Foreign Direct Investment and Shadow Economy: A Causality Analysis Using Panel Data

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25. March 2009

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Abstract

The present paper investigates the link between the shadow economy and FDI using the Granger panel causality test. For that purpose we use the shadow economy and FDI data for 145 countries of five data points 1999/2000, 2001/2002, 2002/2003, 2003/2004 and 2004/2005. The system GMM estimation results show that FDI causes the shadow economy and vice versa. The empirical evidence supports the hypotheses that higher FDI causes lower shadow economy and higher shadow economy causes higher FDI.

1. Introduction

The shadow economy is a phenomenon known throughout the world. It exists, especially, when governments apply excessive tax or unreasonably regulate economic activities. The shadow economy is a non-negligible part of economic activity whose economic volume occupies as much as 10 to 50 percent of the economy and without consideration of this important sector, it is impossible to evaluate the consequences of various economic policies. This is a particularly serious obstacle in developing

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countries. Knowledge of the shadow economy will lead to a better understanding of the market system and hopefully to better economic policies.

There is a large literature on the different methods of measurement of the shadow economy and a good review and criticism of them can be found in Lackó (1999), Schneider and Enste (2000) and Schneider (2005).

The hidden nature of shadow economy makes it difficult to measure and study. That is why a majority of commonly used methods take use of indirect estimation. Such methods involve many restrictive hypotheses. There are three major methods for measurement of the size of shadow economy:

1. The methods based on microeconomic theories (Direct Approaches)

2. The methods based on macroeconomic theories (Indirect Approaches)

3. The Model Approach (Multiple Indicators Multiple Causes, MIMIC)

There is a large body of literature[5] on the possible causes and indicators of the shadow economy. In almost all studies[6] it has been ascertained that the overall tax and social security contribution burdens are among the main causes for the existence of the shadow economy but in most of these studies, tax burden is considered nationally and the effects of tax avoidance in a global scale is not mentioned.

In fact, capital's ability to cross borders without restriction has left nationally based tax systems struggling to protect themselves from tax avoidance. The rise of the tax avoidance industry has coincided with a trend towards using tax competition as a strategy for attracting inwards investment, with widespread use of export processing

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[5] - Thomas (1992); Schneider (1994a, 1997, 2003, 2005); Pozo (1996); Johnson, Kaufmann and Zoido-Lobatón (1998a, 1998b); Giles (1997a, 1997b, 1999a, 1999b, 1999c); Giles and Tedds (2002), Giles, Tedds and Werkneh (2002), Del'Anno (2003) and Del'Anno and Schneider (2004).

[6] - See Thomas (1992); Lippert and Walker (1997); Schneider (1994, 1997, 1998, 2000, 2003, 2005, 2007); Johnson, Kaufmann, and Zoido-Lobatón (1998a,1998b); Tanzi (1999); Giles (1999a); Mummert and Schneider (2001); Giles and Tedds (2002) and Del'Anno (2003), just to quote a few recent ones.

zones, tax holidays, accelerated depreciation rates, fiscal subsidies and preferential tax terms. So tax competition has led to many governments cutting tax rates on income earned by non-residents in order to attract portfolio and foreign direct investment (FDI).

Faced with this threat to their tax revenues, governments have increasingly resorted to shifting the tax burden from capital to labor, despite this being in most instances both regressive and counter-productive from an employment creation perspective. Therefore, shifting tax burden from capital to labor and consumption to attract FDI, induce them towards the shadow economy activities. This is the views of those who focused on the dark side of FDI. Against this view, there are those who look on the bright side of FDI and argue that it affects economic growth and government tax revenues positively in a variety of ways and ultimately decrease the shadow economy.

On the other hand, not only the economic, but also the political system affects the shadow economic activities. In an inefficient state where corruption is rampant the citizens will have little trust in the authority and thus a low incentive to be active in the formal economy. Recent studies show that countries with high level of corruption have a higher share of shadow economy. The large body of literature on the relationship between corruption and FDI has suggested that the relationship is theoretically ambiguous; therefore how shadow economy affects FDI is also ambiguous.

Although the casual relationship between shadow economy and FDI is important for economic policies, it has received less attention and there is no empirical study on this issue. In this paper we aim at filling this gap using recent causality methods developed for panel data (Generalized Method of Moments (GMM)).

2. Relative Literatures and Hypotheses

In this section we explore the relationship between the shadow economy and FDI and formulate concrete hypotheses. We thereby combine two strands of the literature. The first deals with the impact of FDI on the shadow economy; the second with the influence of the shadow economy on FDI. In both strands there are important gaps.

