999/2000 to 42.2% of official GDP in 2004/05. If we turn to the size of the shadow economy for single countries (for 2004/05) Bolivia has the largest shadow economy with 67.2%, followed by Panama with 62.2% and Peru with 58.2% of official GDP. The median country is Brazil with 41.8% where Colombia comes also close with 42.7%. At the lower end are Chile with 14.9%, Costa Rica with 26.3% and Argentina with 27.2% of official GDP. We are aware that this comparison between Latin and South American countries is a crude one and as a different estimation method is used getting the estimates in Table (8), our international comparison shows, that the Colombian shadow economy is with respect to the size of the middle field, compared to the ones of other South and Middle American countries.

## 5. The interaction of the shadow economy with the official one in Colombia

[33] We are thankful to an anonymous referee, who pointed out that we should make a comparison of our estimation of the size of the Colombian shadow economy with other Central and South American countries. However, we did not find studies for other South and Middle American countries using the currency demand approach. Hence, we refer to the MIMIC estimation of Schneider (2007). Due to this, only a rough comparison between our size and development of the shadow economy within the currency demand approach can be done with other Middle and South American countries.

## 5.1. *The estimation of a growth model*

To estimate the influence of the shadow economy on the "official" one, a growth model has to be specified, explaining the growth of real "official" GDP per capita [*GGDPPC*] by the independent factors influencing economic growth given using general economic theory. The most important factors are: inflation rate [*CPI*], the exchange rate [*ER*], domestic and foreign direct investments [*DI, FDI*], size of the population [*POP*], human capital, measured as average schooling years per capita [*SPC*], participation rate on labour market [*LPA*], public spending on consumption [*PCGDP*]) as well as the size of the shadow economy [*SE*]. Applying this we get the following regression equation:

*Regression model:*

$$GGDPPC_t = \beta_1 \times GGDPPC_{t-1} + \beta_2 \times \ln CPI_t + \beta_3 \times \ln ER_t + \beta_4 \times \ln DI_t + \beta_5 \times \ln FDI_t + \beta_6 \times \ln POP_t + \beta_7 \times \ln SPC_t + \beta_8 \times \ln LPA_t + \beta_9 \times \ln PCGDP + \beta_{10} \times \ln SE_t + u_t \quad (3)$$

According to general economic growth theory, the expected signs of the regression coefficients of the independent variables are positive for the lagged endogenous variable (*GGDPPC*), the exchange rate (*ER*), domestic and foreign direct investments (*DI, FDI*), total population (*POP*), average schooling per capita (*SPC*) and the participation rate on the labour market (*LPA*), whereas the signs of the coefficients for inflation rate (*CPI*) and government consumption (*PCGDP*) are negative.

Equation (3) has been estimated using the two variations of the independent variable shadow economy: The first one uses the simulations on the size of the shadow economy calculated from the regression results of the first model (variable: currency demand per

capita) and the second variation uses the estimations from model 2, based on the ratio of cash holdings to checkable deposits.[34]

## 5.2. ***Econometric results***

The results are shown in Table (6) below. The estimated coefficients, in general, show the expected signs. Domestic and foreign direct investments, the exchange rate and average schooling (significant only in model 2) have a statistically highly significant positive effect on economic growth which is in line with economic growth theory. Also the coefficient on the participation rate on the labour market has the expected positive sign but without statistical significance in neither model. The price level has the expected significant negative effect on economic growth. Also governmental consumption comes up with the expected negative coefficient, but only in model 1 and without any statistic significance in neither model. The lagged endogenous variable and total population enter with the wrong sign. However, only the negative sign for the variable population is statistically significant on a high level. An explanation for the statistically significant "wrong" sign for this variable could be that Colombia has been suffering from overpopulation and a growth rate which is considered too high.

insert table 6

[34] As the GDP per capita enters in the regression model for estimating the size of the shadow economy and then also appears in the model for calculating its influence on economic growth there is some risk of simultaneity. However, due to the fact that the size of the shadow economy does not directly depend on GDP but needs to be calculated through a simulation process, we do not deal with pure simultaneous equations here.

For the most interesting explanatory variable in our study, the shadow economy, the regression results show a statistically highly significant, although quantitatively moderate, negative influence on GDP growth: A one percent increase in the size of the shadow economy (measured in percent of GDP), leads to a fall of the growth rate of real GDP per capita by around 0.1 percentage points, ceteris paribus.[35]

### 5.3. *Simulations on the relative and absolute influence of the shadow economy on economic growth*

Finally, we empirically determine the relative and absolute influence of the shadow economy for each year of our investigation; i.e. from 1980 to 2012. Applying a dynamic simulation, the difference between the official and the theoretical growth of real GDP per capita (the theoretical growth rate is corrected for the influence of the shadow economy) can be calculated: Multiplying the yearly variation of the estimated size of the shadow economy with its regression coefficient provides the concrete influence of the shadow economy on GDP growth for each year in percentage points. Taking these values one can easily calculate the absolute effects of the informal economy on economic growth. The corresponding simulation results are shown in appendix D.

While the yearly growth rate of real GDP per capita varies between -5.41 and +5.63 % or -222 and +280 USD, the relative and absolute influences on growth by shadow economic activity lie between -0.99 and +0.77 percentage points and -40 and +30 USD respectively. which shows a moderate but still important effect of underground activity on economic

[35] In this point all our models, also the 2 variations including drug business, are consistent, showing a statistically highly significant negative influence of the shadow economy on real GDP growth.

growth. To sum up, for the period under consideration in total, GDP growth would have been slightly higher when correcting for unregistered activity: average published growth of real GDP p. c. was 1,86 %, without influence of the shadow economy it would have been in a range between 1,96 % and 2,01 %, yearly average during 1980 and 2012.

insert Figure 4

## 6. Summary and conclusion

Applying the currency demand approach, the first major finding of our paper is the large size of the shadow economy in Colombia, over the period from 1980 to 2012. The two models give an estimation of the size of the shadow economy over the whole period under consideration of around 45 % of GDP. Model 1, based on cash demand per capita, shows higher values up to more than 55 % for the 80s until the mid-90s and then a decreasing trend until present. The estimations based on the second model specified based on the ratio of cash holdings to checkable deposits draws an increasing trend until the start of the new millennium and keeping a high level of shadow economic activity from then onwards. Both models indicate a short increase of the shadow economy during the recent financial crisis in 2009.

Our empirical analysis of the main causes for underground activities shows that taxation, especially indirect taxation, has a great effect on the growth of the shadow economy, on the other side we also find a considerable influence caused by unemployment and the intensity of regulation. Our brief investigation of the effect of business crime on cash demand was

difficult because of poor data quality. However, the results are consistent in confirming the expected positive influence on cash demand.

Our second major finding is the negative effect of the shadow economy on economic growth in Colombia. Our results demonstrate a clear negative relation between the size of the shadow economy and the growth rates of real GDP per capita: The average growth rate of real GDP per capita between 1980 and 2012 is 1.86 %, without illicit activity the real economy would have grown between 1,96 % and 2,01 % on a yearly average during the period under consideration.

Considering these two major findings we draw the following two conclusions:

(1) Our econometric estimates provide the clear result of a negative effect of the shadow economy on "official" economic growth. Although this influence is only moderate, it shows that there are still great latent potentials and productivities in the shadow economy which can not be (fully) used due to the generally low productivity of the shadow economic activities and restrictions on human and financial capital resources. This may be one of the reasons why Colombia keeps being classified as a developing country and why its economic standard is still relatively low compared to western industrialized OECD nations. Colombia's government is aware about these lost potentials by not using these underground productivities and has already implemented various programs to integrate the shadow economy in the official economy. We think it is reasonable to follow this strategy to benefit more from the shadow economic potentials.[36]

[36] For a further discussion of integration strategies see Tokman (2006) and Lubell (1991).

(2) Moreover, Colombia was one of the first countries, where the government actively began dealing with the problems and potentials of shadow economic activities. Already from the beginning of the 70s, Colombia's government has not only implemented strategies to integrate the shadow economy but also programs were set up to aim at the reduction of shadow economic activities. Unfortunately, these programs have not been of great success, mainly due to a lack of a long-term strategy and too little coordination of different programs.[37] One suggestion for a better coordination of the various programs dealing with the shadow economy could be the so-called "two-pillar strategy" which is an all-embracing approach on a macroeconomic basis aiming at a slow-down or reduction in shadow economic activities.[38]

[37] See for example O'Grady (2006) for a discussion of continuous drawbacks in taxation policy and Gracia/ Urdinola (2000) for a debate on changes in labour market regulations.
[38] For a detailed explanation of the two-pillar strategy consult Schneider/Enste (2002).

