

# SHADOW ECONOMIES IN LATIN AMERICA: WHAT DO WE KNOW? A HIGHLIGHT ON BRAZIL

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## Abstract:

Using the DYMIMIC approach, estimates about the development and the size of the shadow economy of 17 Latin American countries are presented for 1990/91, 1994/95 and 1999/2000. The average size of the shadow economy over the sample is 41.5% of official GDP. We have also showed an estimate of the Brazilian Shadow Economy (BSE) using a MIMIC model. In 2002, the BSE reached an average level of 39.40% of GDP. An increasing burden of taxation and social security contributions combined with rising state regulatory activities are the driving forces for the growth of the shadow economy.

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**Key-words:** shadow economy, interaction of the shadow economy with the official one, tax burden, government regulation, DYMIMIC and MIMIC method

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# 1 Introduction

As shadow economic activities are a fact of life around the world, most societies attempt to control these activities through various measures like punishment, prosecution, economic growth or education. Gathering statistics about who is engaged in shadow economy activities, the frequencies with which these activities are occurring and the magnitude of them, is crucial for making effective and efficient decisions regarding the allocations of a country's resources in this area. Unfortunately, it is very difficult to get accurate information about these shadow economy activities on the goods and labor market, because all individuals engaged in these activities wish not to be identified. Hence, the estimation of the shadow economy activities can be considered as a scientific passion for knowing the unknown.

Although quite a large literature<sup>1)</sup> on single aspects of the hidden or shadow economy exists and a comprehensive survey has been written by Schneider (the author of this paper) and Enste (2002), the subject is still quite controversial<sup>2)</sup> as there are disagreements about the definition of shadow economy activities, the estimation procedures and the use of their estimates in economic analysis and policy aspects.<sup>3)</sup> Nevertheless around the world, there are some indications for an increase of the shadow economy but little is known about the development and the size of the shadow economies in Latin America over the period 1990 to 2000.

Hence, the goal of this paper is: to undertake the challenging task to estimate the shadow economy for 17 countries in Latin America and to provide some insights about the main

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<sup>1)</sup> The literature about the „shadow“, „underground“, „informal“, „second“, „cash-“ or „parallel“, economy is increasing. Various topics, on how to measure it, its causes, its effect on the official economy are analyzed. See for example, survey type publications by Frey and Pommerehne (1984); Thomas (1992); Loayza (1996); Pozo (1996); Lippert and Walker (1997); Schneider (1994a, 1994b, 1997, 1998a); Johnson, Kaufmann, and Shleifer (1997), Johnson, Kaufmann and Zoido-Lobaton (1998a,b); Belev (2003); Gerxhani (2003) and Pedersen (2003). For an overall survey of the global evidence of the size of the shadow economy see Schneider and Enste (2000, 2002), Schneider (2003) and Alm, Martinez and Schneider (2004).

<sup>2)</sup> Compare e.g. in the Economic Journal, vol. 109, no. 456, June 1999 the feature “controversy: on the hidden economy”.

causes of the shadow economy. In section 2 an attempt is made to define the shadow economy and some theoretical considerations about the reasons why the shadow is increasing are undertaken. Section 3 presents the empirical results of the size of the shadow economy over 17 Latin American countries. In section 4 the shadow economy of Brazil is in detail investigated and in section 5 a summary is given and some policy conclusions are drawn.

## **2 Some Theoretical Considerations about the Shadow Economy**

### **2.1 Defining the Shadow Economy**

Most authors trying to measure the shadow economy face the difficulty of how to define it. One commonly used working definition is all currently unregistered economic activities that contribute to the officially calculated (or observed) Gross National Product.<sup>4)</sup> Smith (1994, p. 18) defines it as “market-based production of goods and services, whether legal or illegal that escapes detection in the official estimates of GDP.” Or to put it in another way, one of the broadest definitions of it, includes “...those economic activities and the income derived from them that circumvent or other wise government regulation, taxation or observation”.<sup>5)</sup> As these definitions still leave open a lot of questions, table 2.1 is helpful for developing a better feeling for what could be a reasonable consensus definition of the legal economy and the illegal underground (or shadow) economy.

From table 2.1, it becomes clear that 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 state (tax) authorities. In this paper the following more precise definition of the shadow

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<sup>3)</sup> Compare the different opinions of Tanzi (1999), Thomas (1999), Giles (1999a,b) and Pedersen (2003).

<sup>4)</sup> This definition is used for example, by Feige (1986, 1989, 1994), Schneider (1994a, 2003) and Frey and Pommerehne (1984). Do-it-yourself activities are not included. For estimates of the shadow economy and the do-it-yourself activities for Germany see Karmann (1990).

<sup>5)</sup> This definition is taken from Del’Anno (2003), Del’Anno and Schneider (2004) and Feige (1989); see also

economy is used:<sup>6)</sup> The shadow economy includes all monetary legal production of goods and services that are deliberately concealed from public authorities for the following reasons:

- (1) to avoid payment of income, value added or other taxes,
- (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
- (4) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.
- (5) Hence, in this paper, I will not deal with typical underground, economic (classical crime) activities, which are all illegal actions that fits the characteristics of classical crimes like burglary, robbery, drug dealing, etc. I also include not the informal household economy which consists of all household services and production. Also this paper does not focus on tax evasion or tax compliance, because it would get to long, and moreover tax evasion is a different subject, where already a lot of research has been underway.<sup>7)</sup>

## **Table 2.1: A Taxonomy of Types of Underground Economic Activities**

### **2.2 The Main Causes of Determining the Shadow Economy**

#### **2.2.1 Tax and Social Security Contribution Burdens**

In almost all studies<sup>8)</sup> it has been found out, that the tax and social security contribution burdens are one of the main causes for the existence of the shadow economy. Since taxes

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Thomas (1999), Fleming, Roman and Farrell (2000).

<sup>6)</sup> Compare also the excellent discussion of the definition of the shadow economy in Pedersen (2003, pp.13-19), who uses a similar one.

<sup>7)</sup> Compare, e.g. the survey of Andreoni, Erard and Feinstein (1998) and the paper by Kirchler, Maciejovsky and Schneider (2002).

<sup>8)</sup> See Thomas (1992); Lippert and Walker (1997); Schneider (1994a,b, 1997, 1998a,b, 2000); Johnson, Kaufmann, and Zoido-Lobaton (1998a,1998b); Tanzi (1999); Giles (1999a); Mummert and Schneider (2001);

affect labor-leisure choices, and also stimulate labor supply in the shadow economy, the distortion of the overall tax burden is a major concern of economists. The bigger the difference between the total cost of labor in the official economy and the after-tax earnings (from work), the greater is the incentive to avoid this difference and to work in the shadow economy. Since this difference depends broadly on the social security burden/payments and the overall tax burden, they are key features of the existence and the increase of the shadow economy.

But even major tax reforms with major tax rate deductions will not lead to a substantial decrease of the shadow economy.<sup>9)</sup> Such reforms will only be able to stabilize the size of the shadow economy and avoid a further increase. Social networks and personal relationships, the high profit from irregular activities and associated investments in real and human capital are strong ties which prevent people from transferring to the official economy. For Canada, Spiro (1993) found similar reactions of people facing an increase in indirect taxes (VAT, GST). This fact makes it even more difficult for politicians to carry out major reforms because they may not gain a lot from them.

Empirical results of the influence of the tax burden on the shadow economy is provided in the studies of Schneider (1994b, 2000) and Johnson, Kaufmann and Zoido-Lobaton (1998a, 1998b); they all found statistically significant evidence for the influence of taxation on the shadow economy. This strong influence of indirect and direct taxation on the shadow economy is further demonstrated by discussing empirical results in the case of Austria and the Scandinavian countries. For Austria the driving force for the shadow economy activities is the direct tax burden (including social security payments), it has the biggest influence, followed by the intensity of regulation and complexity of the tax system. A similar result has been

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Giles and Tedds (2002) and Dell'Anno (2003), just to quote a few recent ones.

<sup>9)</sup>See Schneider (1994b, 1998b) for a similar result of the effects of a major tax reform in Austria on the shadow economy. Schneider shows that a major reduction in the direct tax burden did not lead to a major reduction in the shadow economy. Because legal tax avoidance was abolished and other factors, like regulations, were not changed; hence for a considerable part of the tax payers the actual tax and regulation burden remained

achieved by Schneider (1986) for the Scandinavian countries (Denmark, Norway and Sweden). In all three countries various tax variables (average direct tax rate, average total tax rate (indirect and direct tax rate)) and marginal tax rates have the expected positive sign (on currency demand) and are highly statistically significant. These findings are supported by studies of Kirchgaessner (1983, 1984) for Germany and by Klovland (1984) for Norway and Sweden, too.

In this study an attempt will be made to investigate the influence of the direct and indirect tax burden as well as the social security payments on the shadow economy for developing, transition and highly developed countries. Hence, for the first time this influence is investigated for developing, transition and highly developed countries for the same time period and using the same estimation technique.

### **2.2.2 Intensity of Regulations**

The increase of the intensity of regulations (often measured in the numbers of laws and regulations, like licenses requirements) is another important factor, which reduces the freedom (of choice) for individuals engaged in the official economy.<sup>10)</sup> One can think of labor market regulations, trade barriers, and labor restrictions for foreigners. Johnson, Kaufmann, and Zoido-Lobato (1998b) find an overall significant empirical evidence of the influence of (labor) regulations on the shadow economy, the impact is clearly described and theoretically derived in other studies, e.g. for Germany (Deregulation Commission 1990/91). Regulations lead to a substantial increase in labor costs in the official economy. But since most of these costs can be shifted on the employees, these costs provide another incentive to work in the shadow economy, where they can be avoided. Empirical evidence supporting the model of Johnson, Kaufmann, and Shleifer (1997), which predicts, inter alia, that countries with more

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unchanged.

<sup>10)</sup>See for a (social) psychological, theoretical foundation of this feature, Brehm (1966, 1972), and for a (first) application to the shadow economy, Pelzmann (1988).

general regulation of their economies tend to have a higher share of the unofficial economy in total GDP, is found in their empirical analysis. A one-point increase of the regulation index (ranging from 1 to 5, with 5 = the most regulation in a country), *ceteris paribus*, is associated with an 8.1 percentage point increase in the share of the shadow economy, when controlled for GDP per capita (Johnson et. al. (1998b), p. 18). They conclude that it is the enforcement of regulation, which is the key factor for the burden levied on firms and individuals, and not the overall extent of regulation - mostly not enforced - which drive firms into the shadow economy. Friedman, Johnson, Kaufmann and Zoido-Lobaton (2000) reach a similar result. In their study every available measure of regulation is significantly correlated with the share of the unofficial economy and the sign of the relationship is unambiguous: more regulation is correlated with a larger shadow economy. A one point increase in an index of regulation (ranging from 1-5) is associated with a 10 % increase in the shadow economy for 76 developing, transition and developed countries.