2.1. The Impacts of FDI on Shadow Economy

The scale of tax avoidance activity can be described as a shadow economy operating in the majority of globalizes sectors (Christensen and Kapoor, 2004). The multinational enterprise (MNE) is the embodiment of globalization and its principal agent. MNEs are the "face" of globalization which offers the ability to create value-adding activities that can improve national competitiveness, thereby contributing to economic growth and national welfare (Eden, 1995). MNEs also generate FDI flows (Gorgodze, 2004).

In the mid-1980s and 1990s, MNE state relations shifted from confrontation to cooperation. Governments moved from regulating to encouraging entry, from taxing to subsidizing, from opposition to FDI to partnership with multinationals (Murtha and Lenway, 1994).

At the end of the 1990s, Vernon (1998) argued that the current calm period in MNE-state relations was the "eye in the hurricane". Some authors predict that this period of calm is now ending, as globalization creates a backlash in the OECD countries against multinationals and international organizations (Graham, 2000; Rodrik, 1997; Rugman, 2000; Vernon, 1998). Thus, the multinational enterprise is Janus, the two faced -dark and bright- symbol of globalization (Eden and Lenway, 2001).

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Those who focus on the dark side of the MNE, argue that when a MNE undertakes FDI, it does so through a two stage process. First, the MNE researches several possible locations and narrows its focus to a handful of potential sites. Then these potential locations bid against one another by offering firm-specific tax reductions and other incentives to the firm to ensure that they become the host (Davies, 2005).

The rise of the tax avoidance industry has coincided with a trend towards using tax competition as a strategy for attracting inwards investment, with widespread use of export processing zones, accelerated depreciation rates, fiscal subsidies, preferential tax terms and tax havens (Christensen and Kapoor, 2004). Tax havens share a number of defining characteristics, most importantly low or zero tax rates on offer to non-residents and transaction secrecy (Tanzi, 2000). A low rate in itself is a necessary, but not sufficient condition for a tax haven (Killian, 2006)[7].

The logic of tax competition requires either that all businesses must move offshore in order to compete on a level basis, or that onshore tax authorities adjust their tax regimes to place a greater burden on other factors of production (particularly labor) and onto consumption, as has been the trend in many countries for the past[8].

Capital's ability to cross borders without restriction has left nationally based tax systems struggling to protect themselves from tax avoidance by high net worth individuals and profits-laundering by transnational businesses. At the same time tax competition has led to many governments cutting tax rates on income earned by non-

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[7] - For a system to be described as a tax haven, four conditions must apply: (1) A low or zero rate of tax applied to profits; (2) A lack of transparency; (3) A lack of effective exchange of information; and (4) Either no real economic activity, or the ring fencing of the low tax rate to target firm (From OECD's project on harmful tax practices, available online at: http://www.oecd.org/ctp).

[8] - In Brazil, for example, between 1995 and 2001 the employee's income tax rate rose by 14 per cent and social security contributions by 75 per cent. Tax on profits; however, were reduced by 8 per cent over the same period. The regressive nature of Brazil's tax regime has been magnified by a value-added tax regime that biases the tax burden towards lower income households, which pay approximately 26.5 per cent of their disposable income on VAT whilst high income households pay 7.3 per cent of their disposable income on VAT (Christensen and Kapoor, 2004).

residents in order to attract portfolio and foreign direct investment. Faced with this dual threat to their tax revenues, governments in developed and developing countries have increasingly resorted to shifting the tax burden from capital to labor, despite this being in most instances both regressive and counter-productive from an employment creation perspective. So tax competition between states can be economically harmful in a number of ways:

1- Tax competition shifts the tax burden between different factors of production and between different types of economic activity, thereby increasing the costs of labor in relation to capital and encouraging short term speculative activity to the detriment of fixed, long-term investment;

2- The greater mobility of high net worth individuals and MNEs enables them to make full use of offshore tax vehicles, thereby undermining the integrity and equity of tax structures and creating a free-rider economy;

3- The use of elaborate and typically aggressive tax avoidance structures increases the administrative burden of revenue collection; and

4- Widespread tax evasion and avoidance increases income disparities within and between nation states, and is symptomatic of the withdrawal of wealthy elites from their economic and social obligations.

Tax competition and tax havens reduce tax revenues that could otherwise contribute to public services, development, and the reduction of poverty (Lewis, 2006).

In a world where there are taxes on international transactions or where the rates of business income taxation differ across countries, then a multinational enterprise has

financial incentives to choose strategically a transfer price[9] to reduce the amount of taxation paid in the importing and exporting countries.

Another action to be taken in response to changes in tax rates is to manage earnings levels across accounting periods to minimize the tax liability of the firm through time. When tax rates are known to be reduced, firms are motivated to decelerate the recognition of income. This phenomenon, often called earnings management or income smoothing has been extensively studied through the late 1980s and1990s, particularly in the context of the US Tax Reform Act of 1986 (Killian, 2006).