## Appendix A: Currency demand approach

The currency demand approach was first used by Cagan (1958), who considered the correlation between the demand of currency and tax pressure (as one cause of the shadow economy) for the United States over the period 1919-1955. Twenty years later, Gutmann (1977) used the same approach but without any statistical procedures. Cagan's approach was further developed by Tanzi (1980, 1983), who econometrically estimated a currency demand function for the United States over the period 1929 to 1980 in order to calculate the size of the shadow economy. His approach assumes that shadow (or hidden) transactions are undertaken in the form of cash payments, so as to leave no observable traces for the authorities. An increase in the size of the shadow economy will therefore increase the demand for currency. To isolate the resulting excess demand for currency, an equation for currency demand is econometrically estimated over time. All conventional possible factors, such as the development of income, payment habits, interest rates, and so on, are controlled for. Additionally, such variables as the direct and indirect tax burden and government regulation, which are assumed to be the major factors causing people to work in the shadow economy, are included in the estimation equation. The basic regression equation for the currency demand, proposed by Tanzi (1983), is the following:

$$\ln(C/M_2)_t = \beta_0 + \beta_1 \ln(1+TW)_t + \beta_2 \ln(WS/Y)_t + \beta_3 \ln R_t + \beta_4 \ln(Y/N)_t + u_t$$

with $\beta_1>0$, $\beta_2>0$, $\beta_3<0$, $\beta_4>0$ where *ln* denotes natural logarithms. $C/M_2$ is the ratio of cash holdings to current and deposit accounts, *TW* is a weighted average tax rate (to proxy changes in the size of the shadow economy), *WS/Y* is a proportion of wages and salaries in national income (to capture changing payment and money holding patterns), *R* is the interest paid on savings

deposits (to capture the opportunity cost of holding cash) and *Y/N* is the per capita income.[39] Any "excess" increase in currency, or the amount unexplained by the conventional or normal factors is then attributed to the rising tax burden and the other reasons leading people to work in the shadow economy. Figures for the size and development of the shadow economy can be calculated in a first step by comparing the difference between the development of currency when the direct and indirect tax burden and government regulation are held at lowest values, and the development of currency with the current (higher) burden of taxation and government regulation. Assuming in a second step the same income velocity for currency used in the shadow economy as for legal M1 in the official economy, the size of the shadow can be computed and compared to the official GDP. This is one of the most commonly used approaches. It has been applied to many OECD countries[40] but has nevertheless been criticized on various grounds.[41] The most commonly raised objections to this method are: (1) Not all transactions in the shadow economy are paid in cash. Isachsen and Strom (1985) used the survey method to find out that in Norway, in 1980, roughly 80 % of all transactions in the hidden sector were paid in cash. The size of the total shadow economy (including barter) may thus be even larger than previously estimated. (2) Most studies consider only one particular factor, the tax burden, as a cause of the shadow economy. But others (such as the impact of regulation, taxpayers' attitudes toward the state, tax morality and so on) are not considered, because reliable data for most countries is not available. If, as seems likely, these other factors also have an impact on the extent of the hidden economy, it might again be higher than reported in most studies.[42] (3) As discussed by Garcia (1978), Park (1979) and Feige

[39] The estimation of such a currency demand equation has been criticized by Thomas (1999) but part of this criticism has been considered by the work of Giles (1999a,b) and Bhattacharyya (1999), who both use the latest economic techniques.
[40] See Karmann (1986, 1990), Schneider (1997, 1998a), Johnson et al. (1998a), and Williams and Windebank (1995).
[41] See Thomas (1992, 1999), Feige (1986), Pozo (1996), Pedersen (2003) and Ahumada et al. (2004).
[42] One (weak) justification for the only use of the tax variable is that this variable has by far the strongest impact on the size of the shadow economy in the studies known to the authors. The only exception is the study by Frey and

(1996), increases in currency demand deposits are due largely to a slowdown in demand deposits rather than to an increase in currency caused by activities in the shadow economy, at least in the case of the United States. (4) Blades (1982) and Feige (1986, 1996) criticize Tanzi's studies on the grounds that the US dollar is used as an international currency so that Tanzi should have considered (and controlled for) the presence of US dollars, which are used as an international currency and held in cash abroad.[43] Frey and Pommerehne (1984) and Thomas (1986, 1992, 1999) claim that Tanzi's parameter estimates are not very stable.[44] (5) Most studies assume the same velocity of money in official and shadow economies. As argued by Hill and Kabir (1996) for Canada and by Klovland (1984) for the Scandinavian countries, there is considerable uncertainty about the velocity of money in the official economy, and the velocity of money in the hidden sector is even more difficult to estimate. Without knowledge about the velocity of currency in the shadow economy, one has to accept the assumption of an equal money velocity in both sectors. (6) Ahumada et al. (2004) show that the currency approach together with the assumption of equal income velocity of money in the reported and the hidden transaction is only correct if the income elasticity is 1 and suggest a correction method for that cases where the income elasticity does not equal 1.[45] (7) Finally, the assumption of no shadow economy in a base

---

Weck-Hannemann (1984) where the variable "tax immorality" has a quantitatively larger and statistically stronger influence than the direct tax share in the model approach. In the study of Pommerehne and Schneider (1985) for the US, besides various tax measures, data for regulation, tax immorality, minimum wage rates are available, the tax variable has a dominating influence and contributes roughly 60-70 % to the size of the shadow economy. See also Zilberfarb (1986).

[43] Another study by Tanzi (1982, esp. pp. 110-113) explicitely deals with this criticism. A very careful investigation of the amount of US dollars used abroad and US currency used in the shadow economy and for "classical" crime activities has been undertaken by Rogoff (1998), who concludes that large denomination bills are a major driving force for the growth of the shadow economy and classical crime activities, due largely to reduced transactions costs.

[44] However in studies for European countries Kirchgässner (1983, 1984) and Schneider (1986) conclude that the estimation results for Germany, Denmark, Norway and Sweden are quite robust when using the currency demand method. Hill and Kabir (1996) find for Canada that the rise of the shadow economy varies with respect to the tax variable used; they conclude "when the theoretically best tax rates are selected and a range of plausible velocity values is used, this method estimates underground economic growth between 1964 and 1995 at between 3 % and 11 % of GDP." (p. 1553).

[45] Ahumada, Alvaredo, Canavese (2007)

year is open to criticism. Relaxing this assumption would again imply an upward adjustment of the size of the shadow economy.

## Appendix B: Detailed description of the used variables

insert table 7

## Appendix C: Comparing the Colombian shadow economy with other Middle and South American countries

insert table 8

## Appendix D: Detailed simulation results on the yearly absolute and relative influence of the shadow economy on economic growth, 1980 – 2012

insert table 9

## TABLES

**Table (1): A taxonomy of types of underground economic activities**

| monetary transactions | | non-monetary transactions | |
|---|---|---|---|
| ***illegal activities*** | | | |
| • trade with stolen goods<br>• drug dealing and manufacturing<br>• prostitution<br>• gambling<br>• smuggling<br>• fraud<br>• etc. | | • barter of drugs, stolen goods, smuggling, etc.<br>• producing or growing drugs for own use<br>• theft for own use | |
| ***legal activities*** | | | |
| ***tax evasion*** | ***tax avoidance*** | ***tax evasion*** | ***tax avoidance*** |
| • unreported income from self-employment<br>• wages, salaries and assets from unreported work related to legal services and goods | • employee discounts, fringe benefits | • barter of legal services and goods | • all do-it-yourself work and neighbour help |

*Source: Structure of the table is taken from Lippert and Walker (1997, p. 5) with additional own remarks.*

**Table (2): Interactions between the shadow and the official economy**

| The shadow economy influences | through | Effects on official economy and overall economic performance |
|---|---|---|
| **Tax system** | *tax evasion* | Redestribution policies to finance qualitative and quantitative improvement of public goods are impaired, thus economic growth may be negatively affected (Schneider (2005)). |
| | *additional tax revenues* | If the shadow economic activity is complementary to the official economy, extra income is generated via the shadow economy which is then (at least partly) spent in the official economy for goods and services (Schneider (2005)). |
| **Allocations** | *stronger competition and stimulation of markets* | more efficient use of scarce ressources (Schneider 2003a) |
| | | incentives for firms and individuals, stimulation of creativity and innovation |
| | | enlargement of market supply through additional goods and services |
| | | cost advantages of producers acting from the shadow economy may lead to ruinous competition |
| | | problems in information flows for producers and consumers due to reduction in transparency and lack of structure in inofficial sector |
| **Policy decisions** | *bias in officially published data* | stabilizing, redistributional and fiscal policies may fail desired effects* |

