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An analysis in Latin American Countries.**

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What is the relationship between Unofficial and Official Economy? An analysis in Latin American Countries.

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Abstract

This paper analyzes the relationship between unofficial economy (UE) and official GDP. Through the study of the UE within an institutional comprehensive empirical framework, a positive correlation is found between unofficial and official GDP. Empirical evidence on the procyclicality of UE supports the conclusion that the two sectors are rather complements than substitutes for Latin American countries. Then UE is considered as beneficial to sustain economic growth. Suggestions for economic policy and hints for further research are also offered.

Keywords: Unofficial economy, Economic Development, Latin America, Institutions.

1. Introduction

One of the most discussed questions in the literature on the Unofficial Economy (UE) is about its interactions with the official GDP. Various researches have recently investigated the overall sign of the impact of the UE on the economic performance but they have often yielded different results (e.g. Dell'Anno, 2003; Schneider and Klinglmair, 2004; Schneider, 2005; Galli and Kucera, 2003; Dreher et al., 2007). These controversial outcomes hold the hypothesis that in UE, beneficial and damaging effects coexist on the growth of official GDP. In this research, we attempt to determine which effect prevails in Latin American countries.

On the one hand, UE may damage economic performance. Klinglmair and Schneider (2006), Giles (1997a, b), and Giles et al. (2002) state that rising UE leads to a considerable erosion of the tax base, resulting in a worse provision of public infrastructure and basic public services. Finally, it leads to lower official growth. UE is also considered one among the causes for the inefficient functioning of the goods and labor markets. It introduces distortion of competition within economic sectors and among national economies (Dell'Anno, 2007). A growing UE may attract workers away from the official economy and create unfair competition between unofficial and official firms (Enste, 2003). Due to the exclusion of the unofficial activities by both credit market and public programs for business development, irregular activities rather than regular ones hinder increase in size and initiation of large-scale business strategies. In this sense, UE may be a constraint to hinder industrial development and transition process. UE may also slow down the economic growth by affecting the social capital and ruining the institutional setting. Hidden activities favor corruption and link with criminal activities. UE increases lack of trust in the institutions and feeds resentment among citizens. It harms involved workers by depriving them of rights and guarantees. Furthermore, UE may hamper policy making as it questions the reliability of the national account aggregates.

On the other hand, UE provides beneficial effects to the official economy. According to Schneider and Enste (2000), UE creates an extra-added value that can be spent in the official economy.

They estimate that at least two-third of the income earned in unofficial market is immediately spent in the official economy, thus having a positive effect on the latter. According to Kaufmann and Kaliberda (1996), the UE has had a positive side during the transition period, providing beneficial market experience to the nascent entrepreneurs. According to Thomas (1992), the irregular activities facilitate the transition by acquiring skills necessary for future development. According to Smith (2002), UE helps in the employment of some individuals who would otherwise be unemployed and provide services that would otherwise be unavailable. Further advantages of UE derive from equity prospective. Usually people with low personal income are involved in informal production activities. Therefore, UE may modify (reduce) the distribution of income in society. In this sense, for countries with high unemployment rate, the informal sector may represent a social buffer. In the following, we attempt to assess as to which of the previous effects lead to the correlation between official and unofficial GDP.

The analysis of correlation between the two sides of economy has also been examined in literature using a Granger causality approach. This econometric approach aims to determine the direction of causal influence between measured and hidden economy. Giles (1997a, 1997b, 1999a) and Giles and Tedds (2000) carried out these tests for New Zealand and Canada, respectively. In both the countries, they found a significant evidence of Granger causality from the measured economy to the UE. They concluded that the UE “follows the measured economy through the cycle, rather than vice versa” (Tedds and Giles, 2000, p. 9).

According to Galli and Kucera’s (2003) study on the movements over business cycle of the informal employment, the formal employment tends to be procyclical and informal employment to be countercyclical. Similarly, Calderon-Madrid (2000) showed procyclical movements of workers from informal into formal employment. Consequently, UE may yield beneficial effects to stabilize the business cycle fluctuations.

A further contribution on the negative or positive effects of UE prevailing on official GDP is given by Schneider (2005). He estimated a quantitatively important influence of UE on the growth of the official economy. Empirical evidence revealed correlation between changes in these two phenomena according to the degree of economic development. In particular, Schneider (2005) found a negative correlation between UE and official economy for developing countries and a positive relationship for industrialized and transition ones. This outcome implies that UE could be procyclical for developing economies and countercyclical for developed and transition countries.

A relevant question for any econometric analysis of UE is the endogeneity issue. To control them, we apply a dynamic panel approach as proposed by Arellano and Bond (1991). It offers many advantages for researchers; for instance, this technique allows both for controlling for the potential endogeneity of all explanatory variables and for removing any bias created by unobserved country-specific effects (Sendeniz-Yuncu et al., 2007).

This paper examines the economic reasons behind interactions between UE and official economy by taking into account the institutional setting in the econometric framework. It means the union of two strands of literature: the research that examines UE by following an institutional approach with the analyses of the interactions between UE and the official GDP. This research differs from others on the following aspects: it considers a comprehensive institutional setting for empirical examination. According to Giles (1997a, 1997b), Giles and Tedds (2000), and Hametner and Schneider (2007), this study develops a cross-country analysis for a group of comparable countries. It should reduce the sources of heterogeneity with respect to a worldwide analysis as well as allow for generalizing empirical findings with respect to a single-country approach. A conversion of the UE estimates having the same unit of measure as that of the measured GDP is proposed here. From the best of our knowledge, this issue has not been taken into account in the literature. Not surprisingly, this question assumes fundamental relevance to investigate the interactions between official and unofficial GDP. In particular, we transform Schneider’s (2005, 2007) estimates of the UE as percentage of official GDP into unofficial GDP measured on purchasing power parity (PPP) per capita. Finally, we

infer some suggestions to design more effective economic policies to effectively fight UE without endangering the official economic development.

This article is organized as follows. Section 2 presents an overview of the empirical researches analysing the relationship between official and UE. Section 3 describes the panel data model applied. Empirical outcomes are discussed in Section 4. The article ends with general conclusions. An appendix with data sources and variable definitions is provided.