These findings demonstrate that governments should put more emphasis on improving enforcement of laws and regulations, rather than increasing their number. Some governments, however, prefer this policy option (more regulations and laws), when trying to reduce the shadow economy, mostly because it leads to an increase in power of the bureaucrats and to a higher rate of employment in the public sector. In this study the effect of government regulation on the development of the shadow economy will be investigated for developing, transition and highly developed countries.

### **2.2.3 Public Sector Services**

An increase of the shadow economy can lead to reduced state revenues which in turn reduce the quality and quantity of publicly provided goods and services. Ultimately, this can lead to an increase in the tax rates for firms and individuals in the official sector, quite often

combined with a deterioration in the quality of the public goods (such as the public infrastructure) and of the administration, with the consequence of even stronger incentives to participate in the shadow economy. Johnson, Kaufmann, and Zoido-Lobaton (1998a,b) present a simple model of this relationship. Their findings show that smaller shadow economies appear in countries with higher tax revenues, if achieved by lower tax rates, fewer laws and regulations and less bribery facing enterprises. Countries with a better rule of the law, which is financed by tax revenues, also have smaller shadow economies. Transition countries have higher levels of regulation leading to a significantly higher incidence of bribery, higher effective taxes on official activities and a large discretionary framework of regulations and consequently to a higher shadow economy. Their overall conclusion is that “wealthier countries of the OECD, as well as some in Eastern Europe find themselves in the ‘good equilibrium’ of relatively low tax and regulatory burden, sizeable revenue mobilization, good rule of law and corruption control, and [relatively] small unofficial economy. By contrast, a number of countries in Latin American and the Former Soviet Union exhibit characteristics consistent with a ‘bad equilibrium’: tax and regulatory discretion and burden on the firm is high, the rule of law is weak, and there is a high incidence of bribery and a relatively high share of activities in the unofficial economy.” (Johnson, Kaufmann and Zoido-Lobaton 1998a p. 1). Unfortunately, due to lacking data, for example the effect of corruption on the size of the shadow economy could not be investigated.

### **3 The Size of the Shadow Economy in Latin America**

#### **3.1 *Econometric Results***

In tables 3.1 the econometric estimations using the DYMIMIC approach (latent estimation approach) are presented for the 17 Latin American countries. This grouping was necessary because the available data situation is different for these countries. For the 17 Latin American countries the estimation was done for three different points of time 1990/91, 1994/95 and

1999/2000. For the 17 Latin American countries I have as cause variables the following ones: share of direct and indirect taxation (in % of GDP) as the two tax burden variables; burden of state regulation or state interference (share of public administrative employment in % of total employment), unemployment quota and GDP per capita as two cause variables for the status of the “official” economy. As indicator variables I have employment quota (in % of the population between 18 and 64), annual rate of GDP, and annual rate of local currency per capita.<sup>11)</sup>

The estimation results for the 17 Latin American countries are shown in table 3.1. All cause variables are statistically significant and have the theoretically expected signs. The two tax burden variables together have the quantitative most important influence followed by the burden of state regulation and the “official” employment situation (unemployment quota) on the size of the shadow economy – a result which is in line with the theoretical argumentation of section 2. The estimated coefficient of the burden of state regulation has the quantitative largest impact on the size of the shadow economy as single independent variable, showing that state regulation is the most important factor for the shadow economy in the developing countries. Also the indicator variables are statistically significant and have the expected signs.

**Table 3.1: DYMIMIC Estimations of the size of the shadow economy of 17 Latin American countries in Middle and South America over 1990/91, 1994/95 and 1999/2000**

In order to calculate absolute values of the size of the shadow economies from these DYMIMIC estimation results the author used the already available estimations from the currency demand approach in combination with the DYMIMIC approach for Peru and Brazil. With the help of the absolute values of the shadow economy (in % of GDP) for these

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<sup>11)</sup> Here we have the problem, that in some developing and transition countries the USD is also a widely used currency, which is not considered here, because we got no reliable figures of the amount of USD in these developing and transition countries.

countries the absolute values of the shadow economy for all other Latin American countries could be calculated. The results are shown in the next section.

### **3.2 *The Size of the Shadow Economies for 17 Latin American Countries for 1990/91, 1994/95 and 1999/2000***

In table 3.2 the results of the sizes of the shadow economies for the three periods of time 1990/91, 1994/95 and 1999/2000 for 17 South and Latin American countries are shown. Discussing again first the development of the shadow economy over time in all 17 Central and South American Countries has increased. On average the size of the shadow economy for these 17 Central and South American Countries was 34.2% in 1990/91, increased to 37.7% in 1994/95 and further to 41.5% in 1999/2000. This means an increase of 7.3% over 11 years, a similar size like in the African countries. If I now turn to the size of the shadow economy for the latest period 1999/2000 the largest shadow economy has Bolivia with 67.1%, followed by Panama (64.1%) and Peru (59.9%). The smallest shadow economies are in Chile (19.8%) and Argentina (25.4%).

#### **Table 3.2: The Size of the Shadow Economy in 17 Central and South American Countries**

### **3.3 *The Brazilian Shadow Economy: A separate look***

The causes presented in the previous section are valid for estimating the Brazilian Shadow Economy (BSE) but warrant some comments so that the relationship between them and the specific variables in the Brazilian reality can be understood. In this sense, we provide a profile

of the Brazilian economy, relating its characteristics to the causes presented for a number of Latin American countries, in such a way that the variables used in the BSE estimate presented below could be understood completely.

As can be seen from the description of the causal variables for Latin American countries above, the role and actions of government are fundamental when it comes to understand the size and the evolution of the SE in these countries. Brazil is no different and its government is considered one of the most inefficient in the world for the following reasons:

- It has a very high tax burden (direct and indirect taxes as a percentage of GDP);
- Government interventions do nothing to bring about improvements in income distribution;<sup>12</sup>
- The markets are excessively regulated by Government, especially as far as foreign trade and the labor markets are concerned.

We are going to analyze each one of these elements in more detail, beginning with the excessive tax burden that exists in Brazil. The following table shows the evolution of the tax burden over the last five years taken from SRF (Brazilian Internal Revenue Service) data:

**Table 3.3: Total tax burden for Brazil in terms of GDP**

Even when compared with other Latin American countries this shows quite clearly size of the tax burden:

**Table 3.4: Total tax burden in terms of GDP for selected Latin American countries**

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<sup>12</sup> The intervention from the incidence of taxation and distribution of the benefits gives some idea of the government's efficiency. When tax revenue is very high and there is an extremely unequal distribution of income (Brazil has one of the worst income distributions in the world in terms of the Gini index), the actual tax collected gets no further than the government itself. In the previous section we only used the size of government as the factor for expansion of the SE. In the case of Brazil the government is large and does not improve the distribution of income.

To make clear how the burden from excessive tax and other contributions (the social security contribution paid by employers on behalf of their workers) makes it more advantageous to work in the SE, we present a study prepared by McKinsey (2004), in which they compare the difference between the net income of someone who works formally and informally in the food retail sector in Mexico and Brazil:

**Figure 3.1: Comparison between Mexico and Brazil of net income in the formal and informal sectors in the food industry.**

In Mexico the difference between net incomes in the formal and informal sector reaches 74% while in Brazil it gets as high as 245%. In Mexico this difference is diluted among the various items presented in the table, while in Brazil it is concentrated in value added tax and special taxes (61% of the net income generated for the retailer who works in the informal sector).

In addition to a high tax burden, intervention by the Brazilian government is inefficient. If we consider that one of the functions of the State is to bring about a better income distribution, the Brazilian government has failed miserably. This is an important point when we take into consideration that Brazil has one of the worst income distributions in the world. We can see an example of government activity in this regard in Table 3.5:

**Table 3.5: The distributive effects of intervention by the Brazilian Federal Government**

In terms of the Gini index, the federal government does not reduce the concentration of existing income very much. We can see the role of government when we look at the Gini index for Initial Income (0.64) and Final Income (0.58). The Gini Final Income Index considers the effect of direct and indirect taxes and monetary transfers coming from government in social areas. If the overall Final Gini index leaves any doubt as to government

activity, we can also observe how it acts in the Gini index in each decile: government intervention worsens the income concentration situation for the poorest 30% of the population (deciles 1, 2 and 3).

We also consider the activity of the Brazilian government with regard to its distributive function by comparing it with some other countries using this same methodology:

**Table 3.6: Impact of Monetary Transfers and direct and indirect Taxes on income distribution in some countries.**

Almost all countries in the table are more effective in terms of income distribution than Brazil. Unfortunately we do not have this data for other Latin American countries. In this sense, when compared to the results for previous sections, the size of Brazilian government represented by the level of public administrative employment as a percentage of total employment could be considered as a cause of the SE, because it collects a lot of taxes and transfers little to people in terms of social spending.

The third point refers to excessive government intervention in markets. One of the most important examples of this is the excessive protection from foreign competition enjoyed by some sectors in the economy. Frieden, Ghezzi and Stein (2000) show how an (appreciated) exchange rate, fiscal (taxes) and quantitative instruments (import restrictions on some products) were used throughout this period.

For example, during thirty years Argentina was in a similar process as Brazil and had an average degree of openness of 15.99% of GDP (sum of exports and imports). On the other hand, Chile, which did not use this project for a very long time and based its economy on export promotion, presented an average result for the same period of thirty years of 50.11% of GDP, similar to the figure calculated for European countries - around 50% of GDP. The

consequences of this are still noticeable in the 90s, because the Brazilian economy remains quite closed, as can be seen in Table 3.7:

**Table 3.7.: Degree of economic openness**

One can also see excessive intervention in the labor market, both as setting the Minimum Wage for the whole country, as well as in the high costs associated with the formal hiring of labor, a consequence of the current legislation for hiring an employee. The following Figure shows Brazil as one of the three countries with the most rigid labor laws in the world:

**Figure 3.2: Degree of rigidity in labor legislation**

In Brazil hiring an employee in accordance with current legislation costs the company twice the remuneration received by the employee. The following table shows the calculations made by Pastore (2003) of the expenses associated with hiring employees per working hour:

**Table 3.8: Labor costs per working hour in Brazil**

This is one of the main reasons why, according to data published by IBGE (2004), nearly 60% of the Economically Active Population (45 million), works in the informal market, the majority of them self-employed.<sup>13</sup>

As participation in the Brazilian social security system is conditioned on the existence of an official labor contract, since only formal workers contribute to the system, the vast majority of Brazilian workers do not participate.<sup>14</sup>

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<sup>13</sup> Without an employment contract between the company and the employee, formally registered in a booklet called the employment register – for this reason, in the PME statistical investigation formal employment is registered as that where the employee has his employment register book signed, and informal employment, where the employment register book is not signed.