** For a more detailed discussion on outcomes of economic policy based on biased data compare Feige and McGee (1998), Mc Gee (1989), Schneider and Enste (2002), Fleming, Roman and Farrell (2000).*

**Table (3): Regression results using the currency demand method.**

| ARIMA regression<br>Sample: 1980 to 2012 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Model 1: CDC (ln)** | | | | **Model 2: CD (ln)** | | | |
| | Coef. | Semi-robust Std. Err. | z | P>\|z\| | Coef. | Semi-robust Std. Err. | z | P>\|z\| |
| *GDPPCR* (ln) | 3.5829 | 0.1267 | 28.27 | 0.000 | -0.2472 | 0.0639 | -3.87 | 0.000 |
| *IRD* | -1.1228 | 0.3339 | -3.36 | 0.001 | 0.2872 | 0.2699 | 1.06 | 0.287 |
| *ER* (ln) | 0.4697 | 0.0181 | 26.02 | 0.000 | 0.0990 | 0.0577 | 1.72 | 0.086 |
| *TY* | 0.3086 | 1.1191 | 0.28 | 0.783 | 0.8082 | 1.2729 | 0.63 | 0.525 |
| *TC* | 3.8275 | 0.9600 | 3.99 | 0.000 | 2.4786 | 1.4838 | 1.67 | 0.095 |
| *UNEMP* | 1.2748 | 0.5100 | 2.50 | 0.012 | 2.2331 | 0.7187 | 3.11 | 0.002 |
| *EPE* | 1.4261 | 2.3481 | 6.07 | 0.000 | 3.0064 | 1.7860 | 1.68 | 0.092 |
| *LAW* (ln) | 0.1564 | 0.0341 | 4.58 | 0.000 | -0.0085 | 0.0187 | -0.45 | 0.651 |
| constant term | -26.8766 | 1.0885 | -24.69 | 0.000 | | | | |
| ARMA | | | | | | | | |
| ar L1 | -0.5842 | 0.1833 | -3.19 | 0.001 | 0.9323 | 0.1225 | 7.61 | 0.000 |
| ar L2 | -0.3541 | 0.1841 | -1.92 | 0.054 | | | | |
| *Misspecification and Diagnostic Testing* | | | | | | | | |
| Augm. DF test on exog. variables | | | DF = -4.949 | | p = 0.000 | DF = -2.298 p = 0.0012 | | |
| Autocorrelations CDC (ln) | | | | | | | | |
| to lag 1 | | to lag 1 | 0.9174 | sign. at 5% | | 0.9340 | sign. at 5% | |
| to lag 2 | | to lag 2 | 0.8327 | sign. at 5% | | 0.8675 | sign. at 5% | |
| Partial Autocorrelations CDC (ln) | | | | | | | | |
| to lag 1 | | to lag 1 | 0.9774 | sign. at 5% | | 0.9717 | sign. at 5% | |
| to lag 2 | | to lag 2 | -0.3719 | sign. at 5% | | 0.0070 | insign. at 5% | |
| to lag 3 | | to lag 3 | -0.2337 | insign. at 5% | | | | |

*Source: Own calculations.*

**Table (4): Regression results for alternative models using total direct tax revenues in % of GDP as explanatory variable (tygdp) instead of net effective income tax rate (ty)**

| ARIMA regression<br>Sample: 1980 to 2012 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **variant of Model 1: CDC (ln)** | | | | **variant of Model 2: CD (ln)** | | | |
| | Coef. | Semi-robust Std. Err. | z | P>\|z\| | Coef. | Semi-robust Std. Err. | z | P>\|z\| |
| *GDPPCR* (ln) | 3.5238 | 0.0978 | 36.04 | 0.000 | -0.2554 | 0.05565 | -4.59 | 0.000 |
| *IRD* | -0.7707 | 0.2531 | -3.05 | 0.002 | 0.2542 | 0.32645 | 0.78 | 0.436 |
| *ER* (ln) | 0.4573 | 0.0179 | 25.48 | 0.000 | 0.0881 | 0.04033 | 2.18 | 0.029 |
| *TYGDP* | 3.1799 | 2.1683 | 1.47 | 0.143 | 4.6875 | 2.70839 | 1.73 | 0.083 |
| *TC* | 4.7711 | 0.8490 | 5.62 | 0.000 | 3.5032 | 2.00866 | 1.74 | 0.081 |
| *UNEMP* | 1.8646 | 0.5772 | 3.23 | 0.001 | 2.9351 | 0.98586 | 2.98 | 0.003 |
| *EPE* | 14.8237 | 1.1329 | 13.08 | 0.000 | 2.5006 | 1.80125 | 1.39 | 0.165 |
| *LAW* (ln) | 0.1643 | 0.0286 | 5.75 | 0.000 | -0.0108 | 0.01909 | -0.57 | 0.570 |
| constant term | -26.6919 | 0.8444 | -31.61 | 0.000 | | | | |
| ARMA | | | | | | | | |
| ar L1 | -0.6493 | 0.1506 | -4.31 | 0.000 | 0.8883 | 0.24828 | 3.58 | 0.000 |
| ar L2 | -0.4387 | 0.1344 | -3.26 | 0.001 | | | | |
| *Misspecification and Diagnostic Testing* | | | | | | | | |
| Augm. DF test on exog. variables | | | DF = -4.949 | | p = 0.000 | DF = -2.298 p = 0.0012 | | |
| Autocorrelations CDC (ln) | | | | | | | | |
| to lag 1 | | to lag 1 | 0.9174 | sign. at 5% | | 0.9340 | sign. at 5% | |
| to lag 2 | | to lag 2 | 0.8327 | sign. at 5% | | 0.8675 | sign. at 5% | |
| Partial Autocorrelations CDC (ln) | | | | | | | | |
| to lag 1 | | to lag 1 | 0.9774 | sign. at 5% | | 0.9717 | sign. at 5% | |
| to lag 2 | | to lag 2 | -0.3719 | sign. at 5% | | 0.0070 | insign. at 5% | |
| to lag 3 | | to lag 3 | -0.2337 | insign. at 5% | | | | |

*Source: Own calculations.*

**Table (5): Regression results including drug business (*lnACC, lnCOC*).**

| | ARIMA regression Sample: 1980 to 2012 | | | | ARIMA regression Sample: 1992 to 2010 | | | |
|---|---|---|---|---|---|---|---|---|
| | **variant 1 of Model 1: CDC (ln)** | | | | **variant 2 of Model 1: CDC (ln)** | | | |
| | Coef. | Semi-robust Std. Err. | z | P>\|z\| | Coef. | Semi-robust Std. Err. | z | P>\|z\| |
| *GDPPCR* (ln) | 3.5681 | 0.1379 | 25.87 | 0.000 | 4.4123 | 0.08183 | 53.920 | 0.000 |
| *IRD* | -1.1851 | 0.3212 | -3.69 | 0.000 | -1.6855 | 0.19937 | -8.450 | 0.000 |
| *ER* (ln) | 0.4601 | 0.0325 | 14.16 | 0.000 | 0.7253 | 0.03394 | 21.370 | 0.000 |
| *TY [var2: TGDP]* | 0.2916 | 1.1433 | 0.26 | 0.799 | 0.5146 | 0.79476 | 0.650 | 0.517 |
| *TC* | 3.7431 | 0.9214 | 4.06 | 0.000 | | | | |
| *UNEMP* | 1.0849 | 0.7062 | 1.54 | 0.124 | 0.2306 | 0.48587 | 0.470 | 0.635 |
| *EPE* | 1.4253 | 2.3528 | 6.06 | 0.000 | 0.8790 | 1.50222 | 0.590 | 0.558 |
| *LAW* (ln) | 0.1487 | 0.0369 | 4.03 | 0.000 | -0.0143 | 0.05366 | -0.270 | 0.790 |
| *ACC* (ln) [var2: *COC* (ln)] | 0.0152 | 0.0397 | 0.38 | 0.702 | 0.1298 | 0.03280 | 3.960 | 0.000 |
| constant term | -26.7408 | 1.1721 | -22.81 | 0.000 | -33.5448 | 1.01007 | -33.210 | 0.000 |
| ARMA | | | | | | | | |
| ar L1 | -0.5788 | 0.1856 | -3.12 | 0.002 | -0.5234 | 0.15669 | -3.340 | 0.001 |
| ar L2 | -0.3510 | 0.1865 | -1.88 | 0.060 | -0.8641 | 0.08283 | -10.430 | 0.000 |