In conclusion, the recent wave of MNEs has been directed towards countries offering a suit of incentives through tax competition to attract FDI categorized as tax havens. Although tax havens offer low or zero tax rates to MNEs, they adjust their tax regimes to place a grater burden on other factors of production especially labor and consumption and induce them towards shadow activities. On the other hand, MNEs tend to take more advantages through tax havens by managing earning and transfer pricing so shadow economy increases in these countries. In summary we expect:

Hypothesis 1: Higher FDI causes higher shadow economy.

On the other hand, those who look on the bright side of MNEs, argue that FDI affects government tax revenues positively in a variety of ways. For example, higher investment levels in a country are expected to increase production, thus directly increasing domestic taxes on income, and on goods and services if the production is

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[9] - When there is an international transaction between say two divisions of a multinational enterprise that has establishments in two or more countries, then the value of the transaction to the exporting division will be equal to the value of the transaction for the importing division. Thus when the multinational enterprise works out its profits worldwide for the quarter when the transaction took place, the export value will equal the import value and hence will cancel out, leaving the company's overall profits unchanged, no matter what price it chooses to value the transaction. The price chosen to value the transaction is called a transfer price.

sold in the country, and indirectly through increases in the quantity and perhaps quality of domestic income that result in higher levels of income taxes if it is sold abroad. Part of the production inputs could also be imported, thus again constituting a potential increase in taxes on international trade. Furthermore, as it is also argued that FDI will foster greater activity in the domestic firms participating in the production chain, and thus, expected higher productivity of these firms provide an additional channel through which tax revenues are expected to increase. Of course the above analysis is dependent on the type of FDI, the sector where is it embedded, and the potential externalities that are expected to generate, but the overall effect is generally expected to be positive. In sum it is argued that FDI motivates the tax system reform in a way that it causes tax evasion reduction. Then it is expected that by increasing FDI, the shadow economy decreases.

But even if the above effects have been theoretically analyzed, the empirical work on the effect of FDI on shadow economy is almost nonexistent, and thus its direction and magnitude still unreported. The only exception is the working paper of Vacaflores (2006), who studies the impact of FDI on tax revenue in Latin America during 1980-2002, by estimating the dynamic panel model with system GMM. He finds that FDI has a positive effect on central government tax revenues.

Hypothesis 2: Higher FDI causes lower shadow economy.

2.2. The Impacts of Shadow Economy on FDI

The present authors are unaware of any studies on the issue of relationship between shadow economy and FDI. This paper therefore seeks to address this very issue. It will do so by linking the theme of shadow economy to corruption that has been playing an important role in attracting FDI.

Studies have indicated that political system can affects formal and informal economic activities. Torgler and Schneider (2007) find strong support that governance and institutional quality increase leads to a smaller shadow economy. If citizens perceive that their interests (preferences) are properly represented in political institutions and they receive an adequate supply of public goods, their identification with the state increases, their willingness to contribute increases.

On the other hand, in an inefficient state where corruption is rampant the citizens will have little trust in the authority and thus a low incentive to cooperate. A sustainable tax system is based on a fair tax system and responsive government, achieved with a strong connection between tax payments and the supply of public goods (Bird et al., 2006). Friedman et al. (2000) show empirically that countries with more corruption have a higher share of unofficial economy. Dreher and Schneider (2006) have also investigated the correlation between shadow economy and corruption. They observe the tendency that shadow economy and corruption are substitutes in high-income countries, but complements in low-income countries.

In countries where corruption is systemic and the government budget lacks transparency and accountability the obligation of paying taxes cannot be assumed to be an accepted social norm. Institutional instability, lack of transparency and rule of law undermine the willingness of frustrated citizens to be active in the formal economy. Citizens will feel cheated if they believe that corruption is widespread, their tax burden is not spent well, their government lacks accountability, and that they are not protected by the rules of law. This increases the incentive to enter the informal sector. Thus an increase in corruption increases the size of shadow economy.

The relationship between corruption - which increases shadow economy- and FDI, should be observed by making use of data on FDI. Wheeler and Mody (1992)

did not find a significant correlation between the size of FDI and the host country's risk factor - which included corruption among other variables and was highly correlated with corruption. Another insignificant finding is reported by Alesina and Weder (1999).

More recent studies provide evidence in favor of corruption deterring foreign investors. Focusing on bilateral flows between 14 sources and 45 host countries in 1990 and 1991, Wei (2000a) detects a significant negative impact of corruption on FDI. Aizenman and Spiegel (2003) reveal a negative impact of corruption, measured by the BI-data, on the ratio of FDI to total capital accumulation for a variety of regressions.