Rodrik (2001) had already highlighted the high number of workers outside the social security system in Brazil when he investigated those who are employed but unprotected by the system in Latin American countries.

**Table 3.9: Level of unprotected employment in some Latin American countries**

When we consider these elements, a more precise measurement of the size of the Shadow Economy in Brazil begins to gain in importance. Initially we shall analyze the different ways in which Brazilian literature has dealt with this problem, using both observed and non-observed variables.

## **4 The Brazilian Shadow Economy (BSE)**

In this part of work, we present the estimate of Brazilian Shadow Economy considering what was discussed in the last section on the relationship between the Brazilian Economy and the other Latin-American countries by using the MIMIC model.

### ***4.1. Estimate of the Brazilian Shadow Economy taken from observed variables<sup>15</sup>***

Flores de Lima (1985) estimated the SE from the composition of observed variables. His estimate was made using a composition of data relative to tax and debt evasion and estimates of the informal economy labor market.

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<sup>14</sup> Among the benefits included are unemployment benefit, state retirement pension, etc.

<sup>15</sup> The definitions of the institutions mentioned and the research for which each one of them is responsible can be found in the Appendix 7 (Table A.1).

Tax evasion was calculated using data from the SRF (Internal Revenue Department), the Rio de Janeiro State Treasury Department <sup>16</sup> and the Federal Treasury Department (Department of Economic Affairs). The estimate was based on the discrepancy between income declared for tax purposes and that measured by selective checks. <sup>17</sup> Debt evasion was constructed using information from Swiss and American banks. The author had not presented in this work the technique used by these banks in arriving at this estimate.

The informal economy labor market was estimated by the IBGE (Brazilian Institute of Geography and Statistics) using the PME (Monthly Employment Research), considering the number of workers who do not have their official employment register book signed by their employer.<sup>18</sup> The amounts in monetary terms were computed from the multiplication of the number of people without a signed employment register book by average monthly remuneration in the formal labor market taken from the RAIS (Social Information Annual Report).<sup>19</sup> In literature this type of estimate is known as the discrepancy between the official and the actual labor force. <sup>20</sup>

The final Shadow Economy estimate for the years 1981 to 1983 (the last year as preliminary data) can be seen in the following table:

**Table 4.1: Flores de Lima's estimate of the SE for the years 1981 to 1983**

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<sup>16</sup> Responsible for collecting state taxes in Rio de Janeiro State – Rio de Janeiro is one of the 27 sub-national governments (states) that exist in Brazil.

<sup>17</sup> Bajada, and Schneider (2003) and Schneider and Klinglmair (2004) have already described this type of procedure and the problems in using it.

<sup>18</sup> Has a contract of employment in the formal sector.

<sup>19</sup> The author was able to work with the average worker's pay in the informal sector of the economy. This information is available in the PNAD.

<sup>20</sup> See Bajada and Schneider (2003) and Schneider and Klinglmair (2004) for a description of this technique.

#### **4.2. Estimate of the Brazilian Shadow Economy taken from non-observed variables <sup>21</sup>**

Ribeiro and Bugarin (2003) estimated the Shadow Economy using non-observed variables. The technique they used in this estimate was the MIMIC (Multiple Indicator Multiple Cause) model. <sup>22</sup>

Considering the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI) and Root Mean Square Residual (RMR) tests, of the four estimated models the best result obtained is set out in the following table:

**Table 4.2.: Results of the MIMIC model in Ribeiro and Bugarin (2003)**

To remove the indeterminacy from the structural coefficients one of coefficients of the indicating variable of the phenomenon has to be set equal to unity. In this case the variable chosen by them was GDP. Therefore this variable gave no results in the t-Student statistics. The indicator variable of the SE, NTSCT (Number of Workers without an Employment Register), showed significance at the level of 10%. The causal variables, DIGPDI (Rate of Inflation), DTRADE (Index of Imports and Exports divided by GDP) and MINSALARY (Minimum Salary) were not significant, while DESEMP (Unemployment), RDPOC (Disposable Income divide by the total population in employment) and NTCCT (Number of Workers with an Employment Register) were shown to be significant. The authors considered the variable MINSALARY, to have either an expansionist or constructionists effect on the SE, and for this reason the expected result is identified with a [?] mark. A positive relationship was achieved in the estimate: the larger the minimum wage fixed by the

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<sup>21</sup> The definition of the variables used can be found in the Appendix 7, Table A.2

<sup>22</sup> Basically the literature for estimating the SE has been moving towards using this multi-varied analysis technique: Giles (1999a), Loyaza (1997) Caragata and Giles (1998), Bajada and Schnieder (2003) and Ribeiro

government, the larger the SE. This seems to be a convincing result, to the extent that the setting of the minimum wage is clearly an intervention in the labor market (regulation) with expansionist effects on the SE.

When DESEMP (Unemployment) increased, the SE increased. On the other hand, the NTCCT (Number of Workers with their employment register signed in the city of São Paulo) tend to decrease the size of the SE.

Differing from the literature on the subject, Ribeiro and Bugarin (2003), instead of introducing taxes directly into the estimate as a causal variable, decided to include them in the RDPOC variable. The result they achieved was the one they expected: the larger the disposable income available to the employed population, the smaller the size of the SE. Ceteris paribus, a reduction in taxes increases disposable income and reduces the size of the SE.

Nevertheless, the authors use this model only to determine the evolution of the SE. By virtue of the very characteristics of the model, an estimate of the SE as a percentage of GDP cannot be directly obtained. To get around this problem an alternative procedure is presented in the following section.

#### ***4.3. Brazilian Shadow Economy as a percentage of GDP: an estimate***

To solve the problem arising from analyses such as those of Ribeiro and Bugarin (2003), we developed a two-stage procedure, by combining the two strands that are to be found in the literature. In the first stage we use a Vector Error Correction Model to determine the volume of money in the SE in Brazil (the currency demand approach) and after this we calibrate our estimates of the evolution of the SE obtained using a MIMIC model.

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and Bugarin (2003).

### 4.3.1. Estimating the volume of money in the SE

Bajada (1999) estimated the volume of money used in the SE from the difference between the two estimates of money demand: one with all the factors that normally determine money demand (GDP, interest rate and inflation, for example) combined with the factors that might create the SE (in our case the best estimate occurred with revenue from social contributions and the other without the factors that might produce the SE. The Vector Error Correction (VEC) model was used to estimate the demand for money (with all the factors):<sup>23</sup>

$$\begin{aligned} \Delta \log(PMPP) = & \delta_0 + \delta_1 \Delta \log(GDP_t) + \delta_2 \Delta \log(R_t) + \delta_3 \Delta \log(I_t) + \delta_4 \Delta \log(IGP) + \beta_1 D_t^2 + \\ & + \beta_2 D_t^3 + \beta_3 D_t^4 + \phi_1 \log(PMPP_{t-1}) + \phi_2 \log(GDP_{t-1}) + \phi_3 \log(R_{t-1}) + \phi_4 \log(I_{t-1}) + \\ & \theta_1 TREND + \beta_4 D_t^{REAL} + \varepsilon_t \end{aligned} \quad [1]$$

The definitions of the variables are as follows:

- **Currency (PMPP)** – Expressed in millions of Reais. As can be seen in the equation (1), this same variable was considered as independent. It is on the right hand side of the equation in terms of lagged logarithm. We do not intuitively know the expected sign for this variable.
- **Gross Domestic Product at market prices (GDP)** – Expressed in millions of Reais.

The GDP estimates were built by IPEA (The Institute of Applied Economic

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<sup>23</sup> After different tests this was the best estimated model for showing money demand in the SE. Observe the decisive role that social contributions play in this result, and not total tax revenue. The growth of social contributions in the total of collected taxes during the 90s was really striking. Arvate and Silva (2004) showed that the cause for this growth of social contributions in the 90s was linked to the dividing up of federal government revenue that was imposed by the 1988 Constitution. The New Constitution shared out traditional federal government taxes with the states and municipalities and delegated the responsibility for deciding on spending to subsequent complementary legislation. Since there was a delay in this complementary legislation coming into force the response of federal government was to invest heavily in collecting social contributions (not shared with states and municipalities) The growth of government revenue as a whole in the 90s was due to the appearance (in some cases) and growth of social contributions.

Research). Note that this is a quarterly GDP estimate. The expected effect of the GDP on money demand is positive because part of money demand depends on the transactions. We do not intuitively know the effect of this lagged variable. See Giles (1999).

- **Interest Rate on Bank Deposit Certificates (R)** – This corresponds to short term interest rates (% per month). The expected result of R on money demand is negative because part of money demand depends on the opportunity cost, which is a speculative effect.
- **Revenue from Social Contributions as a percentage of GDP (T)** – We considered the following social contributions in this calculation: CIDE (Contribution of Intervention in the Economic Area, applied on operations involving fuel), FINSOCIAL/COFINS (Contributions for Financing Social Security), CPMF (Provisional Contribution on Financial Movements), PIS/PASEP (the Social Integration Program for workers in the private sector/Program for Forming a Fund for Civil Servants) and CSLL (Contribution on Net Profit). All amounts expressed in millions of Reais. The expected effect of T on the SE is positive because the vast majority of these social contributions are collected in a cumulative manner (contribution upon contribution), which increases the inefficiency of the economy a very great deal. They were considered here because of its growth and importance to the federal government in the 90s.
- **Inflation Rate (IGP)** – Measured by the variation in the General Price Index (IGP). The expected effect of IGP is positive for two reasons: the first is linked to nominal money demand itself (inflation makes nominal money demand grow) and the second is linked to the SE: inflation disorganizes legal activities and stimulates illegal ones. See Giles' (1999) argument on this point. Even with lagged variables the effect is the one we expected.

- **D2, D3 e D4** - Quarterly dummies, corresponding to the second, third and fourth quarters in the year. We do not intuitively know the expected sign for these dummies.
- **TREND** – is a time trend;
- **D real** - Dummy referring the Real Plan. The Real Plan was the Stabilization Plan that reduced inflation in Brazil. Up until the third quarter 1994, when inflation was very high, we consider the variable with a value equal to zero, and after this, with low inflation, we consider the variable with a value equal to 1. The drop in inflation should cause an increase in money demand. For this reason the expected sign for this variable is positive.