2. What do we know about the interactions between unofficial and official economy?

Much of what we know today about the effects of UE on official economy, and vice versa, has been learned both from comparative and single-country studies. Although this literature has unearthed significant information on economic policies practices in a score of countries, these studies have been subject to two main limitations. First, literature is still lacking in a widely accepted theory of UE that universally works for each country and time-period. Second, invariably the authors have found extremely difficult-to-compute reliable UE estimates. The limited reliability of the shadow economy estimates undermines the empirical assessments of theoretical statements on the effects of UE. A number of these studies is discussed here to make a widespread overview on how the UE affects, and/or is affected by, the official economic development.

According to Chen (2007), there are at least three schools of thought on link between informal and formal economies: dualism, structuralism, and legalism. The “dualists” argue that unofficial activities have few linkages to the official economy but, rather, operate as a separate sector. This approach is based on the neoclassical hypothesis that rigidities in the official sector, introduced through legislation or negotiation, segment the market (Harris and Todaro, 1970). The dualist hypothesis asserts that these two sectors are subsidiaries through common factors that lead to the flow of workers and activities from formal to the informal economy.

The “structuralists” consider the informal and formal sectors as intrinsically linked. Formal enterprises promote informal production and employment relationships with subordinated economic units and workers to reduce their input costs (Chen, 2007). According to this approach, both informal enterprises and informal wage workers are inclined to meet the interests of increasing the competitiveness of regular firms, providing cheap goods and services (Moser, 1978; Portes et al. 1989). Consequently, growing official economy boosts unofficial production.

The “legalists” direct their interest on the relationship between informal activities and the formal regulatory environment, not formal firms (Chen, 2007), which is attributed to the fact that the capitalist interests collude with government to set the formal “rules of the game” (de Soto, 1989).

Another viewpoint to examine the economic consequences of UE on official economy is based on the analysis of the nature of this relationship. It means that the interest of economist is to know if substitution effects prevail on complementary ones. When the complementarities between unofficial and official economy overcome the substitution effects, larger UE should stimulate the official growth. It fits the structuralist hypothesis. The economic explanation is that the value-added created in the UE is spent (also) in the official sector. At the same time, more official production increases the demand of unofficial goods and services. Various studies have supported the hypothesis of beneficial effect of UE on economic development. For instance, Adam and Ginsburg (1985) estimate a positive relationship between the growth of the UE and the official economy under the assumption of low probability of enforcement. Lubell (1991) considers as significant the influence of the UE on the development of official economy. Bhattacharyya (1999) shows clear evidence in case of the United Kingdom (from 1960 to 1984) that the UE has a positive effect on several components of GDP (e.g. consumer expenditures, services, etc.). According to Asea (1996), UE offers significant contributions “to the creation of markets, increase financial resources, enhance entrepreneurship, and transform the legal, social, and economic institutions necessary for accumulation” (ibidem, p. 166). Enste (2003) argues

that UE stimulates economic development in transition countries. He considers the shadow economy as an incentive to develop both the entrepreneurial spirit and a constraint to limit an excessive growth of the government activities. Schneider (2003) emphasizes that UE, stimulating higher competition, leads to more efficient resource allocation on both sides of economy. Again, by assuming complementarities between UE and official GDP, Schneider (2005) claims that the unofficial activities, boosting the economic growth, is also able to generate additional tax revenues. Further empirical evidence of a positive correlation between UE and official economy are also found by Tedds (2005), Giles (1999a, 1999b), Giles and Tedds (2002), Bovi and Dell'Anno (2007), and Hametner and Schneider (2007).

The alternative hypothesis that substitution effects between unofficial and official GDP prevail on complementarities, is basically based on the idea that unofficial activities, creating unfair competition, interferes negatively with the market allocation.

From the demand side, a lack of transparency may distort the information flows, thus making difficult market competition and an efficient comparison of goods and services. From production side, the untaxed return of investment of the unofficial business activities may attract resources from official firms. It is due to the fact that more productive investments of official activities may have lower taxed returns than unofficial ones. Then the misallocation slows down economic growth. Feige and McGee (1989) point out the damaging consequences caused by anticyclical monetary and fiscal policy measures when UE is not taken into consideration by the policy maker. Macroeconomic stability and economic reforms to sustain economic growth are thus harder to attain. Loayza (1996) found empirical evidence of negative correlation between the size of informal sector and the growth rate of official real GDP per capita for 14 Latin American countries. The inverse relationship between UE and economic growth is theoretically supported by author's hypothesis on shadow economy's congestion effect. Loayza (1996) set out a model where the production technology depends on tax-financed public services, and the informal sector does not pay taxes but must pay penalties and these resources are not used to finance public services. According to these assumptions, larger UE reduces the availability of public services to the official economy than do the existing public services which are being used less efficiently. Ihrig and Moe (2000) reveal that the movements in the size of UE have an economically significant and negative effect on the growth of real GDP per worker. By examining the UE in 24 transition countries, Eilat and Zinnes (2000) found an inverse relationship between official and UE. They estimated that a one-dollar fall in official GDP was associated with a 31-percent increase in the size of the UE. Kaufmann and Kaliberda (1996) observed that UE mitigates the decrease in official GDP of transition countries. They estimated that for "every 10 percent cumulative decline in official GDP, the share of the irregular economy in the overall increases by almost 4 percent" (ibidem, p. 46). Schneider and Enste's (2000) overall survey of 76 countries concludes that a growing UE has a negative impact on official GDP growth. Ihrig and Moe (2004) estimate a negative convex relationship between real GDP per worker and the percent of output produced in the informal sector. According to Chong and Grandstein's (2007) findings, a large informal sector implies, inter alia, slower economic growth. Among the other scholars that find a negative relationship between UE and official economy: Frey and Weck-Hannemann (1984); de Soto (1989); Turnham et al. (1990); Thomas (1992); Johnson et al. (1998, 1999); Friedman et al. (2000); Ott (2002); Dell'Anno (2003); Dabla-Norris and Feltenstein (2005); Dell'Anno et al. (2007); Dell'Anno (2007).

As this survey has summarized, the literature presents contradictory results. A noteworthy contribute to reconcile these findings come from Schneider's (2005) research. He finds that the effects of the UE on the official economic growth are just *prima facie* ambiguous. The sign of correlation becomes well defined if it is conditioned to the degree of economic development. He estimated a negative relationship between the UE of low-income countries and the official rate of economic growth but a positive relationship between UE and economic growth in industrialized and transition countries. Schneider's motivation was that the citizens of high-income countries are overburdened by taxes and regulation so that an increasing UE stimulated the official economy as the additional income earned in the UE was spent in the official sector. On the contrary, for low-income countries, an increasing UE

“erodes the tax base, with the consequence of a lower provision of public infrastructure and basic public services with the final consequence of lower official economy” (Schneider, 2005, p. 613). Schneider (2005) stated that the effects of UE on the economic development should be evaluated by considering the beneficial effects that a lower size of the UE has in terms of tax revenue. In other words, to discover hidden tax base means additional resources for policy maker, thus leading to more resources for investment in productive public goods and services. By this viewpoint, if the policy maker has lack of resources to finance public investments (e.g. infrastructures, education, etc.), as in low-income countries, then lower UE makes possible the promotion of the economic growth through finance policies.