Lambsdorff and Cornelius (2000) show an adverse impact of corruption on FDI for the African countries. Abed and Davoodi (2002) obtain a negative impact of corruption on the US-Dollar per capita value of FDI for a cross-section of 24 transition countries. Doh and Teegen (2003) show that investments in the telecommunications industry are adversely affected by the extent of corruption.

Smarzynska and Wei (2000) provide evidence in a similar vein for corruption to reduce firm-level assessments of FDI in Eastern Europe and the former Soviet Union. In another study, Wei (2000b) and Wei and Wu (2001) also hint at corruption reducing foreign direct investments.

Habib and Zurawicki (2001; 2002) also provide evidence in the line of corruption deterring foreign direct investments. They found that the impact of corruption on FDI to be larger than that on local investment.

But FDI represent only a minor fraction of a country's total capital inflows. In order to ascertain the negative welfare consequences of corruption, it is vital to prove

its adverse effect on total capital inflows. The impact of corruption on these total net capital imports is proven in Lambsdorff (2003). In a cross-section of 65 countries, corruption is shown to decrease capital inflows at a 99 % confidence level.

Hypothesis 3: Higher shadow economy causes lower FDI.

On the other hand, in some cases, foreign investors use illegitimate means to "persuade" governments to allow them to invest. Bribery is also common when foreign companies are only prepared to invest if they can secure special privileges. Corrupt governments make agreements with foreign firms, which allow the firms to do business on very favorable terms, often to the economic disadvantage of the local population. Foreign direct investment often involves contracts in which the foreign investor gains the profits and the government bears the risk (Anti Corruption Resource Center, ACRC). In Addition, by increasing corruption and shadow economy, government revenues decreases –citizen don't contribute to pay tax – then for compensating budget deficit, government attract FDI by giving privilege to foreign investors. Egger and Winner (2005) empirically find a clear positive relation between corruption and FDI for a sample of 73 countries and time period 1995-1999.

Hypothesis 4: Higher shadow economy causes higher FDI.

3. Empirical Model, Methodology and the Data

3.1. Model

The empirical model is aimed at investigating the Granger Casual relationship between shadow economy and FDI using dynamic panel system GMM estimators. Thus, the empirical model that employed in the analysis is as follows:

$$y_{it} = \alpha + \sum_{j=1}^{m} \delta_j \, y_{i,t-j} + \sum_{l=1}^{n} \beta_l \, x_{i,t-l} + \sum_{k=1}^{r} \gamma_k \, z_{i,t-k} + u_{it}$$

Where the causality-based variables x and y are FDI or shadow economy. We use three major control variables (z) as mediators between shadow economy and FDI including economic growth, economic freedom and institutional quality.

Although the review of recent literature shows that the relationship between shadow economy and economic growth is ambiguous, Nikopour *et al.* (2008) by using Kuznet's curve and data for 21 selected OECD countries for time period 1995-2006 empirically show that there is a positive relationship between shadow economy and economic growth. On the other hand, the empirical studies show that there is a bi-directional causality between FDI and economic growth and this relationship is positive (Chowdhury and Mavrotas, 2005).

Using different restrictions on economic activities by government, financial, labor, trade and investment markets and also property rights causes economic freedom decreasing and force peoples and firms towards shadow economy activities. On the other hand, increasing economic freedom by reducing tariff and non-tariff barriers and liberalizing domestic financial system, increases FDI.

The importance of institutional quality factor has caught the attention of economists in a variety of fields. North (1990) defines institutions as the human constraints that structure political, economic and social interaction. They comprise both formal rules (property rights, constitutions and laws) and informal constraints (unwritten taboos, customs, traditions and codes of conduct). When the rules change persistently or are not respected, when corruption is widespread and rule enforcement is fragile, or when property rights are not well defined, there is likely to be a problem with the quality of the institutions. Since the allocation of resources, the delivery of services and fair judgment will be less than desirable and the actual achievements will be less than the supposed aims. Problems related to institutional quality may be

translated into an increased degree of uncertainty that sends misleading signals to the market, thus affecting the productive economic process (Law and Azman-Saini, 2008).