All data were taken from the Brazilian Institute for Economic Research site (IPEA - [www.ipeadata.gov.br](http://www.ipeadata.gov.br)) and are expressed on a quarterly basis. The descriptive statistics of the variables (average, standard deviation, minimum and maximum, etc.) can be found in Table A.3 in the Appendix 7. Data presented with  $\Delta$  and log means the difference and the neperian logarithm operators respectively. To be certain of the internal consistency of these model two steps are necessary. The first is to check if the variables involved are stationary or not, and secondly to check if they exhibit a long run cointegrating relationship. Let us see if the variables are stationery. The following table shows the values for the statistics of the Augmented Dickey-Fuller (ADF) test.

**Table 4.3. – Results of the ADF Test**

The results in Table 4.3 show that two variables were stationary: Log(PMPP) and Log(R). Nevertheless, and especially in the case of the Log(PMPP) variable, the result on the existence or not of a unit root is not clear because these same variables change according to the deterministic terms included in the test specification. Because of this we chose to treat this variable as being integrated of order 1.

The next step was to carry out a cointegration analysis to check if there is any long term relationship between the variables. The results are set out in table 4.4. below:

**Table 4.4. – Number of Cointegration Vectors – Johansen Test**

It should be noted that the cointegration test indicates the existence of more than one long run relationship between the variables. Since we are not interested in characterizing the long run relationship as such, and the literature tell us that the estimate by OLS is consistent in accordance with these results<sup>24</sup>, we can use the estimates obtained from equation (1) as for calibrating the subsequent estimate. Table A.4. in the Appendix 7 gives these results.

From the variables presented in this section for which we have some intuitive result, all presented the expected sign, including the dummy D4, which corresponds to the Real Plan. Not all however gave a highly significant result (at level of 10%, if we look at the t-Student statistics in the table). Equation (1) is  $\overline{PMPP}_t$  in the VEC model. The following step was to determine the amount of money without the factors that might create the SE. This amount was calculated in the following way:

$$\begin{aligned} \Delta \log(\overline{PMPP}_t^e) = & \hat{\delta}_0 + \hat{\delta}_1 \Delta \log(GDP_t) + \hat{\delta}_2 \Delta \log(R_t) + \hat{\delta}_4 \Delta \log(IGP_t) + \hat{\beta}_1 D_t^2 + \\ & + \hat{\beta}_2 D_t^3 + \hat{\beta}_3 D_t^4 + \hat{\phi}_1 \log(\overline{PMPP}_{t-1}) + \hat{\phi}_1 \log(GDP_{t-1}) + \hat{\phi}_2 \log(R_{t-1}) + \hat{\phi}_4 \log(IGP_{t-1}) + \\ & \hat{\theta}_1 TREND + \hat{\beta}_4 D_t^{REAL} \end{aligned} \quad [2]$$

The circumflex accents denote the estimated coefficients for Ordinary Least Squares (OLS) in equation (1).<sup>25</sup> The next step was to define the monetary volume used in the SE (called  $\overline{PMPP}_t^H$ ) from the difference. It was possible to calculate it using the formula

<sup>24</sup> Hamilton (1994).

<sup>25</sup> Note that the velocity of circulation of money in the SE and the formal economy is hypothetically the same.

$PMPPP_t^H = \overline{PMPPP_t} - \overline{PMPPP_t}^e$ . We therefore constructed a time series on the monetary volume of the SE (note that for one of the techniques described in the introduction, an estimation of the SE from the behavior of money demand, the results here presented could already be the size of the SE). The average participation of the monetary volume of the SE for the period between and including the first quarter 1994 and the first quarter 2003 was 24.89% of GDP.<sup>26</sup> It is important to note that the only objective of this analysis is to provide a point of reference for adjusting the series obtained from the MIMIC model.<sup>27</sup>

#### 4.3.2. Estimating the Brazilian Shadow Economy using the MIMIC model

The next step is to work in more detail on the theoretical aspects referring to the modeling of the latent variables in the MIMIC model. This modeling has a special importance to the extent that it is especially appropriate when it comes to dealing with variables that are not directly observed – as is the case with the size of the SE. In doing our estimates we used the following series of data, obtained for the period between January 1995 and December 2002:<sup>28</sup>

*Indicator variables:*

- **GDP** – Monthly Gross Domestic Product in millions of current Reais at constant deflated values (July, 1994), using the IGP-DI (General Price Index – Internal Disposability). In some countries the sign we found for this variable was positive. See Giles (1999) for New Zealand. In others, as in Loyaza (1996) for 14 Latin American countries, the sign was negative. Two types of intuition can explain this last result according to Loyaza (1996): the revenue from taxation set up by law might have been

<sup>26</sup> Note that this series is greater than the period intended for this study.

<sup>27</sup> Data for the second half of 1998 are not reported for mathematical reasons. As in these quarters inflation was negative the logarithm of these values is not defined and therefore neither is the value calculated for the dependent variable.

<sup>28</sup> The data used in the MIMIC estimate are monthly. We do not have quarterly data for all the variables and for this reason we worked with monthly data. When we adjust the model we shall use a point from one quarter to

higher than the maximum level, or the state does not have the power to set up obligations. As we have already said, Ribeiro & Bugarin (2003) used this variable to remove the indeterminacy from the structural coefficients.

- **NTSCT** - Index Number (basis 07/1994=100) representing the number of workers – over 15 – not formally registered in employment in the following metropolitan areas: Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre. Source: PME/IBGE. This variable appears in international literature; it is self-employment. Dell'Anno (2003) found a positive sign for this variable but did not use it as an indicator of the SE. It was used as a causal variable. The self-employment used in the model for European countries does not have the same significance as this variable in Brazil. In Brazil there is excessive regulation in the labor market (as we have shown above) and in Europe this variable might indicate second employment. Ribeiro & Bugarin (2003) used it merely with the data for the city of São Paulo (Number of Workers not formally registered in employment - SP); we have used it for other capitals. The sign they found and expected for this variable was positive, because workers not officially registered in formal employment are a clear indicator of the behavior of the SE. Officially registering workers in Brazil is very dear. According to Pastore (2003) in the formal sector (hourly salary) this cost reaches 103,43% of the salary actually paid.
- **PMPP** - Currency in the Hands of Public - in the same way as happened in the model developed by Ribeiro & Bugarin (2003), in our development this variable is equal to unity in order to remove the indeterminacy of the structural coefficients. It does not show the result of the t – Student statistics.

### *Causal Variables*

- **CPMF** – Net revenue received from the Provisional Contribution on Financial Movement. These amounts are expressed in millions of Reais at constant deflated values (July, 1994), using the IGP-DI (General Price Index – Internal Disposability). This variable was not used by Ribeiro & Bugarin (2003) in their work. This contribution was separately highlighted by virtue of its possible consequences on the BSE: it is charged on any financial operation, it provides those responsible for tax administration with an instrument for monitoring the income of tax payers, thereby allowing for a more effective fight against tax evasion and informality.
- **RDPOC** - Proxy for the Disposable Income of the Employed Population. Calculated by taking the difference between the GDP and the Gross Revenue Administered by the Internal Revenue Department, divided by the number of people employed in the above-mentioned metropolitan areas (POCt).<sup>29</sup> This variable was also not used in any work that has been published in international literature. Ribeiro & Bugarin (2003) used it and the result was negative. As RDPOC increases the SE reduces.
- **RTRIB** – Gross Revenue Administered by the Internal Revenue Department – in millions of Reais at constant deflated values (July, 1994), using the IGP-DI (General Price Index – Internal Disposability). This is a variable used in various international works, among which, work by Giles (1999) and Dell’Anno (2003). Ribeiro & Bugarin (2003) did not use this variable in isolation in their estimate for Brazil. The expected sign for this variable is positive. When taxes increase there is a strong incentive to work in the SE. Note that we do not work with total government taxes in the three areas because we cannot get this information on a monthly basis.
- **TRADE** - The sum of Exports plus Imports, divided by the GDP. This shows the degree of openness in the economy. Source: IPEA. This is not a variable that is

normally used in international literature but is fundamental as an indicator of regulation in the Brazilian economy. Ribeiro & Bugarin (2003) used this variable in their estimate. As was mentioned, the sign they expected for this variable was negative because a greater opening in the economy would reduce existing regulations of markets and the size of the SE. As we saw, they obtained a positive sign, perhaps because the economy is excessively closed (the Brazilian economy is very closed, as can be seen from the trade flow data) and any effort towards opening it does not affect the size of the SE as expected.

- **DESEMP** – Rate of Open Unemployment in the Metropolitan Areas.<sup>30</sup> This includes the following areas: Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre. Source: PME/IBGE. The expected effect of this variable on the SE is positive. Unemployment always contributes to the size of the SE. Dell’anno (2003) found a positive sign and Ribeiro & Bugarin (2003) also found the same sign for this variable.

All the models obtained from sub-sets of these variables were tested. For the selection of specifications – over than 120 models – the following criteria were used: the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), the Browne-Cudeck Information Criterion (BCC), the Minimum Value of the Discrepancy Function (C), the Minimum Value of the Discrepancy Function less the Degrees of Freedom (C-df) and the Minimum Value of the Discrepancy Function divided by the number of Degrees of Freedom (C/df). The best models in accordance with each one of these criteria are set out in the following table:

**Table 4.5. – Results of Specifications Selected – MIMIC Models**

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<sup>29</sup>Employed population in metropolitan Regions. This covers the metropolitan regions of: Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre. Source: PME/IBGE.

<sup>30</sup> Reference period: 30 days.

We can see that from the five models selected, Model 3 is the one that proves to be the most suitable in two of the model selection criteria (AIC and BCC). Furthermore it is very close to those considered the best ones both in C-df and in BIC, and has all the significant variables to 5%. For these reasons we consider Model 3 to be the most suitable for representing the SE in Brazil.