*Source: Own calculations.*

**Table (6): Empirical results estimating the effect of the shadow economy on economic growth in Colombia, 1980-2012.**

| | **Model 1: basis CDC (ln)** | | | | **Model 2: basis CD (ln)** | | | |
|---|---|---|---|---|---|---|---|---|
| | Coef. | Robust Std. Err. | t | P>\|z\| | Coef. | Robust Std. Err. | z | P>\|z\| |
| *GDPPC* (ln) t-1 | -0.2372409 | 0.1550506 | -1.53 | 0.140 | -0.32872 | 0.2085533 | -1.58 | 0.129 |
| *CPI* (ln) | -0.121479 | 0.0321642 | -3.78 | 0.001 | -0.13722 | 0.0401556 | -3.42 | 0.002 |
| *ER* (ln) | 0.1041126 | 0.025722 | 4.05 | 0.001 | 0.114455 | 0.0343871 | 3.33 | 0.003 |
| *DI* (ln) | 0.0975495 | 0.0240059 | 4.06 | 0.001 | 0.089774 | 0.0283613 | 3.17 | 0.004 |
| *FDI* (ln) | 0.0242486 | 0.0044637 | 5.43 | 0.000 | 0.033076 | 0.0074485 | 4.44 | 0.000 |
| *POP* (ln) | -0.1657704 | 0.0494601 | -3.35 | 0.003 | -0.20393 | 0.0604043 | -3.38 | 0.003 |
| *SPC* (ln) | 0.1581529 | 0.2002552 | 0.79 | 0.438 | 0.364556 | 0.1669523 | 2.18 | 0.040 |
| *LPA* (ln) | 0.1048016 | 0.1170683 | 0.9 | 0.380 | 0.078328 | 0.1005298 | 0.78 | 0.444 |
| *PCGDP* (ln) | -0.0151475 | 0.0344171 | -0.44 | 0.664 | 0.001606 | 0.032544 | 0.05 | 0.961 |
| *SECDC/SECD* (ln) | -0.0719529 | 0.03028 | -2.38 | 0.027 | -0.10768 | 0.0481161 | -2.24 | 0.036 |

*Source: Own calculations. See appendix B.3 for a more detailed listing of the regression results.*

**Table (7): Description of the variables used in the discussed regression models**

| Variable | | Obs | Mean | Std. Dev. | Min | Max | source |
|---|---|---|---|---|---|---|---|
| name | label | | | | | | |
| CDC | currency demand per capita in COP (Colombian Pesos) | 33 | 163,279.40 | 198,866.80 | 1,759.71 | 1,759.71 | [2], [5] |
| CD | ratio of cash holdings to checkable deposits | 33 | 0.6604 | 0.2289 | 0.3944 | 1.0005 | [2], [5], o.c. |
| GDPPC | real GDP per capita in COP, Base Year: 2005 | 33 | 7,136.59 | 1,330.59 | 5,379.49 | 10,106.59 | [4], [8] |
| IRD | yearly average interest rate on deposits at 90 days sight | 33 | 0.2268 | 0.1302 | 0.0368 | 0.4006 | [2], [5] |
| ER | yearly average market exchange rate COP/USD | 33 | 1219.006 | 926.8126 | 47.57167 | 2,875.05 | [2] |
| TY | average effective net tax rate on income | 33 | 0.2679 | 0.0464 | 0.2021 | 0.3255 | [1], [4], [9], o.c. |
| TC | average effective net tax rate on consumption | 33 | 0.1410 | 0.0256 | 0.0932 | 0.1748 | [1], [4], [9], o.c. |
| TGDP | Total tax revenues in % of GDP | 33 | 0.0733 | 0.0269 | 0.0333 | 0.1221 | [2], [5], [7] |
| UNEMP | unemployment rate | 33 | 0.1139 | 0.0239 | 0.0700 | 0.1670 | [3], [4] |
| EPE | real expenditures for public employees in % of GDP | 33 | 0.0939 | 0.0305 | 0.0496 | 0.1409 | [2], [4], [5] |
| LAW | new laws enforced per year | 33 | 726 | 195 | 123 | 1186 | [2] |
| GGDPPC | yearly growth of real GDP per capita in % | 33 | 0.0186 | 0.0227 | -0.0541 | 0.0563 | [4], [8] |
| CPI | consumer price index, base: Dec. 1998 | 33 | 85.05 | 74.56 | 2.25 | 213.16 | [2], [8] |
| DI | real capital investment, Mio COP, Base Year: 1998 | 33 | 37,592.45 | 14,945.78 | 19,922.64 | 72,440.20 | [5], [8] |
| FDI | foreign direct investment, Mio USD | 33 | 3,467.04 | 4,191.54 | 157.14 | 15,822.94 | [6] |
| SPC | average years of schooling per capita | 33 | 6.77 | 0.92 | 5.25 | 8.09 | [5], [10] |
| LPA | participation rate on labour market | 33 | 0.5894 | 0.0291 | 0.5220 | 0.6366 | [3], [4], [11] |
| POP | Colombian total population, 1.000 Pers. | 33 | 3.770E+04 | 5.574E+03 | 2.845E+04 | 4.660E+04 | [5], [8] |
| PCGDP | public spending on consumption in % of nominal GDP | 33 | 0.1297 | 0.0374 | 0.0826 | 0.1838 | [4], [5], o.c. |
| ACC | Area used for coca cultivation (hectares) | 33 | 60.906 | 42.765 | 1.400 | 166.875 | [1], [12] |
| COC | Production potential of coca valued at actual market price (Mio. USD) | 18 | 1,537 | 1,040 | 84 | 2,944 | [12] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECDC | size of shadow economy in % of real GDP (estimation results model 1) | 33 | 0.4454 | 0.0511 | 0.3581 | 0.5646 | o.c. |
| SECD | size of shadow economy in % of real GDP (estimation results model 2) | 33 | 0.4177 | 0.0721 | 0.2729 | 0.5358 | o.c. |

*Souces: see numbers in listing of empirical sources; o. c. = own calculations.*

**Table (8): The Size of the Shadow Economy in 21 Central and South American Countries[1)]** ***(in % of official GDP)***

| | | **Shadow Economy using the MIMIC and Currency Demand Method** | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Country** | **1999/00** | **2001/02** | **2002/03** | **2003/04** | **2004/05** |
| 1 | Argentina | 25.4 | 27.1 | 28.9 | 28.6 | 27.2 |
| 2 | Bolivia | 67.1 | 68.1 | 68.3 | 68.0 | 67.2 |
| 3 | Brazil | 39.8 | 40.9 | 42.3 | 42.6 | 41.8 |
| 4 | Chile | 19.8 | 20.3 | 20.9 | 20.3 | 19.4 |
| 5 | Colombia | 39.1 | 41.3 | 43.4 | 43.0 | 42.7 |
| 6 | Costa Rica | 26.2 | 27.0 | 27.8 | 27.1 | 26.3 |
| 7 | Dominican Republic | 32.1 | 33.4 | 34.1 | 34.4 | 34.8 |
| 8 | Ecuador | 34.4 | 35.1 | 36.7 | 36.1 | 35.2 |
| 9 | El Salvador | 46.3 | 47.1 | 48.3 | 48.1 | 47.2 |
| 10 | Guatemala | 51.5 | 51.9 | 52.4 | 51.1 | 50.3 |
| 11 | Haiti | 55.4 | 57.1 | 58.6 | 59.3 | 59.6 |
| 12 | Honduras | 49.6 | 50.8 | 51.6 | 50.8 | 49.3 |
| 13 | Jamaica | 36.4 | 37.8 | 38.9 | 39.2 | 38.4 |
| 14 | Mexico | 30.1 | 31.8 | 33.2 | 32.6 | 31.7 |
| 15 | Nicaragua | 45.2 | 46.9 | 48.2 | 48.8 | 48.1 |
| 16 | Panama | 64.1 | 65.1 | 65.3 | 64.1 | 62.2 |
| 17 | Paraguay | 27.4 | 29.2 | 31.4 | 32.4 | 33.1 |
| 18 | Peru | 59.9 | 60.3 | 60.9 | 59.1 | 58.2 |
| 19 | Puerto Rico | 28.4 | 29.4 | 30.7 | 29.6 | 28.2 |
| 20 | Uruguay | 51.1 | 51.4 | 51.9 | 50.8 | 49.2 |
| 21 | Venezuela, RB | 33.6 | 35.1 | 36.7 | 36.1 | 35.4 |
| **Unweighted Average** | | **41.1** | **42.2** | **43.4** | **43.0** | **42.2** |