3.2. Econometric Methodology

In this paper, Granger-causality tests will be performed with panel data, which present a problem associated with dynamic panel data analyses. The general dynamic relationship is characterized by the presence of lagged regressors, which include apart from the causality-based variables (x and y) and additional control variables (z):

$$y_{it} = \alpha + \sum_{j=1}^{m} \delta_j y_{i,t-j} + \sum_{l=1}^{n} \beta_l x_{i,t-l} + \sum_{k=1}^{r} \gamma_k z_{i,t-k} + u_{it} \qquad (1)$$

Where $t = 1,...,T$ is time and $i = 1,...N$ is cross section and m, n and r are the number of lags. It is assumed that the u_{it} follow a one-way error component model:

$$u_{it} = \mu_i + \lambda_t + v_{it} \qquad (2)$$

Where $\mu_i \sim IID\left(0,\sigma_\mu^2\right)$ is the unobserved country-specific effect, $\lambda_t \sim IID\left(0,\sigma_\lambda^2\right)$ represents period-specific effects and $v_{it} \sim IID\left(0,\sigma_v^2\right)$ the error term. The dynamic panel data regressions described in (1) and (2) are characterized by two sources of persistence over time, Autocorrelation due to the presence of a lagged dependent variable among the regressors and individual effects characterizing the heterogeneity among the individuals. Since y_{it} is a function of μ_i, it follows that $y_{i,t-1}$ is also a function of μ_i. Therefore, $y_{i,t-1}$, a right-hand regressor in (1) is correlated with the error term. This renders the OLS estimator biased and inconsistent even if the v_{it} are not serially correlated.

In panel estimation, neither the Generalized Least Squares (GLS) estimator nor the Fixed Effect (FE) estimator will produce consistent estimates in the presence of dynamics and endogenous regressors (Baltagi 1995). Arellano and Bond (1991) have proposed a dynamic panel General Method of Moments (GMM) estimator which is an IV estimator that uses all past values of endogenous regressors as well as current values of strictly exogenous regressors as instruments. Estimates can be based on first difference, or on orthogonal deviations.

Arellano- Bond estimation starts by transforming all regressors, usually by differencing, and uses the Generalized Method of Moments (Hansen 1982), and so is called Difference GMM. The Arellano-Bover/Blundell-Bond estimator augments Arellano-Bond by making an additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments, and can dramatically improve efficiency. It builds a system of two equations-the original equation as well as the transformed one- and is known as System GMM. It is preferred to difference GMM since finite sample bias problem caused by weak instruments in first differenced GMM will be addressed by using system GMM. It also offers forward orthogonal deviations, an alternative to differencing that preserves sample size in panels with gaps. And it allows finer control over the instrument matrix.

Both Difference GMM and System GMM are general estimators designed for situations with 1) "small T, large N" panels, meaning few time periods and many individuals; 2) a linear functional relationship; 3) a single left-hand-side variable that is dynamic, depending on its own past realizations; 4) independent variables that are not strictly exogenous, meaning correlated with past and possibly current realizations of the error; 5) fixed individual effects; and 6) heteroskedasticity and autocorrelation

within individuals but not across them. Arellano and Bond proposed two estimators - one- and two-step estimators- with the two-step estimator being the optimal estimator. The Sargan/Hansen test of over- identifying restrictions is performed which is a joint test of model specification and appropriateness of the instrument.

The test of whether x Granger-causes y consists of a test of the hypothesis that $\beta_1 = \beta_2 = ... = \beta_n$ are equal to zero (Wald test) after controlling for y's own lags and the influence of additional controls (z).

3.3. Data

Until few years ago, quantitative analyses of interactions between variables such as shadow economy, indexes of rule of law, corruption and economic freedom have been virtually impossible. Fortunately, the recent availability of data on the scope of shadow economy now makes such a study possible. In particular, we refer to Schneider's (2005, 2007) estimates of the shadow economy as percentage of official GDP. The collected data set consists of five data points (1999/2000, 2001/2002, 2002/2003, 2003/2004 and 2004/2005) for 145 countries[10].

The Heritage Foundation has provided economic freedom index since 1995. The index of economic freedom conceive uses 10 specific freedoms; *(i) Business freedom, (ii) Trade freedom, (iii) Fiscal freedom, (iv) Government size, (v) Monetary freedom, (vi) Investment freedom, (vii) Financial freedom, (viii) Property rights, (ix) Freedom from corruption* and *(x) Labor freedom* (Beach and Kane, 2008). The definition of the above economic freedom indicators are provided in Table 2 (Appendix). Since labor freedom is available only for recent years and not for the time period used in this paper, we used average of these nine indicators as an *Economic Freedom*. It is

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[10] - The Definition of indicators is shown in Appendix (Table 2) and the list of countries in the sample is shown in Appendix (Table 5).

expected that the activities of the shadow economy decrease and FDI increase with increasing economic freedom.