Observing the effect of the causal variables on the latent variable, we can see that CPMF (expected effect positive, because it increases the SE), TRADE (expected effect negative, because more trade is an indicator of less regulation in the economy), DESEMP (expected effect positive, because it increases the number of workers who have no formally registered employment) and RTRIB (expected effect positive, because it increases the SE) provided the influence we expected. The only result not intuitively expected was that of the TRADE variable. It coincided with the result found in Ribeiro and Bugarin (2003). With these values for the coefficients we can construct a series for the size of the SE, considering as a starting point for the adjustment the value of 21.3% of GDP, obtained at the end of the first quarter, 1995. This data was obtained from the estimate of the monetary volume of the SE in this section. Graph 4.1 shows the evolution of the SE as estimated by the MIMIC as from January, 1995:

#### **Graph 4.1– Evolution of the Participation of the Shadow Economy – MIMIC Model**

Based on the above graph there is a clearly upward trend of the Shadow Economy in Brazil. Except for the months between the years 1995 (20.71% of GDP, on average) and 1996 (20.96% of GDP, on average), the results have always been growing. In 1997 there was a significant leap forward in the average level of participation (20% of GDP reached in

previous years) to 25.69% of GDP. This growth has not stopped. In 2002 the SE reached an average level of 39.40% of GDP.<sup>31</sup>

## **5 Summary and Conclusions**

There have been many obstacles to overcome to measure the size of the shadow economy and to analyze its consequences on the official economy, but as this paper shows that some progress has been made. We provided estimates of the size of the shadow economies for 17 Latin American countries for three periods of time (1990/91, 1994/95 and 1999/2000) using the DYMIMIC and the currency demand approach. Hence, some insights can be provided into the size and development of the shadow economy of developing, transition and highly developed OECD countries. The first conclusion from these results is that for all countries investigated the shadow economy has reached a remarkably large size.

We demonstrated that the Brazilian Shadow Economy (BSE) is growing very faster on last decade. With estimate from MIMIC technique, except for the months between the years 1995 (20.71% of GDP, on average) and 1996 (20.96% of GDP, on average), the results have always been growing. In 1997 there was a significant leap forward in the average level of participation (20% of GDP reached in previous years) to 25.69% of GDP. This growth has not stopped. The Brazilian Shadow Economy reached an average level of 39.40% of GDP (2002). The Number of Workers without an Employment Register (NTSCT) was the main variable to represent it. In spite of the proxies used being different from those used to represent other Latin-American countries, the motivation to using and results are not very different. In spite of the series with MIMIC estimate started on 1995, when we compared these results with those of Brazil inside Latin-American countries (using the DYMIMIC technique), they are very similar on final: the average was 39,8% of GDP (1999/2000) with the DYMIMIC and it

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<sup>31</sup> Our result on average for the year 2000 was a little below that estimated by Schneider and Klinglmair (2004). Our average estimate for the year 2000 was 33.72% of GDP and they obtained 39.8%.

was 32,60% of GDP (1999/2000) with MIMIC. The studied demonstrated that the size of the Brazilian Shadow Economy is very close to 40% of GDP.

Moreover, we have also demonstrated that there is an empirically strong interaction of the shadow economy with government policies and with the official economy. From these empirical results I draw two further conclusions:

- (1) The empirical results convincingly demonstrate that an increasing burden of taxation and social security payments, combined with rising state regulatory activities, are the major driving forces for the size and growth of the shadow economy.
- (2) Shadow economies are a complex phenomenon, present to an important extent in all type of economies (developing, transition and developed). People engage in shadow economic activity for a variety of reasons, among most important, of which we can count are government actions, most notable taxation and regulation. With these two insights, goes a third, no less important one: a government aiming to decrease shadow economic activity has to first and foremost analyze the complex relationships between the official and shadow economy – and even more important – among consequences of its own policy decisions.

## 6 References

- Alm, J., Martinez-Vazquez, J., Friedrich S., 2004. Sizing the Problem of the Hard-to-Tax, *Working Paper, Georgia State University: USA*.
- Andreoni, J., Erard, B., Jonathan F., 1998. Tax compliance. *Journal of Economic Literature*, 36, pp. 818-860.
- Arvate, P.R., da Silva, M.F.G., 2004. Constitutional change and the federal government revenue administration in Brazil between 1982 and 2001. *Article send to The Constitutional Policy Economy*.
- Bajada, C., 1999. Estimates of the Underground Economy in Australia. *The Economic Record*, vol. 75, no. 231 – December, pp. 369-384.
- Bajada, C., Schnieder, F., 2003. The size and Development of shadow economies in the Asia-Pacific. *Paper presented at the Public Choice Meeting –Nashville/USA*.
- Bhattacharyya, D.K., 1990. An econometric method of estimating the “hidden economy”, United Kingdom (1960-1984): estimates and tests. *Economic Journal* 100.
- Belev, B., 2003. The informal economy in the EU Accession Countries: Size, Scope, *Trends and Challenges to the Process of EU Enlargement*, Center for Study of Democracy, Sofia.
- Brehm, J.W., 1966. A theory of psychological reactance. New York (Academic Press).
- Brehm, J.W., 1972. Responses to loss of freedom. A theory of psychological reactance. Morristown (General Learning Press).
- 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?, Linz: University of Linz, Department of Economics, Discussion Paper.
- Feige, E., 1986 A re-examination of the “Underground Economy” in the United States. *IMF Staff Papers*, 33/ 4, pp. 768-781.
- Feige, E. L., 1989 (ed.): The underground economies. Tax evasion and information distortion. Cambridge, New York, Melbourne, Cambridge University Press.
- Feige, E. L., 1994. The underground economy and the currency enigma, *Supplement to Public Finance/ Finances Publiques*, 49, pp. 119-136.
- Fleming, M.H., Roman, J., Farrel, G., 2000. The Shadow Economy, *Journal of International Affairs*, Spring 2000, No. 53/2, pp.64-89.
- Flores de Lima, B.M., 1985 Criptoconomia ou Economia Subterrânea. Estudos Especiais nº 5. *Instituto Brasileiro de Economia*. Editora da Fundação Getúlio Vargas.
- Frey, B. S., Werner P., 1984. The hidden economy: State and prospect for measurement, *Review of Income and Wealth*, 30/1, pp. 1-23.
- Frieden J., P. Ghezzi and E. Stein, 2000. Politics and Exchange Rates: A Cross-Country Approach To Latin America, *InterAmerican Development Bank Research Network Working Paper*.
- Friedman, E., Johnson, S., Kaufmann, D. and Zoido-Labton, P., 2000. Dodging the grabbing hand: The determinants of unofficial activity in 69 countries, *Journal of Public Economics*, 76/4, pp.459-493.
- Gerxhani, K., 2003. The Informal Sector in Developed and Less-Developed Countries: A Literature Survey, *Public Choice*, forthcoming.
- Giles, D.E.A., 1999. Modeling the hidden economy and the tax gap in New Zealand. *Department of Economics, University of Victoria*.

- Giles, D. E.A., 1999a. Measuring the hidden economy: Implications for econometric modelling, *The Economic Journal*, 109/456, pp.370-380.
- Giles, D.E.A.,1999b. Modelling the hidden economy in the tax-gap in New Zealand, *Empirical Economics* 24/4, pp.621-640.
- Giles, D. E.A., Linsey M., Tedds, 2002. Taxes and the Canadian Underground Economy, Canadian Tax Paper No. 106, *Canadian Tax Foundation*, Toronto/Ontario.
- Giles, D.E.A. e Caragata, P.J.,1998. The learning Path of the Hidden Economy: the Tax Burden and Tax Evasion in New Zealand. University of Victoria Econometrics Working Paper.
- Hamilton, J. D.,1994. Times Series Analysis. Princeton University Press. *Tax and growth effects in New Zealand. Department of Economics, University of Victoria*
- Johnson, S., Kaufmann, D., Shleifer A. ,1997. The unofficial economy in transition, Brookings Papers on Economic Activity, Fall, Washington D.C.
- Johnson, S., Kaufmann, D., Zoido-Lobaton P., 1998a. Regulatory discretion and the unofficial economy. *The American Economic Review*, 88/ 2, pp. 387-392.
- Johnson, S., Kaufmann, D., Zoido-Lobaton P.,1998b. Corruption, public finances and the unofficial economy. Washington, D.C.: *The World Bank*, discussion paper.
- Karmann, A., 1990. Schattenwirtschaft und ihre Ursachen: Eine empirische Analyse zur Schwarzwirtschaft und Selbstversorgung in der Bundesrepublik Deutschland, *Zeitschrift für Wirtschafts- und Sozialwissenschaften (ZWS)* 110/3, 1990, pp.185-206.
- Kirchgaessner, G.,1983. Size and development of the West German shadow economy, 1955-1980, *Zeitschrift für die gesamte Staatswissenschaft*, 139/2, pp. 197-214.
- Kirchgaessner, G.,1984. Verfahren zur Erfassung des in der Schattenwirtschaft erarbeiteten Sozialprodukts, *Allgemeines Statistisches Archiv*, 68/4, pp. 378-405.
- Kirchler, E., Maciejovsky, B., Schneider F., 2002. Everyday representations of tax avoidance, tax evasion and tax flight: Do legal differences matter?, *Economic Psychology*, 8/3, pp.1-19.
- Klovland, J.,1984. Tax Evasion and the Demand for Currency in Norway and Sweden: Is there a Hidden Relationship? *Scandinavian Journal of Economics*, 86:4, pp. 423-39.
- Lippert, O., Walker M. (eds.), 1997. The underground economy: Global evidences of its size and impact, Vancouver, B.C.: The Frazer Institute.
- Loayza, N. V.,1996. The economics of the informal sector: a simple model and some empirical evidence from Latin America. *Carnegie-Rochester Conference Series on Public Policy* 45, pp. 129-162.
- McKinsey Consulting, 2004. Eliminando as Barreiras ao Crescimento Econômico e à Economia Formal no Brasil. *Research Report* available at <http://www.etco.org.br>.
- Mummert, A. and Schneider F.,2001. The German Shadow Economy: Parted in a United Germany?, *Finanzarchiv*, 58/3, pp.260-285.
- Pastore, J.,2003. Simples Trabalhista. Article published in '*Jornal da Tarde*' on April 2, 2003.
- Pelzmann, L., 1988. *Wirtschaftspsychologie. Arbeitslosenforschung, Schattenwirtschaft, Steuerpsychologie*. Wien, New York (Springer).
- Pedersen, S., 2003. The shadow economy in Germany, Great Britain and Scandinavia: A measurement based on questionnaire service, Study No. 10, *The Rockwool Foundation Research Unit*, Copenhagen.
- Pozo, S. (ed.), 1996. *Exploring the underground economy: Studies of illegal and unreported activity*, Michigan: W.E. Upjohn, Institute for Employment Research.
- Ribeiro, R.N. and Bugarin, M.N.S.,2003. Fatores Determinantes e Evolução da Economia Submersa no Brasil. *Estudos Econômicos*, vol 33, número 2.