With reference of structural characteristics of Latin American UE, it is important to consider the workers’ mobility between formal and informal employment. In these countries, the informal labor is considered one of the most relevant components of UE. In this sense, a negative relationship between official and UE in Latin America may be lead by the flow of workers from formal to informal labor market. A number of studies investigate on this issue. Among these, Funkhouser (1997), Maloney (1999), and Calderon-Madrid (2000) give empirical evidence on substantial flow of workers back and forth between formal and informal employment. Galli and Kucera (2003) assess that “informal employment serves as a macroeconomic buffer for formal sector employment over the course of business cycles, with informal employment expanding during downturns and contracting during upturns (ibidem, p. 17)”.

Both Schneider (2005) and Galli and Kucera (2003) state that the relationship between official and unofficial side of production is not intrinsic, but it depends on the economic development and the institutional factors characterizing the country and time-period under analysis. By taking into account their statement, the next sections will attempt to examine the sign of correlation between UE and official GDP through an institutional framework where the two-way interactions between official and unofficial economy are estimated through a dynamic panel model.

3. Data Issues and Econometric Model

Until few years ago, quantitative analyses of interactions between variables such as UE, indexes of rule of law, economic freedom, and labor regulation have been virtually impossible. Fortunately, the recent availability of data on the scope of institutions’ performance and UE now makes such a study possible. In particular, we refer of Schneider’s (2005, 2007) estimates of the UE as percentage of official GDP and recent releases of the Fraser Institute’s Economic Freedom Index (Gwartney et al., 2007). The collected data set consists of seven data points of time (1990, 1995, 2000, 2001, 2002, 2003, 2004) of 19 Latin American and Caribbean countries¹. The sample is restricted to a subset of selected Latin American countries owing to data limitations for smaller economies and available estimates of UE. Then by considering a group of comparable countries, it is possible to reduce the sources of heterogeneity among the economies under observation. It should increase the reliability of the data analysis. Furthermore, since many Latin American countries had or still have a tradition of high UE, weak institutions and different economic performances, these countries are considered an optimal sample to test the hypotheses of this research.

Our panel data include the following variables²: unofficial Gross Domestic Product based on purchasing-power-parity (PPP) per capita (UE); GDP based on PPP per capita (GDP cap); unemployment rate as percentage of labor force (Unem); labor market regulation (LR); hiring and firing of workers (HF); rule of law (RoL); stable rates of inflation (σ [infl]); income inequality (Gini); transfers and subsidies as a share of GDP (Subs), and an index of top marginal tax rate that also

¹ The list of countries in the sample is shown in Appendix (Table 3).

² We consider two additional variables as instruments for GMM estimators: an index of freedom to trade internationally (Free Trade index) and the inflation rate (infl). See appendix for details.

considers the income threshold to which it applies (Tax). Details on dataset sources and definitions of variables are given in Appendix.

With regard to the econometric approach, we apply a panel analysis to test empirically the theoretical hypotheses. Alternative types of panel model specification can be suitable for our analysis. One type of panel model has constant coefficients, referring to both intercepts and slopes. In the event that there are not significant fixed effects, we could pool all of the data and run an ordinary least squares regression model. In contexts like this one, the question usually arises as to whether the individual specific effects should be assumed to be fixed (Fixed effects model) or random (Random effects model). According to Baltagi (2008), the fixed effects model is the appropriate specification if the analysis is focusing on a specific set of N units and the inference is restricted to the behavior of this set of units. The Random effects model, on the other hand, is an appropriate specification if we are drawing N individuals randomly from a large population and want to draw inferences about the entire population. Finally, since pooling amounts to applying (linear) restrictions on the coefficients, an F-test can be used, where a restricted model is compared with an unrestricted model. We compute F-tests in order to test the statistical significance of countries and time-fixed model specification³. The pooling tests reveal that both the fixed country and the fixed country and time-effects specification are preferable to the pooled case.

In models for pure time-series data and for pure cross-section data, respectively, disturbance serial correlation and disturbance heteroskedasticity often requires attention. Since panel data combine both data types, it may be wise to give both of these departures from the assumptions for disturbances in classical regression models due attention. In our dataset, estimation of a static panel model shows significant first-order autocorrelated errors. Then, a dynamic fixed effects model is considered the proper specification in our research. Equation (1) shows this type of panel model specification:

$$y_{i,t} = \gamma y_{i,t-1} + x'_{i,t} \beta + \alpha_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $i = 1, 2, \dots, 19$; and $t = '90, '95, '00, '01, '02, '03, '04$. α_i and λ_t are used to capture the cross-country and time (fixed) effects, respectively; $x_{i,t}$ is a vector of exogenous regressors and $\varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)$ is a random disturbance.

The estimation of fixed-effects dynamic panel data models has been one of the main challenges in econometrics during the last decades. The review of the study by Arellano and Honore (2001), Arellano (2003), and Baltagi (2008) can be found in the literature. The seminal paper of Nickell (1981) showed that in dynamic panel regressions, the LSDV only performs well when the time dimension of the panel is large (Judson and Owen, 1999). In consequence, bias reduction procedures have been proposed for practical implementation with a variety of dynamic panel estimators (e.g. Kiviet, 1995; Hahn and Kuersteiner, 2002). The development and comparison of such new estimators was necessary because the traditional least-squares dummy-variable estimator is inconsistent for fixed T . Various instrumental variables estimators and generalized method of moments (GMM) estimators have been proposed and compared (e.g. Anderson and Hsiao, 1981; Arellano and Bond, 1991; Kiviet, 1995; Judson and Owen, 1999). Beck and Katz (1995, 1996) state that "Panel Corrected Standard Errors" (PCSE) estimator is able to take account of panel heteroskedasticity and contemporaneous correlation of the error terms⁴. Unfortunately, PCSE properties hold for time dimension greater than 15 (Beck and Katz, 1995). In our panel the time dimension is 7; therefore, it is likely that the Nickell bias⁵ will be

³ This test suggests that model specification with both countries and time fixed effects is a better specification than the pooled model.