The institutional quality data sets we employed in the analysis are newly assembled dataset by Kaufmann *et al.* (2008). These indicators are constructed based on information gathered through a wide variety of cross-country surveys as well as polls of experts. Kaufmann *et al.* (2008) use a model of unobserved components, which enables them to achieve levels of coverage of approximately 212 countries for each of their indicators. They construct six different indicators, each representing a different dimension of governance: (i) *Voice and Accountability*, (ii) *Political Stability and Lack of Violence*, (iii) *Government Effectiveness*, (iv)*Regulatory Quality*, (v) *Rule of Law*, and (vi) *Control of Corruption*. The definition of the above institutional quality indicators are provided in Table 2 (Appendix). Because of collinearity between theses indicators, we defined average of voice and accountability, and political stability as the *Political Freedom and Stability* and average of government effectiveness, regulatory quality, rule of law and corruption as the *Government Efficiency*. We expect an increase in governance and institutional quality reduces the size of the shadow economy and increase FDI.

4. The Empirical Results

We explore the Granger causality between shadow economy and FDI using two step system GMM method with t-values and test statistics that are asymptotically robust to general heteroscedasticity and corrected for a small sample bias.

The estimates of the shadow economy equations are presented in Table 3a which its columns present different specifications of the shadow economy equation. In all models the variable of interest is FDI.

In specification (1), no control variable is used while in specification (2), GDP growth rate is used as a control variable. In specification (3), economic freedom variable is added to GDP growth rate as another control variable and in specification (4) indicator of political freedom and stability is added to GDP growth rate as the other control variable and finally in specification (5) the government efficiency indicator is added to GDP growth rate as a control variable.

All models include a set of year dummies. In all specifications, year dummies and levels equation are used as instrument variables because all other regressors are not strictly exogenous. The shadow economy equation fits the data well as indicated by the regression statistics.

Two types of diagnostic test are used for the empirical models. Firstly we conducted the test of first and second order serial correlation in the residuals. The AR (2) test statistics of the residuals do not reject the specification of the error term in all models except for model (1). Secondly, the Hansen test statistics indicate that the shadow economy equation for all specifications is well specified and that the instrument vector is appropriate. Test statistics also reject the null hypothesis that the time dummies are jointly equal to zero at the one percent level.

The results suggest that there is no significant relationship between FDI and the shadow economy except for model (2) in which FDI has a negative significant impact on shadow economy. The economic growth rate in all specifications has a statistically significant positive effect on the shadow economy. In specifications 3-5 economic freedom, political freedom and stability and government efficiency have a statistically significant negative effect on the shadow economy respectively.

The Granger causality test (Wald test) is used for specification (2) since only in that FDI has a statistically significant impact on shadow economy. The result of this test suggests that FDI causes shadow economy. That is, past information on FDI help improve prediction of the shadow economy. Thus, the empirical evidence supports the second hypothesis that higher FDI causes lower shadow economy although this result is not robust.

For double robustness checks, we drop outlier the shadow economy data – countries their shadow economy is more than 60% of GDP[11]. The results in Table 3b confirm the above mentioned results.

The different specification estimates of FDI equation are presented in Table 4a. All models are specified the same as shadow economy equation and the variable of interest is shadow economy. All models include a set of year dummies. In all specifications, only year dummies and levels equation are used as instrument variables because all other regressors are not strictly exogenous. The FDI equation fits the data well as indicated by regression statistics.

The AR (2) test statistics of the residuals do not reject the specification of the error term in all models. The Hansen test statistics also indicate that the FDI equation in all specifications is well specified and the instrument vector is appropriate. Test statistics also reject the null hypothesis that the time dummies are jointly equal to zero at one percent level.

The results suggest that in all specifications, shadow economy has a statistical significant positive effect on FDI. Although in specifications 2-5, economic growth rate has a positive effect on FDI, only in specifications 3 and 5 this positive effect is statistically significant. In specifications 3-5 economic freedom, political freedom and

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[11] - These countries including: Azerbaijan, Bolivia, Georgia, Panama, Peru, Tanzania and Zimbabwe.

stability and government efficiency have a positive effect on FDI respectively although only government efficiency is statistically significant in specification 5.

The results of the Granger causality test (Wald test) suggest that shadow economy causes FDI in all models. That is, past information on shadow economy help improve prediction of FDI. Thus, the empirical evidence supports the fourth hypothesis that higher shadow economy causes higher FDI.

For double robustness checks, we drop outlier the shadow economy data – countries their shadow economy is more than 60% of GDP- and added three extra control variables including labor force, human capital and capital formation (investment). The results in Table 4b confirm the above mentioned results.

6. Conclusion

The present paper examines the link between shadow economy and FDI using the Granger panel causality test. To our knowledge, this is the first study that investigates the relationship between these two variables. For that purpose we use the shadow economy and FDI data for 145 countries of five data points 1999/2000, 2001/2002, 2002/2003, 2003/2004 and 2004/2005.

In this way we thereby combine two strands of the literature. The first deals with the impact of FDI on the shadow economy; the second with the influence of the shadow economy on FDI. In both strands there are important gaps. In this study we formulate four hypotheses:

Hypothesis 1: Higher FDI causes higher shadow economy.