*1) Calculations are done using the MIMIC method. Source: Schneider (2007).*

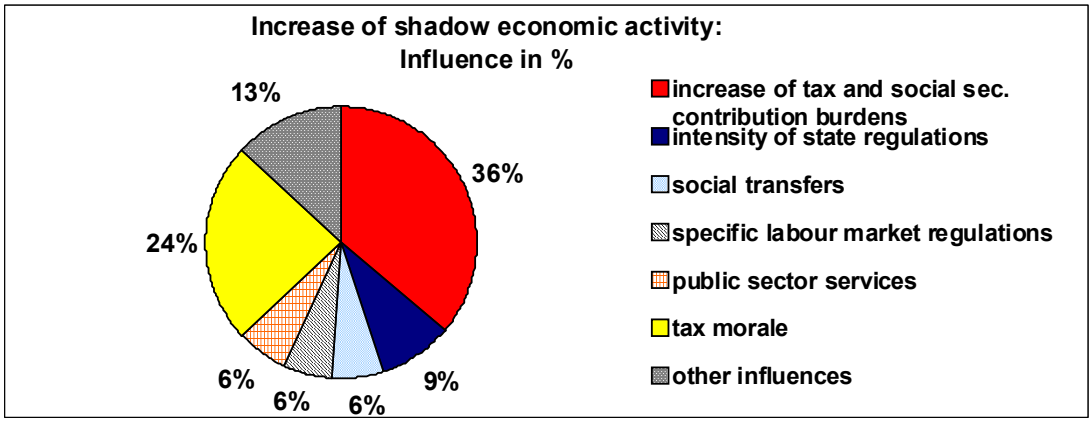
**Table (9): Detailed simulation results, 1980 – 2012**

| Year | size of the shadow economy | | relative influence of the shadow economy on growth of GDP p.c. (percentage points) | | GDP per capita | | | absolute influence of the shadow economy on growth of GDP per capita (USD) | |
|---|---|---|---|---|---|---|---|---|---|
| | based on cash demand per capita | based on ratio of cash holdings to cd | based on cash demand per capita | based on ratio of cash holdings to cd | yearly variation | real in USD | real growth of GDP p.c. in USD | based on cash demand per capita | based on ratio of cash holdings to c.d. |
| | | | estimated coefficients | | | | | | |
| 1980 | 38.40% | 34.27% | **-0.07195** | **-0.1077** | -1.16% | 3045.15 | | | |
| 1981 | 35.81% | 27.29% | 0.19% | 0.75% | 0.05% | 3046.69 | 1.54 | 5.67 | 22.90 |
| 1982 | 46.43% | 30.33% | -0.76% | -0.33% | -1.22% | 3009.56 | -37.13 | -23.28 | -9.98 |
| 1983 | 46.93% | 36.49% | -0.04% | -0.66% | -0.57% | 2992.28 | -17.27 | -1.09 | -19.97 |
| 1984 | 46.33% | 32.57% | 0.04% | 0.42% | 1.20% | 3028.31 | 36.03 | 1.31 | 12.64 |
| 1985 | 46.87% | 34.32% | -0.04% | -0.19% | 3.81% | 3143.70 | 115.39 | -1.19 | -5.70 |
| 1986 | 48.93% | 38.89% | -0.15% | -0.49% | 3.67% | 3259.16 | 115.46 | -4.65 | -15.47 |
| 1987 | 56.46% | 33.26% | -0.54% | 0.61% | 3.21% | 3363.62 | 104.46 | -17.67 | 19.76 |
| 1988 | 52.42% | 32.21% | 0.29% | 0.11% | 1.93% | 3428.53 | 64.91 | 9.78 | 3.79 |
| 1989 | 50.71% | 34.56% | 0.12% | -0.25% | 1.31% | 3473.60 | 45.07 | 4.23 | -8.67 |
| 1990 | 45.94% | 36.78% | 0.34% | -0.24% | 2.20% | 3549.94 | 76.35 | 11.90 | -8.30 |
| 1991 | 46.56% | 35.39% | -0.04% | 0.15% | 0.29% | 3560.18 | 10.23 | -1.58 | 5.31 |
| 1992 | 50.41% | 38.07% | -0.28% | -0.29% | 2.31% | 3642.38 | 82.21 | -9.85 | -10.29 |
| 1993 | 49.68% | 35.92% | 0.05% | 0.23% | 3.73% | 3778.27 | 135.89 | 1.91 | 8.45 |
| 1994 | 52.49% | 43.67% | -0.20% | -0.84% | 3.28% | 3902.16 | 123.89 | -7.65 | -31.57 |
| 1995 | 45.56% | 38.89% | 0.50% | 0.51% | 3.44% | 4036.51 | 134.35 | 19.45 | 20.09 |
| 1996 | 45.79% | 48.11% | -0.02% | -0.99% | 0.42% | 4053.54 | 17.03 | -0.65 | -40.08 |
| 1997 | 49.74% | 46.88% | -0.28% | 0.13% | 2.09% | 4138.28 | 84.74 | -11.54 | 5.39 |
| 1998 | 46.40% | 46.12% | 0.24% | 0.08% | -0.97% | 4098.16 | -40.12 | 9.95 | 3.37 |
| 1999 | 45.04% | 44.77% | 0.10% | 0.15% | -5.41% | 3876.43 | -221.73 | 4.02 | 5.98 |
| 2000 | 42.96% | 53.58% | 0.15% | -0.95% | 1.44% | 3932.16 | 55.73 | 5.79 | -36.81 |
| 2001 | 42.93% | 46.40% | 0.00% | 0.77% | 0.37% | 3946.80 | 14.64 | 0.10 | 30.41 |
| 2002 | 41.26% | 50.46% | 0.12% | -0.44% | 1.21% | 3994.62 | 47.82 | 4.75 | -17.26 |
| 2003 | 41.59% | 47.22% | -0.02% | 0.35% | 2.63% | 4099.56 | 104.94 | -0.95 | 13.96 |
| 2004 | 38.98% | 45.25% | 0.19% | 0.21% | 4.04% | 4265.09 | 165.53 | 7.69 | 8.67 |
| 2005 | 39.34% | 47.90% | -0.03% | -0.28% | 3.43% | 4411.58 | 146.49 | -1.09 | -12.15 |
| 2006 | 40.00% | 46.50% | -0.05% | 0.15% | 5.43% | 4651.09 | 239.51 | -2.10 | 6.62 |
| 2007 | 38.98% | 46.09% | 0.07% | 0.04% | 5.63% | 4913.07 | 261.98 | 3.40 | 2.08 |
| 2008 | 36.49% | 47.90% | 0.18% | -0.19% | 2.33% | 5027.36 | 114.28 | 8.82 | -9.57 |
| 2009 | 41.42% | 52.86% | -0.36% | -0.53% | 0.46% | 5050.39 | 23.04 | -17.85 | -26.84 |
| 2010 | 39.88% | 48.75% | 0.11% | 0.44% | 2.75% | 5189.38 | 138.98 | 5.61 | 22.32 |
| 2011 | 39.47% | 48.11% | 0.03% | 0.07% | 5.39% | 5469.33 | 279.96 | 1.54 | 3.56 |
| 2012 | 39.66% | 48.62% | -0.01% | -0.05% | 2.79% | 5621.69 | 152.36 | -0.77 | -2.95 |
| | | **MIN** | **-0.76%** | **-0.99%** | | | | | |
| | | **MAX** | **0.50%** | **0.77%** | | | | | |
| | | **AVERAGE** | **-0.01%** | **-0.07%** | | | | | |