⁴ Monte Carlo experiments showed that PCSEs are very close to OLS standard errors when the Gauss-Markov assumptions hold, and can be considerably better than OLS standard errors when those assumptions are violated so long as $T > 15$ (Beck and Katz, 1995).

⁵ Nickell (1981) shows that OLS estimation may be inconsistent when applied to models that include fixed effects and a lagged dependent variable. The bias is of the order $1/T$, where T is the time dimension of the panel.

large and PCSE estimators may be not appropriate. According to Judsen and Owen (1999), for unbalanced panel and $T < 10$, generalized method-of-moments (GMM) is the best estimator. Arellano and Bond (1991) propose to eliminate the country-specific effect by first differences, however, it introduces a new econometric problem. The new error term in the difference equation is now correlated with the lagged dependent variable. It implies to use GMM estimator. The consistency of the GMM estimator depends mainly on the assumptions that the error terms do not exhibit serial correlation and that the instruments are valid. To check whether these assumptions hold, we run Sargan's test and serial correlation tests on residuals. Failure to reject the null hypothesis of these tests implies that the assumptions of the estimation hold true. In the next section, to check the robustness of estimates, the results obtained with both GMM (Arellano and Bond, 1991) and PCSE (Beck and Katz, 1995) estimators will be shown.

4. Results and Discussion of Econometric Analysis

In the following, the effects of UE on the official economy (equation 2), and vice versa (equation 3), are compared in a wide-ranging framework where both institutional and macroeconomic variables are included. These models are specified in a symmetric way in order to better compare the different effects of regressors for sustaining or hindering the official or unofficial GDP.

$$\frac{UE_{i,t}}{Pop_{i,t}} = \alpha_i + \delta_i + \beta_0^U \frac{UE_{i,t-1}}{Pop_{i,t-1}} + \beta_1^U \frac{GDP_{i,t}}{Pop_{i,t}} + \beta_2^U Gini + \beta_3^U LR + \beta_4^U HF_{i,t} + \beta_5^U RoL_{i,t} + \beta_6^U Unem_{i,t} + \beta_7^U \sigma_{infl,i,t} + \beta_8^U Subs_{i,t} + \beta_9^U Tax_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$\frac{GDP_{i,t}}{Pop_{i,t}} = \alpha_i + \delta_i + \beta_0^O \frac{GDP_{i,t-1}}{Pop_{i,t-1}} + \beta_1^O \frac{UE_{i,t}}{Pop_{i,t}} + \beta_2^O Gini_{i,t} + \beta_3^O LR_{i,t} + \beta_4^O HF_{i,t} + \beta_5^O RoL_{i,t} + \beta_6^O Unem_{i,t} + \beta_7^O \sigma_{infl,i,t} + \beta_8^O Subs_{i,t} + \beta_9^O Tax_{i,t} + \varepsilon_{i,t} \quad (3)$$

Table 1 shows estimates of equations (2) and (3). The columns labeled "PCSE" report estimates obtained by applying Panel Corrected Standard Errors method useful to obtain robust covariance estimators to heteroskedasticity across cross-sections and general correlation of residuals. In PCSE (II and V), the model specification country fixed effects are included, whereas in PCSE (I, IV), both country and time fixed effects are included. We omit to report the dummies for the sake of brevity.

The columns GMM (III) and GMM (VI) report estimates according to the method proposed by Arellano and Bond (1991). GMM estimators take into account the fixed effects through first difference of cross-countries. The unofficial and official GDPs are transformed in logarithms.

Table 1: Estimates of eq. (2): columns I, II, III; Estimates of eq. (3): columns IV, V, VI

Dependent Variable	Log(Un off. GDP per capita)				Log(Of f. GDP per capita)			
		PCSE (I)	PCSE (II)	GMM (III)		PCSE (IV)	PCSE (V)	GMM (VI)
Lagged Dep. variable	β_0^U	0.247^a (3.546)	0.177^a (4.316)	0.303^a (5.635)	β_0^O	0.110^c (1.889)	0.079 (1.308)	0.096^a (3.500)
Log GDP per capita	β_1^U	0.961^a (7.292)	0.952^a (9.460)	0.502^a (5.160)	--	--	--	--
Log UE per capita	--	--	--	--	β_1^O	0.512^a (6.275)	0.618^a (8.025)	0.757^a (16.52)
Income Inequality (Gini)	β_2^U	0.002^c (1.835)	0.002^b (2.257)	0.009^c (1.859)	β_2^O	0.000 (0.294)	-0.002^a (-2.185)	-0.013^a (-4.949)
Labour Regulation	β_3^U	-0.027 (-1.643)	-0.037^a (-2.730)	-0.099^a (-4.974)	β_3^O	0.009 (0.549)	0.023 (1.480)	-0.003 (-0.130)
Hiring and Firing	β_4^U	0.012 (1.413)	0.013* (1.789)	0.005 (1.258)	β_4^O	-0.013^b (-2.530)	-0.008 (0.127)	0.001 (0.011)
Rule of Law	β_5^U	-0.020^c (-2.006)	-0.010 (-1.789)	0.015 (1.507)	β_5^O	0.028^a (3.457)	0.023^b (2.407)	0.005 (0.821)
Unemployment rate	β_6^U	0.001 (0.126)	0.000 (0.191)	-0.031^a (-4.184)	β_6^O	-0.007^a (-3.407)	-0.008^a (-3.806)	-0.012^a (-5.971)
Stand. Dev. Inflation	β_7^U	-0.004 (-1.575)	-0.005 (0.006)	-0.005^b (-2.08)	β_7^O	0.005^b (2.024)	0.004 (1.636)	-0.009^a (-2.784)
Subsidies on GDP	β_8^U	-0.041^a (-3.699)	-0.036^a (-3.480)	-0.120^a (-5.973)	β_8^O	0.016 (1.205)	0.007 (0.710)	-0.018 (-0.903)
Marg. tax rate index	β_9^U	-0.009 (-0.763)	-0.008 (-0.757)	0.010 (1.464)	β_9^O	0.017^b (2.478)	0.0129 (1.507)	0.004 (1.320)
Observations		70	70	45		72	72	47
Fixed effects		Country & Time	Country	Δ country		Country & Time	Country	Δ country
Sargan Test*(p-value)				0.69				0.47
Serial corr. AR(1)		D.W.	D.W.	0.87		D.W.	D.W.	0.23
res.(p-value) AR(2)		1.553	1.384	0.75		1.798	1.371	0.82

^a Denotes significant at 1% level; ^b Denotes significant at 5% level; ^c Denotes significant at 10% level.