- Rodrik, D.,2001. Por qué hay tanta inseguridad económica en América latina? *La CEPAL 73 Journal*.
- Schneider, F., 1986. Estimating the size of the Danish shadow economy using the currency demand approach: An attempt, *The Scandinavian Journal of Economics*, 88/4, pp. 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: Brandstatter, Hermann, and Güth, Werner (eds.): *Essays on Economic Psychology*, Berlin, Heidelberg, Springer Publishing Company, pp. 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, pp. 137-152.
- Schneider, F. 1997. The shadow economies of Western Europe, *Journal of the Institute of Economic Affairs*, 17/3, pp. 42-48.
- Schneider, F., 1998a. Further empirical results of the size of the shadow economy of 17 OECD-countries over time, *Paper to be presented at the 54. Congress of the IIPF Cordowa, Argentina and discussion paper, Department of Economics, University of Linz, Linz, Austria*.
- 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)*, 1/98, S. 4-13.
- Schneider, F., 2000. Arbeit im Schatten: Einige theoretische und empirische Ueberlegungen ueber die Schattenwirtschaft, *Perspektiven der Wirtschaftspolitik* 2/4, pp.88-102.
- Schneider, F., 2003. The Shadow Economy, in: Charles K. Rowley and Friedrich Schneider (eds.), *Encyclopedia of Public Choice*, Kluwer Academic Publishers, Dordrecht.
- Schneider, F. and Dominik E., 2000. Shadow Economies: Size, Causes, and Consequences, *The Journal of Economic Literature*, 38/1, pp. 77-114.
- Schneider, F., Enste D.,2002. *The Shadow Economy: Theoretical Approaches, Empirical Studies, and Political Implications*, Cambridge (UK): Cambridge University Press.
- Schneider, F and Klinglmair, R., 2004. Shadow Economies around the world: What do we know? *Paper presented at the Public Choice Meeting 2004 - Baltimore (USA)*.
- Spiro, P.S., 1993. Evidence of a Post-GST Increase in the Underground Economy; *Canadian Tax Journal/ Revue Fiscale Canadienne*, , 41:2, pp. 247-258.
- Smith, P., 1994. Assessing the size of the underground economy: *The Canadian statistical perspectives, Canadian Economic Observer* 11/010, pp.3.16-33.
- Tanzi, V., 1999. Uses and Abuses of Estimates of the Underground Economy, *The Economic Journal* 109/456, pp.338-340.
- 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?, *The Economic Journal* 109/456, pp. 381-389.

## 7 Tables, figures and graphs

**Table 2.1: A Taxonomy of Types of Underground Economic Activities<sup>1)</sup>**

Type of Activity	Monetary Transactions		Non Monetary Transactions	
<b>Illegal Activities</b>	Trade with stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud; etc.		Barter of drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	<b>Tax Evasion</b>	<b>Tax Avoidance</b>	<b>Tax Evasion</b>	<b>Tax Avoidance</b>
<b>Legal Activities</b>	Unreported income from self-employment; 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 neighbor help

<sup>1)</sup> Structure of the table is taken from Lippert and Walker (1997, p. 5) with additional remarks.

**Table 3.1: DYMIMIC Estimations of the size of the shadow economy of 17 Latin American countries in Middle and South America over 1990/91, 1994/95 and 1999/2000**

<b>Cause Variables</b>	<b>Estimated Coefficients</b>
Share of direct taxation (in % of GDP)	$\lambda_1 = 0.21^{(*)}$ (1.89)
Share of indirect taxation and custom duties (in % of GDP)	$\lambda_2 = 0.245^*$ (3.45)
Burden of state regulation (share of public administrative employment In % of total employment)	$\lambda_3 = 0.312^*$ (2.84)
Unemployment quota	$\lambda_4 = 0.294^*$ (3.61)
GDP per capita	$\lambda_5 = -0.153^*$ (-2.43)
<b>Indicator Variables</b>	<b>Estimated Coefficients</b>
Employment quota (in % of population 18-64)	$\lambda_6 = -0.643^*$ (-3.45)
Annual rate of GDP	$\lambda_7 = -1$
Change of currency per capita	$\lambda_8 = 0.361^{**}$ (4.99)
<b>Test-statistics</b>	$RMSEA^1) = 0.000^*$ (p-value) = 0.563  $Chi-square^2) = 402.34$ (p-value = 0.000) $N = 51$ $DF^3) = 28$

Notes:

t-statistics are given in parentheses ( ); \* (\*) means  $|t\text{-statistics}| > 1.96$  ( $|t\text{-statistics}| > 1.72$ ).

<sup>1)</sup> p-value for test of close fit;  $RMSEA < 0.05$ ; the p-value varies between 0.0 and 1.0.

<sup>2)</sup> If the structural equation model is asymptotically correct then the matrix S (sample covariance matrix) will be equal to  $\Sigma(\theta)$  (model implied covariance matrix). This test has a statistical validity if there are large sample ( $N \geq 100$ ) and multi normal distributions both is given for a all three equations in table 3.1 to 3.3 using for a test of multi normal distributions.

<sup>3)</sup> The degrees of freedom are determined by  $0.5(p + q)(p + q + 1) - t$ ; with p = number of indicators; q = number of causes; t = the number for free parameters.

**Table 3.2: The Size of the Shadow Economy in 17 Central and South American Countries**

No.	Country	<i>Shadow Economy [in % of GDP] using the DYMIMIC and Currency Demand Method</i>		
		Average 1990/91	Average 1994/95	Average 1999/2000
1	Argentina	22.1	24.8	25.4
2	Bolivia	55.4	60.4	67.1
3	Brazil	32.5	36.4	39.8
4	Chile	13.6	16.4	19.8
5	Colombia	33.4	36.2	39.1
6	Costa Rica	22.0	24.2	26.2
7	Dominican Republic	28.4	30.4	32.1
8	Ecuador	28.9	31.4	34.4
9	Guatemala	41.4	45.9	51.5
10	Honduras	40.7	44.3	49.6
11	Jamaica	31.4	33.2	36.4
12	Mexico	24.1	27.1	30.1
13	Nicaragua	40.1	43.2	45.2
14	Panama	51.4	58.2	64.1
15	Peru	47.1	52.3	59.9
16	Uruguay	41.3	45.3	51.1
17	Venezuela, RB	27.4	30.4	33.6
	<i>Unweighted Average</i>	<i>34.2</i>	<i>37.7</i>	<i>41.5</i>

Source: Own calculations.

**Table 3.3: Total tax burden for Brazil in terms of GDP**

Year	(% of GDP)
1998	29.74
1999	31.77
2000	32.48
2001	33.84
2002	35.86

Source: SRF

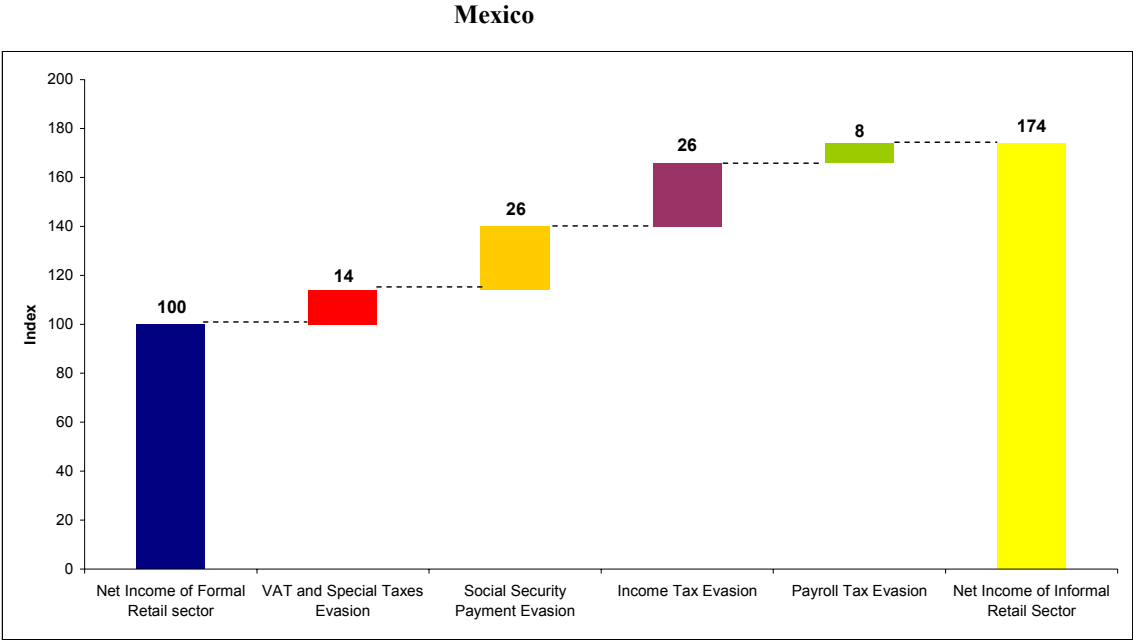
**Table 3.4: Total tax burden in terms of GDP for selected Latin American countries**

<b>Country</b>	<b>(% of GDP– 1990/2000)</b>
Argentina	12.12
Bahamas, The	15.97
Bolivia	12.14
Chile	18.50
Costa Rica	17.79
Dominican Republic	14.23
Mexico	13.02
Panama	17.66
Paraguay	9.98
Peru	14.03
Uruguay	25.85
Venezuela, RB	14.86

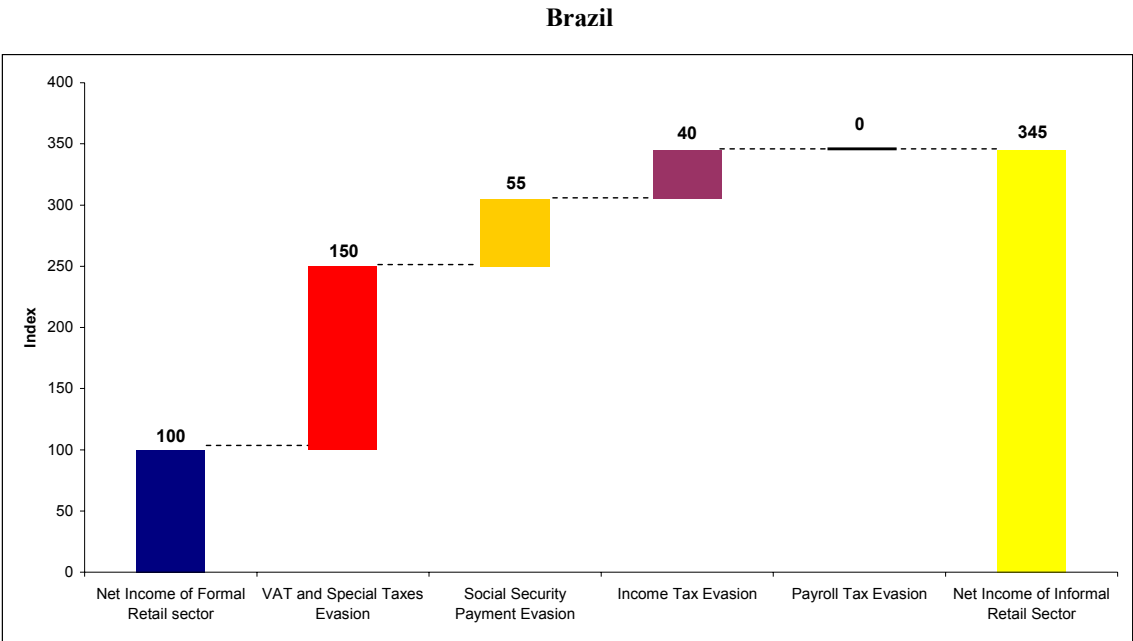
**Source:** World Development Indicators, 2003.