*Source: Own calculations.*

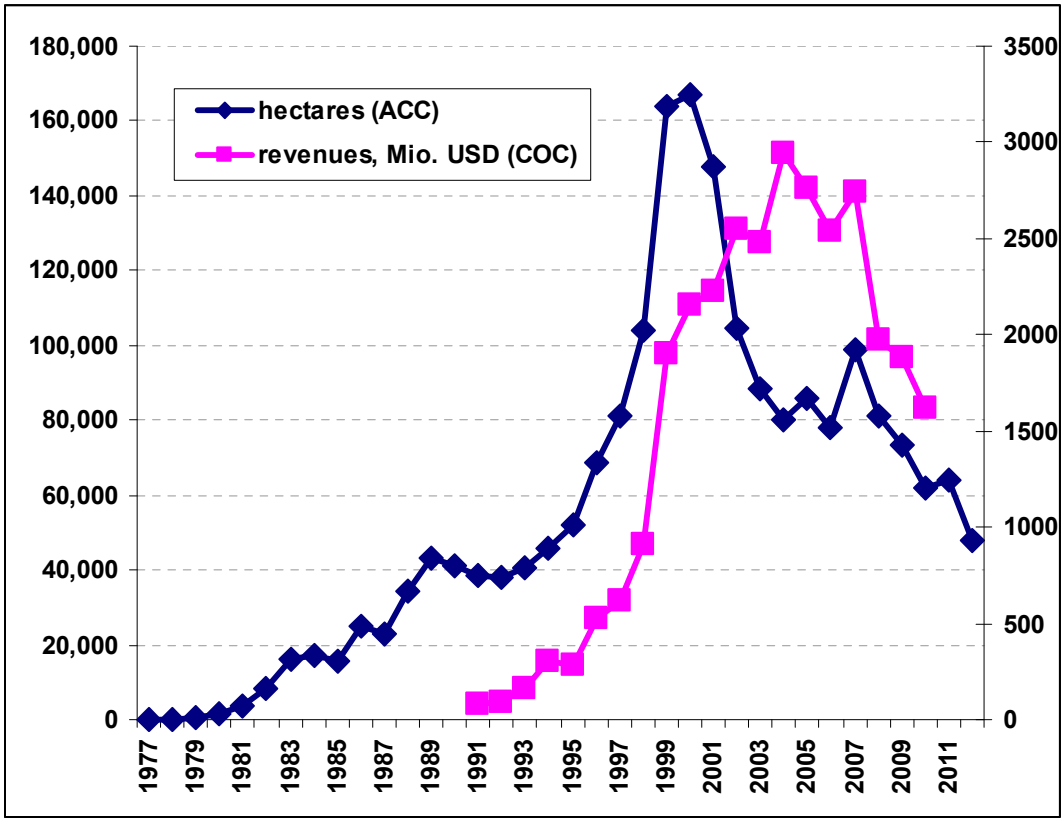
**FIGURES**

**Figure (1): Main causes for the increase of shadow economic activities.**
***(Influence in %)***



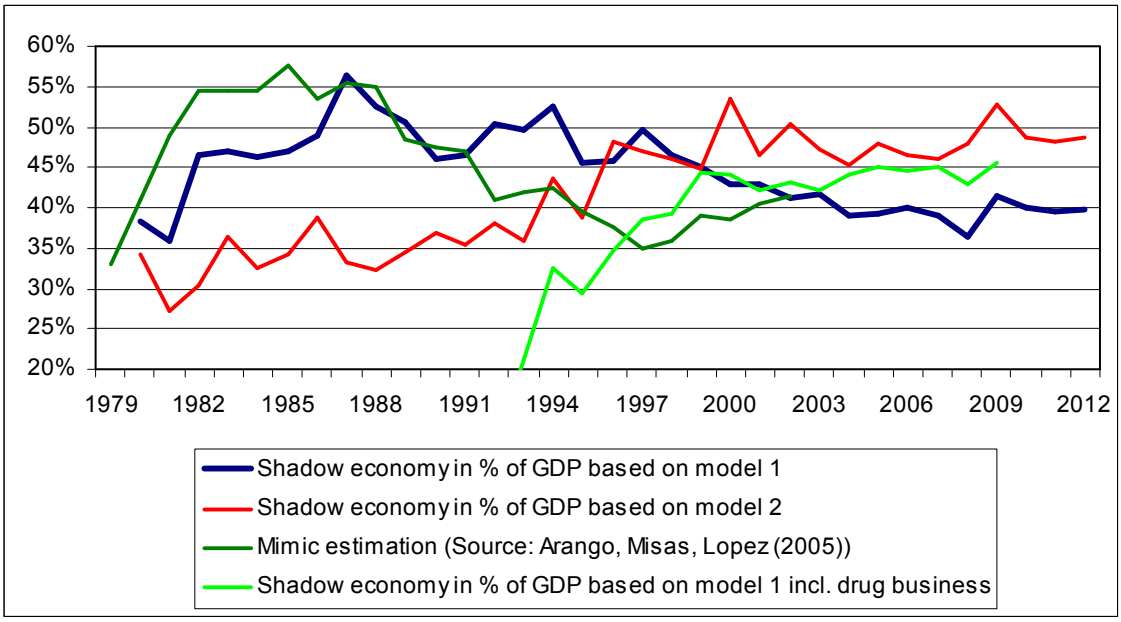

*Source: Schneider (2006).*

**Figure (2): Evolution of coca cultivation and revenues from coca business in Colombia**



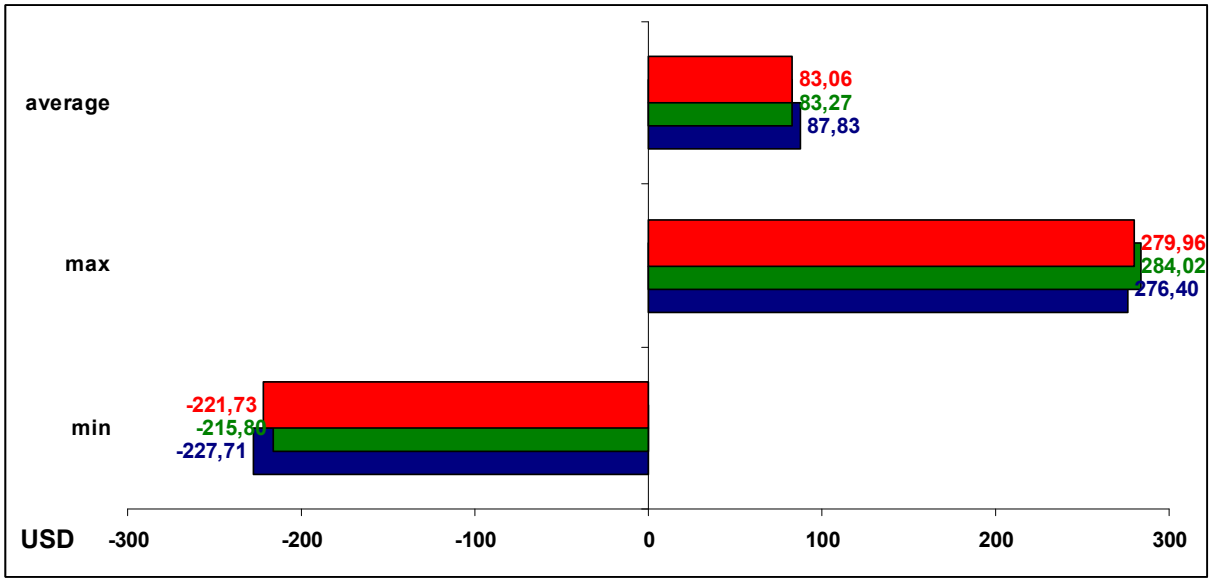

*Source: UNODC, Banco de República de Colombia.*

**Figure (3): Simulations of the estimated size of the shadow economy in % of nominal GDP for Colombia**
***(1980-2012 in percent of GDP)***