*The validity of instruments for the estimates is tested using the null hypothesis of the Sargan test. The higher the p-value of the test, the more confidence we can have in not rejecting the null hypothesis of instruments used are not correlated with the residuals from the respective regression. Failure to reject the null hypothesis of Sargan's test and serial correlation tests implies that the assumptions of the instruments hold.

For PCSE (I) the F-tests for countries and time dummies is: F-stat=27.14>F(22,37) at 1% [p-value =0.00]. For PCSE (II) the F-tests for countries dummies is F-stat=32.52>F(17,42) at 1% [p-value =0.00]. For PCSE (IV) the F-tests for countries and time dummies is F-stat=40.51>F(22,39) at 1% [p-value =0.00]. For PCSE (V) the F-tests for countries dummies is F-stat=39.31>F(17,44) at 1% [p-value= 0.00].

For GMM estimators two types of instruments are applied. GMM (III) applies as dynamic period-specific (predetermined) instruments the lags of dependent variable (log of unofficial GDP per capita) from 2 to the last periods of the sample; as strictly exogenous instruments the first difference of the following variables as: Rol HF, $\sigma[\text{infl}]$, Tax, Gini(t-1), Inflation. GMM (VI) applies as dynamic period-specific (predetermined) instruments the log of official GDP per capita from t-2 to the end of sample; as strictly exogenous instruments the first difference of following variables: Rol HF, $\sigma[\text{infl}]$, Tax, Gini(t-1), Free Trade index.

A preliminary statement helps to interpret appropriately the empirical findings. As a consequence of insufficient time dimension of panel, we cannot investigate specifically on the directions of causation between unofficial and official GDP (e.g. by performing Granger causality tests as in Giles, 1997a, 1997b, 1999a). Therefore, outcomes are regarded as correlations. In the following, we focus our attention mainly on GMM estimates.

First, we find a statistical significance of the first-order autoregressive term of lagged UE. This result supports the analyses of UE by means of dynamic framework. It holds the view that economies with large size of UE, suffer from persistent informality. Due to dynamic modeling of UE, several papers emphasize the existence of multiple (stable and unstable) equilibria (e.g. Gordon, 1989; Kim, 2003; Rosser et al., 2003). Indirectly, our findings provide evidence for their approach.

In absolute term, the persistence of unofficial GDP is estimated to be greater than official GDP ($\beta_0^U > \beta_0^O$). Thus, we deduce that if “big push” strategies are adopted to escape from “irregularity traps”, they need more massive coordinated policies with respect to the case of “poverty traps”⁶.

With reference to the question as to whether the complementarities between unofficial and official GDP prevail on substitution effects, we find affirmative answer for Latin American countries. This result points out that the unofficial and official GDP per capita are strictly and positively correlated. The UE thus sustains official economic development. A positive elasticity of β_1 means that the two phenomena move cyclically. Consequently, the interpretation of UE as macroeconomic buffer for official sector does not find empirical evidence in our sample. Due to fluctuations in statistical significance of estimates over the estimator approaches, we cannot be totally confident if the elasticity of official GDP to unofficial income (β_1^O) is lower or higher than the elasticity of unofficial GDP to official production (β_1^U).

As concerns the effects of income inequality on GDP, the index of Gini is statistically significant for both regressions, but it assumes different signs. It means that an increase of income inequality (higher index of Gini) is related to higher unofficial GDP ($\beta_2^U > 0$). On the contrary, more equal income distribution is correlated with richer (official) economy ($\beta_2^O < 0$). The result of $\beta_2^U > 0$ corroborates the recent studies that investigates on correlation between Gini coefficient and the size of UE (e.g. Rosser et al., 2000, 2003 for transition countries; Winkelried, 2005 for Mexico; Chong and Grandstein, 2007 for 57 industrial and developing countries). These studies find evidence that high inequality leads to a large informal sector; therefore, redistribution policy decreases the size of UE.

By comparing the estimates of β_2^U with β_2^O , an initial suggestion for policy maker may be provided. To reduce income inequality, it is effective to sustain official GDP as well as to lower unofficial GDP. Moreover, as $|\beta_2^U| < |\beta_2^O|$ the ceteris paribus marginal effects of a reduction in inequality increases the overall (official plus unofficial) GDP. Then reduction in income distribution may be considered one of the most effective policies to both increase total GDP and lower unofficial GDP.

With regard to the labor market variables, rigid labor regulations ($\beta_3^U > 0$) is correlated to higher UE, whereas it is not related to the official GDP ($\beta_3^O = 0$). These outcomes reveal that without adequate labor regulation, the goal of the decrease of UE becomes more difficult to achieve. The UE can thus be considered as one of the costs for rigid, lacked, incomplete, or inadequate reformation of labor market. The indexes of hiring and firing workers regulation and the perception of rule of law ($\beta_4 = \beta_5 = 0$) are not significant.

We find that the (official) unemployment rate is negatively correlated with official GDP ($\beta_6^O < 0$) while, unexpectedly, it is also negatively correlated with the UE. This unforeseen result may

⁶ According to the literature on development economics, an effective strategy to move from bad to good equilibrium is the “big push theory” proposed by Rosenstein–Rodan (1943) and more recently by Murphy et al. (1989). They sustain that in market, coordination failure leads to an outcome (equilibrium) inferior to a potential situation where resources would be correctly allocated and all agents would be better off. For a critical overview of this literature, see Esterlin (2006).

depend on scarce reliability of official statistic for countries where informal employment involves large part of Latin American people (Tokman, 2007). However, statistical significance holds true only when GMM estimator is applied. This should suggest prudence to interpret this outcome.

From table 1, as much a government is able to follow policies and adopt institutions that lead to stable rates of inflation⁷ then both UE and official GDP will decrease. This outcome confirms the hypothesis that inflation is detrimental for both official economic development (e.g. Barro, 1995) and unofficial GDP (e.g. Schneider, 2005).

With reference to variable “Subsides on GDP”, lower index of monetary transfers as percentage of country GDP from government to citizens is correlated with higher unofficial GDP ($\beta_8^U < 0$). Whereas the relationship between the government subsidies and the official production is not statistically significant ($\beta_8^O = 0$). We infer that more generous are the government transfers and subsidies as a share of GDP (e.g. unemployment benefits) and lower will be the incentive to move from informal to formal employment.