**Note:** The data used were for the years between 1990 and 2000. The countries were selected in accordance with the following criteria: countries that presented information for all years. The average for Brazil in the WDI, 2003, using existing data, is 18% of GDP, which is totally different from the reality.

**Figure 3.1: Comparison between Mexico and Brazil of net income in the formal and informal sectors in the food industry.**



Source: McKinsey Consulting (2004)



Source: McKinsey Consulting (2004)

**Table 3.5: The distributive effects of intervention by the Brazilian Federal Government**

Decile	Portion appropriated for each income group (%)			
	Initial Income	Gross Income	Available Income	Final Income
1	0.7	0.8	1.0	0.9
2	1.5	1.7	1.9	1.8
3	2.3	2.5	2.7	2.5
4	3.2	3.4	3.6	3.4
5	4.2	4.5	4.6	4.4
6	6.0	5.9	6.0	5.6
7	8.2	8.1	8.1	7.7
8	11.3	10.9	10.9	10.5
9	16.7	16.5	16.5	16.5
10	45.9	45.7	44.8	16.6
All households	100	100	100	100
Ratio of +20% over -20%	29	24	21	23
Gini's coefficient	0.64	0.58	0.56	0.58

**Notes:**

1. Households organized by equivalent gross income, where the equivalence scale used is 1 for the head of the household, 0.7 for other adults and 0.5 for children under 18.
2. Initial Income – total annual income for all members of the household before deductions for taxes or the addition of government transfers.
3. Gross Income – Initial Income plus government transfers (unemployment benefit and the minimum income program).
4. Available Income – Gross Income less direct taxes and social security contributions.
5. Final Income – Available Income less indirect taxes.

**Source:** Secretary of Political Economy, Ministry of Finance of Central Government. Social Spending: 2001-2002. ([www.fazenda.gov.br](http://www.fazenda.gov.br))

**Table 3.6: Impact of Monetary Transfers and direct and indirect Taxes on income distribution in some countries.**

Country	Gini coefficient		
	Initial Income	Gross Income	Available Income
Belgium	0.53	0.35	0.29
Sweden	0.55	0.34	0.32
Germany	0.55	0.39	0.32
Denmark	0.55	0.37	0.33
Spain	0.51	0.38	0.33
Canada	0.51	0.38	0.34
United Kingdom	0.53	0.38	0.35
Australia	0.49	0.40	0.35
The United States	0.53	0.43	0.38
Brazil	0.64	0.58	0.56

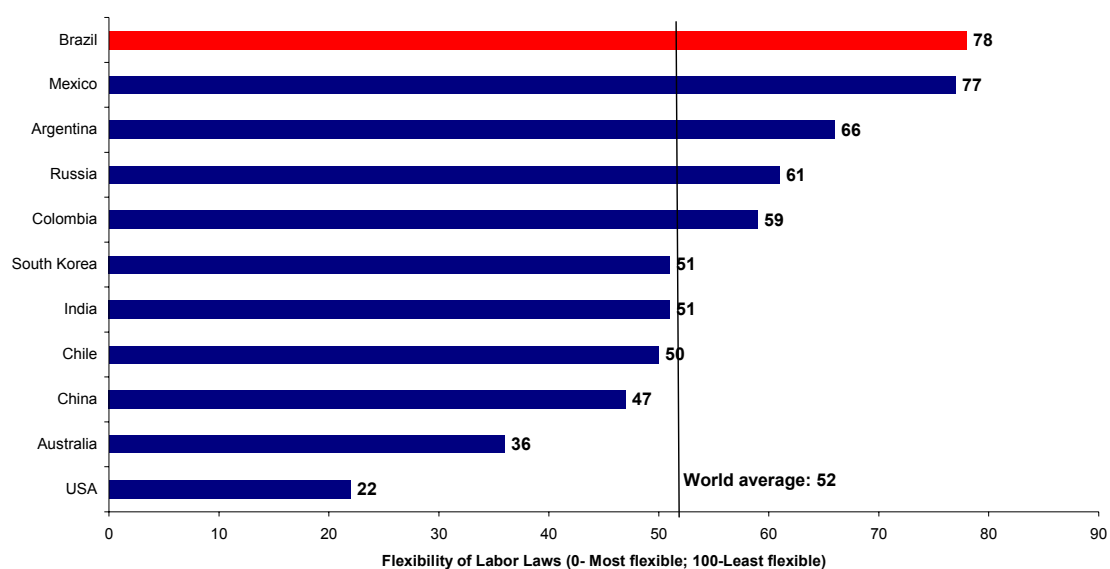
**Source:** Secretary of Political Economy, Ministry of Finance of Central Government. Social Spending: 2001-2002. ([www.fazenda.gov.br](http://www.fazenda.gov.br))

**Table 3.7.: Degree of economic opening**

Period	Sum (Exports + Imports) / GDP
The 70s	16.63
The 80s	17.74
The 90s	17.99

Source: World Development Indicators, 2003.

**Figure 3.2: Degree of rigidity in labor legislation**



Source: McKinsey Consulting (2004)

**Table 3.8: Labor costs per working hour in Brazil**

<b>Type of Expense</b>	<b>% of wage</b>
<b>Group A – Social charges</b>	<b>36.30</b>
<b>Social security</b>	20.00
FGTS (obligatory redundancy fund)	8.50
Educational salary	2.50
Workers' compensation (average)	2.00
SESI/SESC/SEST (workers' funds)	1.50
SENAI/SENAC/SENAT (workers' funds)	1.00
SEBRAE (support for small enterprises)	0.60
INCRA (agrarian reform)	0.20
<b>Group B – Time not worked I</b>	<b>38.23</b>
<b>Weekly rest period</b>	18.91
Vacations	9.45
Vacation bonus	3.64
Public holidays	4.36
Notice period (payment for unjustifiable dismissal)	1.32
Nursing assistance	0.55
	38.23
<b>Group C – Time not worked II</b>	<b>14.12</b>
13th salary	10.91
Dismissal expenses	3.21
<b>Group D – Cumulative incidences</b>	<b>14.81</b>
Cumulative incidence of Group A/ Group B (there are expenses in Group A that are charged on items in Group B, which is why they are called cumulative)	13.88
Incidence of FGTS on 13th salary	0.93
<b>General total</b>	<b>103.46</b>

Source: Pastore (2003)

**Table 3.9: Level of unprotected employment in some Latin American countries**

Country	Year	Unprotected employment (as a percentage of the total number of employees)
Argentina	1990	21.7
	1996	34
Bolivia	1991	28
	1997	34.8
Brazil	1985	63.6
	1996	68.5
Chile	1990	17
	1996	22.3
El Salvador	1994	59.1
	1997	61.3
Mexico	1990	43.4
	1997	49.6
Peru	1990	25.5
	1996	34.1

Source: Rodrik (2001)

**Table 4.1: Flores de Lima's (1985) estimate of the SE for the years 1981 to 1983**

Year	1981	1982	1983
	US\$/million	US\$/million	US\$/million
Tax evasion	2,556.34	2,761.40	1,906.39
Debt evasion	2,000.00	2,000.00	2,000.00
Informal Labor Market	25,013.72	28,490.26	19,552.02
Total	25,013.72	33,251.66	23,458.41
% of GDP	10.9	12.1	....

Note: This is still a preliminary version for 1983.

**Table 4.2.: Results of the MIMIC model in Ribeiro and Bugarin (2003)**

	Indicator variables		Causal variables					
	<i>GDP</i>	<i>NTSCT</i>	<i>DIGPDI</i>	<i>DESEMP</i>	<i>DTRADE</i>	<i>RDPOC</i>	<i>MINSALARY</i>	<i>NTCCT</i>
	1.0000	2.0074	0.0049	0.1110	0.0115	-0.1336	0.0243	-0.2591
Standard error		(0.4946)	(0.0352)	(0.0674)	(0.0360)	(0.0531)	(0.0358)	(0.0933)
T – student test		4.0587	0.1389	1.6465	0.3200	-2.5175	0.6778	-2.7756
Expected sign		[+]	[+]	[+]	[-]	[-]	[?]	[-]

**Table 4.3. – Results of the ADF Test**

	<b>Test Statistics</b>	<b>Result (to 5% of significance)</b>	<b>Deterministic terms</b>
Log (PMPP)	-9,882471	I(0)	Constant and Trend
Log (GDP)	-2,470149	I(1)	Constant and Trend
Log (T)	-3,193413	I(1)	Constant and Trend
Log (R)	-4,153513	I(0)	Constant