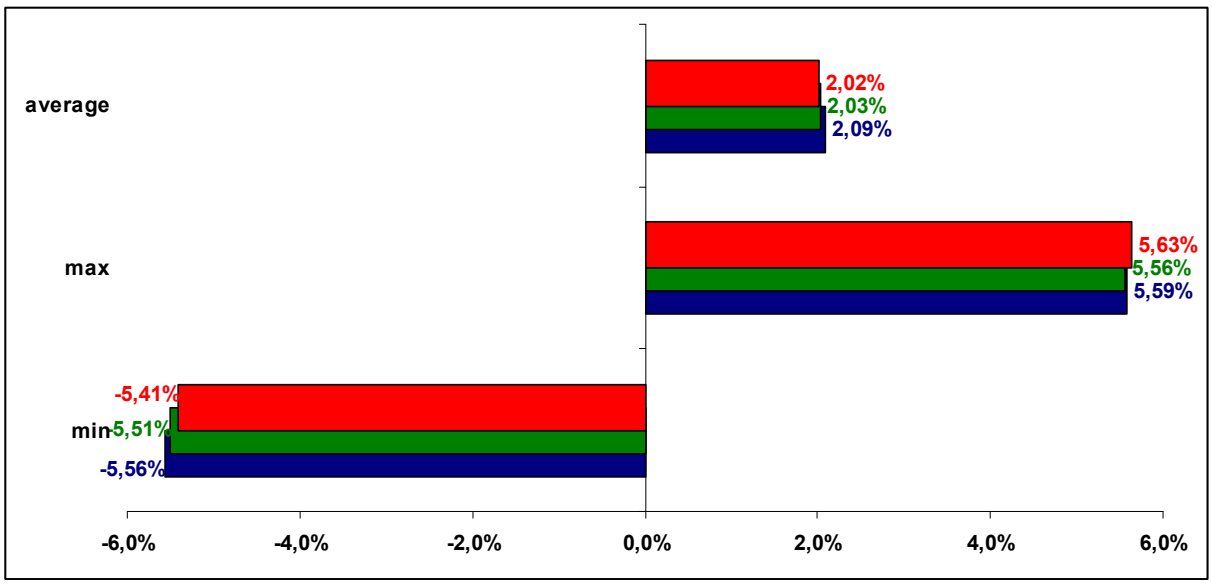



*Source: Model 1 is based on the regression results of model 1, using currency demand per capita as endogenous variable whereas model 2 uses the results of the second regression based on the ratio of cash holdings to checkable deposits as endogenous variable. The figures based on the MIMIC estimation by Colombian Central Bank (2005) are in combination with an estimation based on the currency demand approach carried out by Schneider and Enste (2002).*

**Figure (4): Absolute and relative influence of the shadow economy on economic growth (of real GDP per capita) in Colombia, 1980 – 2012**




| | |
|---|---|
| | growth of real GDP per capita (%) |
| | officially published |
| | excl. effects of shadow economy based on results of model 1 |
| | excl. effects of shadow economy based on results of model 2 |




*Source: Own calculations.*

*Source: Own calculations.*

## BIBLIOGRAPHY


Ahumada, H., Alvaredo, F., Canavese, A., Canavese, P. (2004), The demand for currency approach and the size of the shadow economy: a critical assessment, Discussion Paper, Paris, Delta Ecole Normal Superieure.

Ahumada, H., Alvaredo, F., Canavese, A. (2007), The Monetary Method and the Size of the Shadow Economy: A Critical Assessment, Review of Income and Wealth, 53, 363-371.

Alm, J. (1996), Explaining Tax Compliance, in Pozo, S. (Ed.), Exploring the underground economy – Studies of illegal and unreported activity, Michigan, W.E. Upjohn Institute for Employment Research.

Ardizzi G., Petraglia, C., Piacenza, M., Turati, G. (2013/2014), Measuring the underground economy with the currency demand approach: a reinterpretation of the methodology, with an application to Italy, Review of Income and Wealth, forthcoming.

Besozzi, C. (2001), Illegal, legal – egal?: Zu Entstehung, Struktur und Auswirkungen illegaler Märkte, Bern / Stuttgart / Wien, Haupt.

Bhattacharyya, D.K. (1999), On the economic rationale of estimating the hidden economy, Economic Journal 109: 348-359.

Blades, D. (1982), The hidden economy and the national accouts, OECD Occasional Studies: 28-44.

Botero, J. (2013), Desempleo e informalidad en Colombia: un análisis de equilibrio general, in El mercado de trabajo en Colombia: hechos, tendencias e instituciones edited by Luis E. Arango and Franz Hamann, Banco de la República.

Buehn, A., Schneider, F. (2012), Shadow Economies Around the World: Novel Insights, Accepted Knowledge, and New Estimates, International Tax and Public Finance, 19, 139-171.

Cagan, P. (1958), The demand for currency relative to the total money supply, Journal of Political Economy 66: 302-328.

Del'Anno, R. (2003), Estimating the shadow economy in Italy: a structural equation approach, Discussion Paper, Department of Economics and Statistics, University of Salerno.

Del'Anno, R., Schneider, F. (2004), The shadow economy of Italy and other OECD countries: what do we know?, Discussion Paper, Department of Economics, University of Linz.

Enste, D. H. (2005), The Shadow Economy in OECD and EU Accession Countries – Empirical Evidence for the Influence of Institutions, Liberalization, Taxation and Regulation, in Bajada C., Schneider F. (Eds.), Size, Causes and Consequences of the Underground Economy – An International Perspective, Hants / Burlington, Ashgate Publishing Company.

Echeverry, J. C. (2013), Colombia: The unfinished agenda into the 2014 elections, Global Source Partners, April 2013.

Feige, E.L. (1986), A re-examination of the "underground economy" in the United States, IMF Staff Papers 33: 768-781.

Feige, E. L. (1989), The underground economies: tax evasion and information distortion, Cambridge et al., Cambridge University Press.

Feige, E.L. (1994), The underground economy and the currency enigma, Supplement to Public Finance/Finances Publiques 49: 119-136.

Feige, E.L. (1996), Overseas holdings of U.S. currency and the underground economy, in Pozo, S. (Ed.), Exploring the underground economy – Studies of illegal and unreported activity, Michigan, W.E. Upjohn Institute for Employment Research.

Fleming M., Roman J., Farrell G. (2000), The shadow economy, Journal of International Affairs, Spring 2000, 53, No. 2: 387-412.

Frey, B.S., Pommerehne, W.W. (1984), The hidden economy: state and prospect for measurement, Review of Income and Wealth 30: 1-23.

Frey, B.S., Weck-Hannemann, H. (1984), The hidden economy as an "unobserved" variable, European Economic Review 26: 33-53.

Garcia, G. (1978), The currency ratio and the subterranean economy, Financial Analysts Journal 69: 64-66.

Gijsel, P. (1984), Effektive Nachfrage und illegale Beschäftigung – Zum Zusammenhang zwischen Arbeitslosigkeit und Schattenwirtschaft, in Gijsel, P. (Ed.), Schattenwirtschaft und alternative Ökonomie: Eine Herausforderung für die politische Ökonomie?, Regensburg, Transfer Verlag.

Giles, D.E.A. (1999a), Measuring the hidden economy: implications for econometric modeling, Economic Journal 109: 370-380.

Giles, D.E.A. (1999b), Modeling the hidden economy in the tax gap in New Zealand, Empirical Economics 24: 621-640.

Gracia O., Urdinola P. (2000), Una mirada al mercado laboral colombiano, Departamento Nacional de Planeación, Unidad de análisis macroeconómico, Santafé de Bogotá.

Gretschmann, K. (1984), Schattenwirtschaft, Staatstätigkeit und Finanzwissenschaft – Einige theoretische Überlegungen, in Gijsel, P. (Ed.), Schattenwirtschaft und alternative Ökonomie: Eine Herausforderung für die politische Ökonomie?, Regensburg, Transfer Verlag.

Gutmann, P.M. (1977), The subterranean economy, Financial Analysts Journal 34 (1): 24-27.

Haslinger, F. (1984), Illoyalität und die Ausbreitung der Untergrundwirtschaft – Eine theoretische Analyse, in Gijsel, P. (Ed.), Schattenwirtschaft und alternative Ökonomie: Eine Herausforderung für die politische Ökonomie?, Regensburg: Transfer Verlag.

Hill, R., Kabir, M. (1996), Tax rates, the tax mix, and the growth of the underground economy in Canada: what can we infer?, Canadian Tax Journal/Revue Fiscale Canadienne 44: 1552-1583.

Isachsen, A.J., Strom, S. (1985), The size and growth of the hidden economy in Norway, Review of Income and Wealth 31: 21-38.

Johnson, S., Kaufmann, D., Zoido-Lobatón, P. (1998a), Regulatory discretion and the unofficial economy, The American Economic Review 88: 387-392.

Johnson, S., Kaufmann, D., Zoido-Lobatón, P. (1998b), Corruption, public finances and the unofficial economy, Discussion paper, Washington DC, The World Bank.

Karmann, A. (1986), Monetäre Ansätze zur Erfassung der Schattenwirtschaft: Ein Vergleich verschiedener Messansätze, Kredit und Kapital 19: 233-247.

Karmann, A. (1990), Schattenwirtschaft und ihre Ursachen: Eine empirische Analyse zur Schwarzwirtschaft und Selbstversorgung in der Bundesrepublik Deutschland, Zeitschrift für Wirtschafts- und Sozialwissenschaften (ZWS) 110: 185-206.