In literature, one of the most popular determinants of the UE is taxation. The common hypothesis is that an increase in the tax rate is a strong incentive to work in the unofficial sector. To address the potential endogeneity of tax rate with respect to UE, we employ both top marginal statutory rates and instrumental variables approach. We suppose it to help in alleviating this problem. In Latin American countries, the top marginal income tax rate index has no statistically significant correlation with official or unofficial GDP ($\beta_9^U = \beta_9^O = 0$). This outcome has important value in a normative point of view. It suggests that participation in UE for Latin American citizens is not a consequence of excessive marginal income taxation. The income and substitution effects caused by changes in statutory marginal income tax rates probably counter-balance their effects for irregular workers and entrepreneurs. Due to these reasons, economic policies that stress on flat rate income tax to sustain economic growth and to move business activities from informal to formal economy seem to be ineffective.

In accordance with previous outcomes, we may state that to sustain both Latin American economic development and reduce the size of UE, the policy maker should reduce income inequality through higher marginal income tax rates and by liberalizing labor regulations.

The second econometric exercise is devoted to assess the hypothesis of (counter) cyclical relationship between growth rates of official and unofficial economy. According to Kaufmann and Kaliberda (1996), countries that show a decline in official GDP were able to mitigate such a drop through a growth in the UE. On the contrary, Chong and Gradstein (2007) find a positive relationship between UE and official growth. To test this hypothesis in regression (4), elasticities of the two components of the growth rate of total GDP are estimated:

$$Growth\left(\frac{Tot_{i,t}}{Pop_{i,t}}\right) = \alpha_i + \delta_i + \phi_0 Growth\left(\frac{Tot_{i,t-1}}{Pop_{i,t-1}}\right) + \phi_1 Growth\left(\frac{UE_{i,t}}{Pop_{i,t}}\right) + \phi_2 Growth\left(\frac{GDP_{i,t}}{Pop_{i,t}}\right) + \varepsilon_{i,t} \quad (4)$$

The estimates are reported in Table 2.

⁷ We utilize an index of variation in the rate of inflation over the five-year period instead of the inflation rate to reduce endogeneity issue.

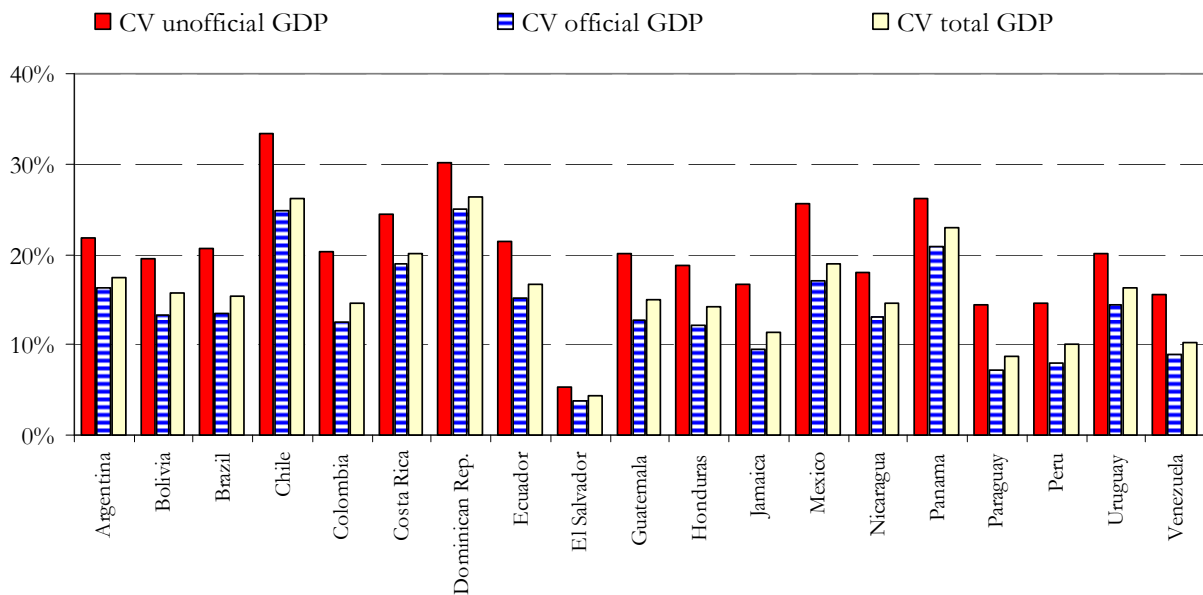
Table 2: Dependent variable Growth rate of total GDP per capita

Variable	$G\left(\frac{UE_{i,t} + GDP_{i,t}}{Pop_{i,t}}\right)$	PCSE	PCSE	GMM (Arellano, Bond 1991; n-step)
Lagged Dependent variable	ϕ_0	-0.013^b (-2.351)	-0.001 (-0.493)	0.004^a (4.509)
Growth Unofficial GDP per cap	ϕ_1	0.763^a (52.207)	0.741^a (138.0)	0.753^a (343.4)
Growth Official GDP per cap	ϕ_2	0.228^a (15.54)	0.258^a (44.15)	0.246^a (124.74)
Fixed Effects		Countries and time dummies	Countries dummies	Cross-countries first difference
Robust Covariance method		Cross-Sections SUR	Cross-Sections SUR	--
Durbin-Watson stat[PCSE] Sargan Test α [GMM]		1.282	1.179	p-value=0.84
F-test Fxed effects(p-val)[PCSE] Serial Corr.res(p-val) [GMM]		1.01>F(22,65) at 1% [0.47]	0.72>F(18,69) at 1% [0.78]	AR(1)=0.73 AR(2)=0.02
Observations		91	91	46

See notes of table 1. For GMM as dynamic period-specific (predetermined) instruments we use the growth rate of total GDP per capita from t-2 to the end of sample; as strictly exogenous instruments the first difference of following variables: Rol, HF, $\sigma[\text{infl}]$, Tax, Gini, Free Trade index.

According to outcomes shown in table 2, the hypothesis that UE serves as a macroeconomic buffer for official sector is rejected. Thus, we may state that unofficial and unofficial growth rates are in sync. It holds the proposition that unofficial sector amplifies the total (official plus unofficial) GDP fluctuations. The cyclical pattern of UE is consistent with the view that movements from formal to informal employment are not largely voluntary.