Hypothesis 2: Higher FDI causes lower shadow economy.

Hypothesis 3: Higher shadow economy causes lower FDI.

Hypothesis 4: Higher shadow economy causes higher FDI.

The system GMM results support that FDI causes the shadow economy and vice versa. That is, past information on FDI help improve prediction of shadow economy and vice versa. Although the empirical evidence supports the robustness of fourth hypothesis, the second hypothesis that higher FDI causes lower shadow economy is not robust. Since FDI represent only a minor fraction of country's economy, this causality is not robust.

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Appendix

Table 1: Characteristics of sample data

Variable	Source	Unit of Measurement	Mean	Standard deviation	Minimum	Maximum	Obs.
Shadow Economy	Schneider (2007)	US$,Billion	73.63	158.25	0.060	1379.6	704
FDI	UNCTAD	US$,Billion	5.48	18.07	-21.15	298.84	715
Economic Growth	IMF	%	7.81	4.77	-12.93	43.04	703
Economic Freedom	Heritage Foundation	%	60.01	10.30	23.96	90.06	640
Government Effectiveness	Kaufmann *et al.* (2008)	Standard deviation	50.35	27.87	1.65	100	723
Control of Corruption	Kaufmann *et al.* (2008)	Standard deviation	48.69	28.22	0.24	100	720
Voice and Accountability	Kaufmann *et al.* (2008)	Standard deviation	49.34	27.55	2.16	100	725
Political Stability	Kaufmann *et al.* (2008)	Standard deviation	45.59	27.74	0.24	99.75	710
Rule of Law	Kaufmann *et al.* (2008)	Standard deviation	47.78	27.88	0.71	100	722
Regulatory Quality	Kaufmann *et al.* (2008)	Standard deviation	50.04	27.51	0.97	99.76	720
Labor Force	WDI	Person	2.02e+7	7.40e+7	35853.3	7.70+e8	695
Human Development Index(HDI)	UNDP	0-1	0.681	0.198	0.129	0.967	680
Gross Capital Formation (Investment)	WDI	% of GDP	22.37	7.14	3.27	59.09	675

Table 2: Definition of Indicators

Indicators	Definition
Shadow economy	The shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons: to avoid or evasion payment of income, value added or other taxes, to avoid payment of social security contributions, to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.
Governance Indicators	
Voice and Accountability	The extent to which country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media
Political Stability	The perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism
Government Effectiveness	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies
Regulatory Quality	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development
Rule of Law	The extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence
Corruption	The extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests
Economic freedom	Encompasses all liberties and rights of production, distribution, or consumption of goods and services.
Business freedom	The ability to create, operate, and close an enterprise quickly and easily. Burdensome, redundant regulatory rules are the most harmful barriers to business freedom.
Trade freedom	A composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services.
Fiscal freedom	A measure of the burden of government from the revenue side. It includes both the tax burden in terms of the top tax rate on income (individual and corporate separately) and the overall amount of tax revenue as a portion of gross domestic product (GDP).
Government size	Defined to include all government expenditures, including consumption and transfers. Ideally, the state will provide only true public goods, with an absolute minimum of expenditure.
Monetary freedom	Combines a measure of price stability with an assessment of price controls. Both inflation and price controls distort market activity. Price stability without microeconomic intervention is the ideal state for the free market.
Investment freedom	An assessment of the free flow of capital, especially foreign capital.
Financial freedom	A measure of banking security as well as independence from government control. State ownership of banks and other financial institutions such as insurer and capital markets is an inefficient burden, and political favoritism has no place in a free capital market.
Property rights	An assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state.
Freedom from corruption	Based on quantitative data that assess the perception of corruption in the business environment, including levels of governmental legal, judicial, and administrative corruption.
Labor freedom	A composite measure of the ability of workers and businesses to interact without restriction by the state.

Sources: Schneider (2007), Beach and Kane (2008) and Kaufmann *et al.* (2008).