**Table 4.4. – Number of Cointegration Vectors – Johansen Test**

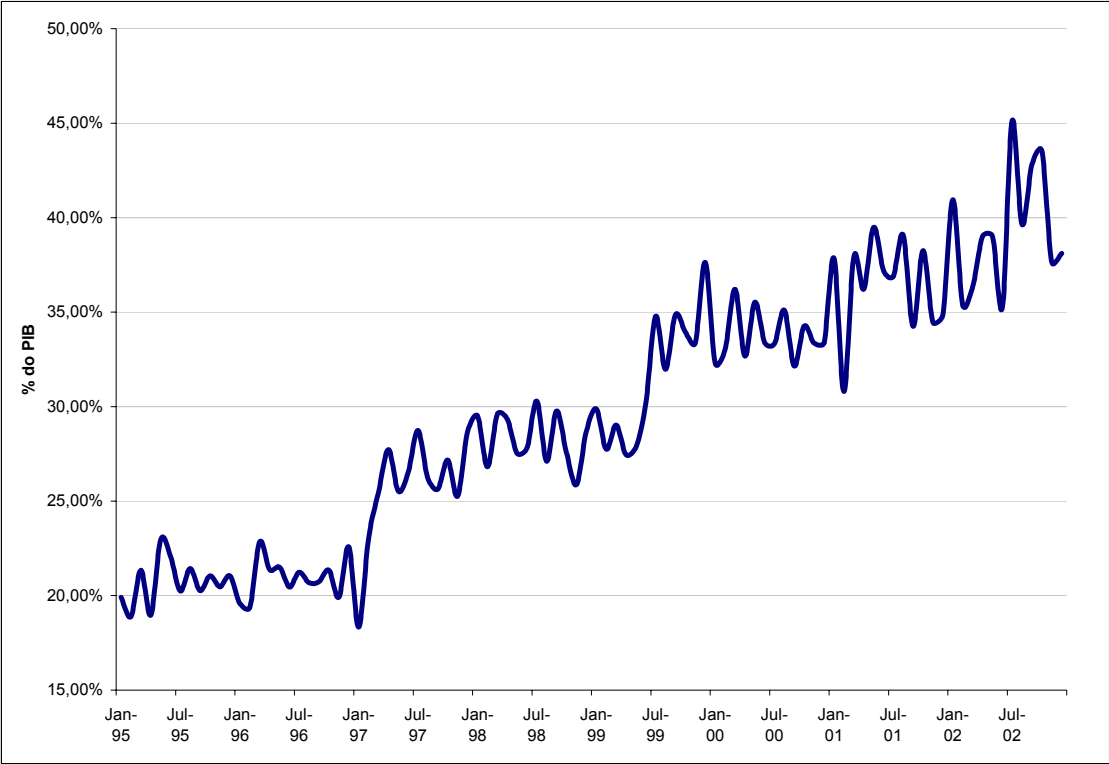
Trend of data	None	None	Linear	Linear	Quadratic
Posto or Number of Cointegration Equation	Without Intercept Without Trend	With Intercept Without Trend	With Intercept Without Trend	With Intercept With Trend	With Intercept With Trend
Number of Cointegration Values (to%5) Selected Model (columns)					
Trace	3	4	3	5	5
Maximum autovalue	2	2	2	3	3

**Table 4.5. – Results of Specifications Selected – MIMIC Models**

Variables	1	2	3	4	5
<b>Indicator</b>					
NTSCT	0.198	0.196	0.191	0.187	0.187
	(0.027)	(0.027)	(0.028)	(0.026)	(0.027)
PMPP	1	1	1	1	1
D(GDP)					-0.005
					(0.018)
<b>Causal</b>					
CPMF	0.299	0.244	0.216	0.212	0.213
	(0.040)	(0.036)	(0.036)	(0.034)	(0.034)
TRADE	5.947	6.012	5.232	5.529	5.483
	(0.762)	(0.767)	(0.726)	(0.719)	(0.717)
DESEMP		6.046	5.792	5.47	5.474
		(1.612)	(1.639)	(1.633)	(1.633)
RTRIB			0.326	0.407	0.411
			(0.094)	(0.097)	(0.097)
RDPOC				0.337	0.322
				(0.207)	(0.207)
C	348.66073	337.42233	333.18296	331.68675	331.52229
C-df	323.66073	313.42233	310.18296	309.68675	310.52229
AIC	386.66073	377.42233	375.18296	375.68675	377.52229
BCC	390.63747	381.60837	379.57831	380.2914	382.33625
BIC	435.38334	428.70929	429.03427	432.10241	436.5023
C/df	13.94643	14.05926	14.48622	15.17667	15.78678

Note: Most suitable model.

**Graph 4.1– Evolution of the Participation of the Shadow Economy – MIMIC Model**



## 8 Appendix

**Table A.1: The Name and Acronyms of the institutions that produce information and the research they are responsible for**

Name of institution	Acronym	Research the institution is responsible for		
Brazilian Institute of Geography and Statistics	IBGE	PME	Monthly employment survey	Monthly survey on employment and the income from formal and informal work, carried out in six major cities: Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre.
		SCN	National Accounts System	Calculation of Brazil's national accounts
Getúlio Vargas Foundation	FGV	IGP-DI	General Price Index – Internal Disposability	Monthly inflation calculation (includes consumer, wholesale and civil construction prices)
The Center for Foreign Trade Studies Foundation	FUNCEX		Responsible for producing primary data on exports and imports	
Internal Revenue Department	SRF		Responsible for collecting taxes and producing primary data on federal government revenue	
Institute of Applied Economic Research	IPEA	GDP	GDP estimate	Has a webpage <a href="http://www.ipeadata.gov.br">www.ipeadata.gov.br</a> where it is possible to find the majority of statistics relating to the Brazilian economy mentioned here
Ministry of Labor and Employment	MTE	Minimum salary	Fixed by law for the whole country	
		RAIS	Annual Report of Social Information	Information about the companies that are registered

**Table A.2: Definitions of the acronyms of the variables used in the work of Ribeiro and Bugarin (2003)**

Variable	Definition	Source
<b>GDP</b>	Gross Domestic Product	IBGE – SCN
<b>NTSCT</b>	Number of Workers without an Employment Register (they used only the city of São Paulo)	IBGE- PME
<b>DIGPDI</b>	Rate of Inflation – General Price Index – Internal Disposability	FGV – IPEADATA
<b>DESEMP</b>	Rate of Unemployment – Brazil	IBGE- PME
<b>DTRADE</b>	Index of Imports and Exports divided by the GDP	FUNCEX – IPEADATA
<b>RDPOC</b>	Disposable Income divided by the total population in employment	= <b>(GDP – CTRIB)/POC</b>
<b>MINSAL</b>	Minimum wage	Ministry of Labor
<b>NTCCT</b>	Number of Workers with an Employment Register (city of São Paulo)	
<b>CTRIB (used in the definition of RDPOC)</b>	Total Tax Burden	SRF
<b>POC (used in the definition of RDPOC)</b>	Economic Population Active (retired people + employee)	IBGE- PME

**Note 1:** All the variables were tested using real values (basis July/1994=100). DIGPDI and DTRADE were used in first difference due to the results of the Augmented Dickey-Fuller test (ADF).

**Note 2:** The period for which the variables were used was August 1994 to December 1999.

**Table A.3. Descriptive Statistics – Variables used to estimate the volume of money used in the SE**

	PMPP	GDP	R	T	IGP
<b>Mean</b>	17786.23	229734.00	4.39	0.06	0.14
<b>Median</b>	17177.92	233974.10	1.64	0.05	0.03
<b>Maximum</b>	42351.42	364306.20	47.80	0.09	1.94
<b>Minimum</b>	719.91	18881.63	1.17	0.04	-0.01
<b>Std. Dev.</b>	9394.03	75593.38	10.10	0.01	0.44
<b>Skewness</b>	0.42	-0.58	3.91	0.46	3.86
<b>Kurtosis</b>	2.83	3.40	16.46	1.98	16.09
<b>Jarque-Bera</b>	1.13	2.34	373.49	2.91	355.80
<b>Probability</b>	0.57	0.31	0.00	0.23	0.00
<b>Sum</b>	658090.40	8500160.00	162.37	2.12	5.25
<b>Sum Sq. Dev.</b>	3.18E+09	2.06E+11	3669.80	0.01	6.92
<b>Observations</b>	37	37	37	37	37

**Table A.4 – Estimated Results – VEC Model**

<b>Coefficients</b>	<b>Expected signs</b>	<b>Equation (4)</b>	<b>T Statistics</b>	<b>P-value</b>
$\delta_0$	[?]	-2.019	-1.882	0.075
$\delta_1$	[+]	0.806	5.059	0.000
$\delta_2$	[-]	-0.061	-1.096	0.286
$\delta_3$	[+]	0.094	0.914	0.371
$\delta_4$	[+]	0.019	1.545	0.138
$\beta_1$	[?]	0.009	0.212	0.834
$\beta_2$	[?]	-0.009	-0.167	0.869
$\beta_3$	[?]	0.263	4.340	0.000
$\phi_1$	[?]	-0.745	-4.230	0.000
$\varphi_1$	[?]	0.667	3.366	0.003
$\varphi_2$	[?]	-0.038	-0.880	0.389
$\varphi_3$	[?]	-0.076	-0.733	0.472
$\varphi_4$	[+]	0.017	0.964	0.347
$\theta_1$	[?]	0.017	3.438	0.003
$\beta_4$	[+]	0.237	1.028	0.316
<b>R<sup>2</sup> = 0.991</b>				
<b>R<sup>2</sup> adjusted = 0.985</b>				
<b>Log likelihood = 72.682</b>				
<b>Durbin-Watson Statistic = 2.291</b>				

**Table A.5 – Descriptive Statistics – Variables used in estimating the MIMIC model**

	<b>D_PIB</b>	<b>SEMCART</b>	<b>PMPP</b>	<b>RDPOC</b>	<b>CPMF</b>	<b>TRADE</b>	<b>RTRIB</b>	<b>DESEMP</b>
<b>Mean</b>	0.100	119.289	274.847	105.554	105.096	17.116	147.397	7.009
<b>Median</b>	0.373	116.682	282.268	103.912	121.469	15.699	149.118	6.999
<b>Maximum</b>	12.628	136.123	409.593	126.194	225.253	29.220	216.185	9.029
<b>Minimum</b>	-12.362	103.376	141.918	83.443	-1.036	9.877	104.418	4.250
<b>Std. Dev.</b>	5.429	9.896	59.000	9.557	75.922	4.260	22.944	1.315
<b>Skewness</b>	-0.158	0.178	-0.337	0.202	-0.334	0.690	0.223	-0.272
<b>Kurtosis</b>	2.441	1.685	2.842	2.295	1.653	2.666	2.491	1.897
<b>Jarque-Bera</b>	1.650	7.427	1.922	2.639	9.040	8.073	1.829	6.047
<b>Probability</b>	0.438	0.024	0.383	0.267	0.011	0.018	0.401	0.049
<b>Sum</b>	9.618	11451.760	26385.320	10133.180	10089.220	1643.142	14150.120	672.873
<b>Sum Sq. Dev.</b>	2800.181	9304.086	330698.500	8676.531	547592.500	1723.852	50011.890	164.215
<b>Observations</b>	96	96	96	96	96	96	96	96