Due to the low frequency of observations, we cannot use time-series econometric methods to investigate the dynamics of business cycle fluctuations. Then we simply show the effects of unofficial GDP on the variability of total production by comparing the coefficient of variations (Figure 1). The coefficients of variation (CV) is calculated by dividing the estimated standard deviation for the mean for each country.

Figure 1: Coefficients of variation of GDP for Latin American countries

According to these estimates, the unofficial GDP per capita has ever higher dispersion than official GDP per capita. Then we deduce that total GDP fluctuations may be amplified by UE. However, further research has to focus on this inference.

6. Summary and Concluding Remarks

The UE is a persistent worldwide phenomenon. Several studies attempted to integrate the UE into macroeconomic models in order to study their effects on the allocation of resources and economic development. Unfortunately, no common view emerges about the sign of the effects of the UE on official economy and vice versa. The current lack of consolidated theory and empirical evidence, as well as the quality of available data, makes this field difficult to research. In this paper, two strands of the empirical literature are combined. The first deals with the influence of the official economy on the UE and vice versa, and the second with the role of institutional setting on the UE. An empirical analysis based on an unbalanced panel of 19 Latin American countries from 1990 to 2004 is proposed. We first estimate the regressions with PCSE. Although this approach correctly controls for unobservable fixed country and year effects as well as heteroskedasticity across cross-sections and general correlation of residuals, it may provide biased estimates as the right-hand-side variables may be endogenous. Taking advantages of the dynamic nature of data, we also perform GMM estimations (Arellano and Bond, 1991). This approach involves the addition of a set of instruments consisting of suitable lags of the level of the explanatory, exogenous, and dependent variables for each cross-section involved in the panel. On the basis of empirical outcomes, a strong positive correlation is found between the official and unofficial economy.

A preliminary remark has to be made before summarizing policy implications and general conclusions. The empirical analysis of the UE must be valued very carefully. There does not exist any common methodology for estimating the UE; furthermore the estimates are never very strong and absolute. Therefore, any empirical analysis using UE estimates necessarily is subject at least to the same caveats. Again, additional limitations for the reliability of the econometric exercise can be highlighted; among these, even ignoring measurement errors and the effect of omitted variables, the most relevant is probably an issue of endogeneity. All that means that the empirical results are surrounded by significant margins of uncertainty that the exercises proposed here can realistically offer only some indicative correlations and that further and deeper analyses are paramount.

We draw the following conclusions. There is a strong interaction of the UE with institutional indicators and official economy. The UE has a positive and quantitatively important effect on the official economy and vice versa. It supports the hypothesis that these two sectors are rather complements than substitutes. The UE in Latin American countries sustains the growth of official GDP because it mainly creates additional resources to reinvest in the economy. There are initial evidences that, as a consequence of procyclical pattern of UE, business cycle fluctuations may be amplified by shadow economy.

In terms of policy suggestions, we deduce that in poorly institutional context as Latin American countries, a simple cut of upper tax rates may not be effective to reduce the size of the UE. The best strategies to boost official GDP and lower UE seem to be a reduction of income inequality, (higher marginal income tax rate better than higher subsidies) and liberalization of labor market regulation.

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Appendix 1: Data definitions and sources

The (unbalanced) panel used for estimating panel regressions consists of a cross-section of 19 countries over 7 time periods and for 11 variables (1463 obs.). However, the missing values reduced the span of the sample with 68 observations: 30 in Gini; 12 in LR and HF; 5 in Subs; 4 in UE and Unem; 1 in Tax.

Data on the UE are published by Schneider (2005) for the 1990 and 1995 and Schneider (2007) for the 2000, 2001, 2002, 2003 and 2004. These articles collect different sources and consider the currency demand approach and (Dynamic) Multiple Indicators Multiple Causes method to estimate UE as percentage of official GDP. To improve the reliability of comparison between unofficial and official GDP, we convert both the indexes of gross domestic product in the same unit of measure. In particular, Schneider's estimates of UE as percentage of official GDP are converted to the levels of Unofficial GDP based on purchasing-power-parity (PPP) per capita. It is obtained by multiplying Schneider's figures $\left(\frac{UE_{i,t}}{GDP_{i,t}}\right)$ for the GDP per capita at current national currency and divided to the implied PPP conversion rate as published by World Economic Outlook Database (2007)⁸. In symbols: $\left(\frac{UE_{i,t}}{GDP_{i,t}} \frac{GDP_{i,t}}{Pop_{i,t}} \frac{1}{I_{PPP}} = \frac{UE_{i,t}^{PPP}}{Pop_{i,t}}\right)$. The calculated unofficial GDP (PPP) per capita used in the analysis is reported in Table 3.

Table 3: Unofficial GDP per capita (PPP)

	1990	1995	2000	2001	2002	2003	2004
Argentina	1672.3	2628.5	3165.3	3266.3	3127.2	3420.4	3578.9
Bolivia	972.9	1291.9	1615.0	1672.2	1707.2	1749.1	1805.2
Brazil	1828.1	2449.5	3011.8	3158.7	3343.3	3400.0	3547.0
Chile	652.9	1242.2	1866.3	1999.4	2113.2	2155.0	2221.7
Colombia	1595.9	2215.3	2474.5	2666.8	2857.3	2954.4	3109.1
Costa Rica	1224.2	1742.1	2310.0	2406.5	2543.2	2638.3	2695.5
Dominican Rep.	1017.9	1399.3	2169.2	2369.6	2533.6	2526.1	2637.0
Ecuador	778.4	1024.7	1140.6	1305.4	1388.0	1437.4	1520.4
El Salvador			2154.5	2261.9	2358.7	2422.5	2456.1
Guatemala	1111.0	1491.5	1931.8	1986.2	2031.7	2016.8	2042.9
Honduras	806.5	1022.1	1264.2	1328.0	1376.5	1401.2	1430.6
Jamaica	971.1	1180.4	1335.1	1432.7	1510.1	1580.5	1600.4
Mexico	1517.5	1896.5	2770.6	2955.6	3115.5	3124.2	3264.5
Nicaragua	1038.3	1167.3	1479.7	1572.7	1612.8	1666.2	1730.6
Panama	1901.1	2867.0	4010.7	4127.1	4226.8	4365.7	4562.3
Paraguay			1357.9	1468.3	1660.2	1786.4	1944.5
Peru	1780.4	2371.9	2631.1	2713.7	2731.5	2757.0	2871.5
Uruguay	2419.4	3512.0	4598.0	4548.7	4133.3	4198.5	4652.9
Venezuela	1312.6	1731.0	1955.6	2141.5	2036.9	1852.2	2157.3

Data on GDP based on purchasing-power-parity (PPP) per capita are available from World Economic Outlook Database (2007) - April Edition.