Kirchgässner, G. (1983), Size and development of the West German shadow economy, 1955-1980, Zeitschrift für die Gesamte Staatswissenschaft 139: 197-214.

Kirchgässner, G. (1984), Verfahren zur Erfassung des in der Schattenwirtschaft erarbeiteten Sozialprodukts, Allgemeines Statistisches Archiv 68: 378-405.

Kirchgässner, G. (2006), Steuermoral und Schwarzarbeit, in Enste, H. D., Schneider, F. (Ed.), Jahrbuch Schattenwirtschaft 2006/2007, Berlin, LIT Verlag.

Klovland, J. (1984), Tax evasion and the demand for currency in Norway and Sweden: is there a hidden relationship?; Scandinavian Journal of Economics 86: 423-439.

Lippert, O., Walker, M. (1997), The Underground Economy: Global Evidences of its Size and Impact, Vancouver, BC, The Frazer Institute.

Lubell, H. (1991), The informal sector in the 1980s and 1990s, Paris, Development centre of the organisation for economic co-operation and development, Publications Service OECD.

McGee, R. T., Feige, E. L. (1989), Policy illusion, macroeconomic instability, and the unrecorded economy, in Feige, E. L. (Ed.), The underground economies: tax evasion and information distortion, Cambridge et al., Cambridge University Press.

O'Grady, M.A. (2006), Una ventana de oportunidad para Colombia; Portafolio, 06/2006, http://www.portafolio.com.co/port_secc_online/porta_ana_online/2006-06-12/ARTICULO-WEB-NOTA_INTERIOR_PORTA-2943805.html, Download: 16.08.2006.

Park, T. (1979), Reconciliation between Personal Income and Taxable Income, Washington, DC, Bureau of Economic Analysis: pp. 1947-1977.

Pedersen, S. (2003), The shadow economy in Germany, Great Britain and Scandinavia: A measurement based on questionnaire service, study no. 10, Copenhagen, The Rockwool Foundation Research Unit.

Pommerehne, W.W., Schneider, F. (1985), The decline of productivity growth and the rise of the shadow economy in the U.S., Working Paper 85-9, University of Aarhus.

Pozo, S. (Ed.) (1996), Exploring the underground economy – Studies of illegal and unreported activity, Michigan, W.E. Upjohn Institute for Employment Research.

Rogoff, K. (1998), Blessing or curse? Foreign and underground demand for euro notes, Economic Policy, The European Forum 26: 261-304.

Schneider, F. (1986), Estimating the size of the Danish shadow economy using the currency demand approach: an attempt, The Scandinavian Journal of Economics 88: 643-668.

Schneider, F. (1994a), Measuring the size and development of the shadow economy: can the causes be found and the obstacles be overcome?, in Brandstaetter, H., Güth, W. (Eds.), Essays on Economic Psychology, Berlin: Springer: 193- 212.

Schneider, F. (1994b), Can the shadow economy be reduced through major tax reforms? An empirical investigation for Austria, Supplement to Public Finance/Finances Publiques 49: 137-152.

Schneider, F. (1997), The shadow economies of Western Europe, Journal of the Institute of Economic Affairs 17: 42-48.

Schneider, F. (1998a), Further empirical results of the size of the shadow economy of 17 OECD-countries over time, Paper Presented at the 54th Congress of the IIPF Cordova, Argentina, and Discussion Paper, Department of Economics, University of Linz.

Schneider, F. (1998b), Stellt das Anwachsen der Schwarzarbeit eine wirtschaftspolitische Herausforderung dar? Einige Gedanken aus volkswirtschaftlicher Sicht, Linz, Mitteilungen des Instituts für Angewandte Wirtschaftsforschung (IAW) I/98: 4-13.

Schneider, F. (2000), Arbeit im Schatten: Einige theoretische und empirische Überlegungen über die Schattenwirtschaft, Institut für Volkswirtschaftslehre, Johannes Kepler Universität Linz.

Schneider, F. (2003a), Stellt das Anwachsen der Schattenwirtschaft ein Problem für die Wirtschafts- und Finanzpolitik dar? Einige vorläufige empirische Erkenntnisse., Perspektiven der Wirtschaftspolitik: Festschrift zum 65. Geburtstag von René L. Frey, www.economics.uni-linz.ac.at/Schneider/FestschriftFrey.pdf; Download: 05.07.2006.

Schneider, F. (2003b), The shadow economy, in Rowley, C.K., Schneider, F. (Eds.), Encyclopedia of Public Choice, Dordrecht, Kluwer Academic Publishers.

Schneider, F. (2005), Shadow economies around the world: What do we really know?, European Journal of Political Economy, vol. 21, no. 3, sept. 2005: 598-642, Amsterdam et al., Elsevier.

Schneider, F. (2006), Shadow economies and Corruption of 145 countries all over the world: What do we really know?, Discussion Paper, Institut für Volkswirtschaftslehre, Johannes Kepler Universität Linz.

Schneider, F. (2007), Shadow Economies all over the World: New Estimates for 145 Countries, Discussion Paper, Department of Economics, University of Linz, Linz, Austria.

Schneider, F., Enste, D. (2002), The Shadow Economy – An International Survey, Cambridge, Cambridge University Press.

Smith, P. (1994), Assessing the size of the underground economy: the Canadian statistical perspectives, Canadian Economic Observer 11: 16-33.

Spiro, P.S. (1993), Evidence of a post-GST increase in the underground economy, Canadian Tax Journal/Revue Fiscale Canadienne 41: 247-258.

Steiner, R. (1998), Colombia's income from drug trade, World Development, vol. 26, issue 6: 1013-1031.

Tanzi, V. (1980), The underground economy in the United States: estimates and implications, Banca Nazionale del Lavoro 135: 427-453.

Tanzi, V. (1982), The underground economies in the United States and Abroad, Lexington, MA, Lexington Books.

Tanzi, V. (1983), The underground economy in the United States: annual estimates, 1930-1980, IMF Staff Papers 30: 283-305.

Thomas, J.J. (1986), The underground economy in the United States: comment on Tanzi, IMF Staff Papers 33: 782-789.

Thomas, J.J. (1992), Informal Economic Activity, LSE Handbooks in Economics, London, Harvester Wheatsheaf.

Thomas, J.J. (1999), Quantifying the black economy: "measurement without theory" yet again?, Economic Journal 109: 381-389.

Tokman, V. E., Integrating the informal sector in the modernization process, http://www.un.org/docs/ecosoc/meetings/2006/forum/statements/tokman.pdf, Download: 10.08.2006.

United Nations Economic Commission for Europe (2008), Non-Observed Economy in National Accounts, Survey of Country Practices, United Nations, New York and Geneva

Wagner, H. (1984), Anmerkungen zum Übergang in die Schattenwirtschaft, in Gijsel, P. (Ed.), Schattenwirtschaft und alternative Ökonomie: Eine Herausforderung für die politische Ökonomie?, Regensburg, Transfer Verlag.

Williams, C.C., Windebank, J. (1995), Black market work in the European Community: peripheral work for peripheral localities?, International Journal of Urban and Regional Research 19: 23-39.

Zilberfarb, B.-Z. (1986), Estimates of the underground economy in the United States, 1930-80, IMF Staff Papers 33: 790-798.

## EMPIRICAL SOURCES


[1] Arango, C., Misas, M., López, E. (2005): Economía Subterranea en Colombia 1976-2003 – Una medición a partir de la demanda de efectivo; Banco de la República de Colombia; http://www.banrep.gov.co/docum/ftp/borra335.pdf; Download: 29.01.2006.

[2] Banco de la República de Colombia, www.banrep.gov.co

[3] Colombia Viva (2000); El Tiempo; Santafé de Bogotá.

[4] Departamento Administrativo Nacional de Estadística (DANE), www.dane.gov.co

[5] Departamento Nacional de Planeación (DNP), www.dnp.gov.co

[6] United Nations Conference on Trade and Development (UNCTAD), www.unctad.org

[7] Ministerio de Hacienda y Crédito Público, www.minhacienda.gov.co

[8] International Monetary Fund (IMF), www.imf.org

[9] Dirección de Impuestos y Aduanas Nacionales de Colombia (DIAN), www.dian.gov.co

[10] United Nations Development Programme (UNDP), www.undp.org

[11] Ministerio de Trabajo, www.mintrabajo.gov.co

[12] Oficina de las Naciones Unidas contra la Droga y el Delito (UNODC), Colombia, Monitoreo de Cultivos de Coca, 2011