Data on the Rule of law are available from the Fraser Institute, which elaborates an index running from 0 to 10 (lower numbers mean worse legal environment). In particular, we use as index of rule of law the Area 2 of the Index of Economic Freedom, so called "Legal Structure and Security of Property Rights" published by Gwartney et al. (2007)⁹. The key components accounted by this index

⁸ <http://www.imf.org/external/pubs/ft/weo/2007/01/data/index.aspx>.

⁹ Data retrieved from www.freetheworld.com.

are: rule of law, security of property rights, independent judiciary and impartial court system.

According with Bertola (1990), rigid labour regulations may discourage formal firms to fire during downturns and to hire workers during upturns as they take into account the risk of incurring high costs of dismissal in the following downturn. Consequently, the variability of regular employment in response to output fluctuations is expected to be lower where job security regulations are tighter (Galli and Kucera, 2003). To take into account the labour market, three variables are considered: two indicator of Fraser institute (the overall index of labour regulation and the hiring and firing index) and the official unemployment rate. The labour-market index measures the extent to which restraints upon economic freedom as minimum wages, dismissal regulations, centralized wage setting, extension of union contracts to non participating parties and conscription, are present across countries. In order to get a high rating in this index, a country must allow to “*the market forces to determine wages and establish the conditions of hiring and firing, and refrain from the use of conscription*” (Gwartney et al. 2007, p. 12). Data on the index of hiring and firing of workers are available from the Fraser Institute. It is a sub-component of “Regulation of Credit, Labour, and Business index”. Hire Fire index running from 1 to 7, it is based on the Global Competitiveness Report’s question¹⁰: The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7).

The “standard deviation of the inflation rate” is a variable that take into account the monetary policy. Inflation erodes the value of property held in monetary instruments. When governments (or central banks) create money to finance their expenditures they are, in effect, expropriating the property and violating the economic freedom of their citizens. In this sense, it is an institutional form to protect property rights and, thus, economic freedom. In order to earn a high rating in this area, a country must follow policies and adopt institutions that lead to stable rates of inflation (Gwartney et al. 2007). This component is a sub-component of Area 3 of Economic Freedom index defined as “Access to Sound Money”. The following formula was used to determine the zero-to-10 scale rating for each country: $(V_{max}-V_i)/(V_{max}-V_{min})$ multiplied by 10. Where V_i represents the country’s standard deviation of the annual rate of inflation during the last five years. The values for V_{min} and V_{max} were set at zero and 25%, respectively. “*This procedure will allocate the highest ratings to the countries with least variation in the annual rate of inflation. A perfect 10 results when there is no variation in the rate of inflation over the five-year period. Ratings will decline toward zero as the standard deviation of the inflation rate approaches 25% annually*” (Gwartney et al. 2007, p. 185)¹¹.

Data on unemployment rate are extracted by the Statistical Yearbook for Latin America and the Caribbean (2007)¹². According with Tanzi (1999), the effect of unemployment rate on UE is ambiguous. It is because the labour force of the UE is composed of very heterogeneous workers. One part of the hidden labour market is classified as unemployed but belongs to the official labour force. The other part of informal workers consists of retirees, minors, and homemakers who are not part of the official workforce. Furthermore, there are persons who simultaneously hold an official and an unofficial job (Tanzi, 1999).

The “Subsidies on GDP” variable accounts the general government transfers and subsidies as a share of GDP. This component of Index of Economic Freedom generates lower ratings for countries with larger transfer sectors. “*When the size of a country’s transfer sector approaches that of the country with the largest transfer sector during the 1990 benchmark year, the rating of the country will approach zero.*” (Gwartney et al. 2007, p. 183).

To evaluate the effect of taxes on official and unofficial GDP is used an indicator of based on the top marginal income tax rate by considering the income threshold at which the top marginal income

¹⁰ Source: World Economic Forum, Global Competitiveness Report (various issues), <http://www.weforum.org/en/initiatives/gcp/index.htm>

¹¹ Source: World Bank, World Development Indicators (various issues); International Monetary Fund, International Financial Statistics (various issues).

¹² Economic Commission for Latin America and the Caribbean, United Nations: http://websie.eclac.cl/anuario_estadistico/anuario_2006. For unemployment rate of Guatemala in the 1990 and 2000 data are extracted by Worl Bank on-line database: <http://devdata.worldbank.org/edstats/query/default.htm>.

tax rate applies (Tax). It is one (1D) of the four components of area 1 (Size of Government: Expenditures, Taxes and Enterprises). “*Countries with high marginal tax rates and low-income thresholds are rated lower*” (Gwartney et al. 2007, p. 9). Although it might be useful to analyze the impact of three main components of tax revenue (direct, indirect, and social security contribution) separately, but the data limitations has prevented any possibility of developing a more complex econometric framework (in terms of the number and kind of potential causes of UE).

As concerns instrumental variables for GMM, other than some of previous independent variables, we consider the indexes of “inflation rate” and of the “Freedom to Trade internationally” in regression (2) and (3) respectively. The index of “inflation rate” is extracted by Economic Freedom of the World (2007). It is calculated by the following formula: $(V_{\max}-V_i)/(V_{\max}-V_{\min})$. Where the V_i represents the rate of inflation during the most recent year. The values for V_{\max} and V_{\min} and are set at zero and 50%, respectively - the lower the rate of inflation, the higher the rating. “*Countries that achieve perfect price stability earn a rating of 10. A zero rating is assigned to all countries with an inflation rate of 50% or more*” (Gwartney et al. 2007, p. 187). The index of “Freedom to Trade Internationally” is the index of Area 4: “freedom to trade internationally” published by the Fraser Institute. This index running from 0 to 10 (lower numbers mean strong restrictions to international exchange). The components in this area are designed to measure a wide variety of restraints that affect international exchange: tariffs, quotas, hidden administrative restraints, and exchange rate and capital controls. In order to get a high rating in this area, “*a country must have low tariffs, a trade sector larger than expected, easy clearance and efficient administration of customs, a freely convertible currency, and few controls on the movement of capital*” (Gwartney et al. 2007, p. 11).

The source of the data for Gini’s index is the World Income Inequality Database (WIID release 2.b)¹³.

¹³ http://www.wider.unu.edu/research/Database/en_GB/wiid.