Table 3a: Effect of FDI on shadow economy, two step system GMM estimation

Dependent variable: $\log(shadow)_t$	(1)	(2)	(3)	(4)	(5)
$\log(shadow)_{t-1}$	0.989 (52.09)*	0.998 (194.4)*	0.999 (151.18)*	0.991 (159.19)*	0.996 (190.28)*
$\log(FDI)_{t-1}$	-0.008 (-1.04)	-0.006 (-2.12)**	0.001 (0.22)	0.0009 (0.20)	-0.0003 (-0.10)
$\log(gGDP)_t$		0.078 (8.89)*	0.068 (5.65)*	0.067 (6.24)*	0.063 (6.50)*
$\log(economicfreedom)_t$			-0.147 (-2.04)**		
$\log(politicalfreedom\ \&\ stability)_t$				-0.021 (-1.76)***	
$\log(governmentefficincy)_t$					-0.023 (-2.62)*
$DUM\,(2001/2002)$	0.074 (10.36)*	0.053 (13.18)*	0.057 (11.77)*	0.058 (11.76)*	0.059 (14.15)*
$DUM\,(2002/2003)$	0.015 (4.12)*	0.044 (11.30)*	0.043 (6.90)*	0.042 (9.83)*	0.042 (9.37)*
$DUM\,(2003/2004)$		0.008 (4.35)*	0.008 (2.84)*	0.007 (3.80)*	0.007 (3.43)*
$-cons$	0.084 (1.37)	-0.104 (-4.03)*	0.521 (1.66)***	0.024 (0.33)	0.025 (0.50)
Number of observation	549	536	489	532	536
Arellano-Bond test for AR(1), (p value)	0.803	0.003	0.012	0.002	0.003
Arellano-Bond test for AR(2), (p value)	0.043	0.145	0.509	0.431	0.476
Hansen test of overid. (p value)	0.596	0.232	0.218	0.209	0.231
Wald test $\left(H_0: \log(FDI)_{t-1}=0\right)$		(4.48)**			
Wald test $\left(H_0: DUM=0\right)$	(64.51)*	(97.97)*	(89.14)*	(127.48)*	(117.01)*

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations (Stata xtabond2 command). Figures in the parentheses are t-statistics. * Significant at the 1 percent level, ** Significant at the 5 percent level and*** Significant at the 10 percent level. Political Freedom and Stability = average of voice & accountability and political stability. Government Efficiency = average of government effectiveness, regulatory quality, rule of law and corruption.

Table 3b: Effect of FDI on shadow economy, two step system GMM estimation (Robustness Checks)

Dependent variable: $\log(shadow)_t$	(1)	(2)	(3)	(4)	(5)
$\log(shadow)_{t-1}$	0.993 (62.44)*	0.999 (204.04)*	0.999 (145.06)*	0.993 (153.79)*	0.997 (184.46)*
$\log(FDI)_{t-1}$	-0.012 (-1.79)***	-0.006 (-2.23)**	0.00009 (0.01)	-0.0001 (-0.03)	-0.001 (-0.33)
$\log(gGDP)_t$		0.078 (8.96)*	0.067 (5.43)*	0.069 (6.46)*	0.063 (6.89)*
$\log(economicfreedom)_t$			-0.136 (-1.75)***		
$\log(politicalfreedom\ \&\ stability)_t$				-0.018 (-1.52)	
$\log(governmentefficincy)_t$					-0.022 (-2.83)*
$DUM(2001/2002)$	0.075 (11.34)*	0.054 (13.18)*	0.058 (10.79)*	0.059 (11.52)*	0.061 (14.25)*
$DUM(2002/2003)$	0.015 (4.32)*	0.045 (11.56)*	0.043 (7.27)*	0.044 (10.47)*	0.043 (9.63)*
$DUM(2003/2004)$		0.008 (4.41)*	0.008 (2.87)*	0.008 (4.24)*	0.007 (3.52)*
$-cons$	0.070 (1.34)	-0.105 (-4.44)*	0.477 (1.40)	0.002 (0.03)	0.018 (0.40)
Number of observation	521	512	465	508	512
Arellano-Bond test for AR(1), (p value)	0.669	0.002	0.009	0.002	0.002
Arellano-Bond test for AR(2), (p value)	0.019	0.155	0.647	0.390	0.475
Hansen test of overid. (p value)	0.543	0.298	0.230	0.197	0.238
Wald test $\left(H_0 : \log(FDI)_{t-1} = 0\right)$		(4.99)**			
Wald test $\left(H_0 : DUM = 0\right)$	(144.84)*	(95.58)*	(80.70)*	(112.29)*	(110.25)*

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations (Stata xtabond2 command). Figures in the parentheses are t-statistics. * Significant at the 1 percent level, ** Significant at the 5 percent level and*** Significant at the 10 percent level. Political Freedom and Stability = average of voice & accountability and political stability. Government Efficiency = average of government effectiveness, regulatory quality, rule of law and corruption.

Table 4a: Effect of shadow economy on FDI, two step system GMM estimation

Dependent variable: $\log(FDI)_t$	(1)	(2)	(3)	(4)	(5)
$\log(FDI)_{t-1}$	0.548	0.568	0.498	0.702	0.540
	(3.84)*	(5.04)*	(6.07)*	(4.39)*	(4.14)*
$\log(shadow)_{t-1}$	0.535	0.561	0.579	0.395	0.462
	(2.93)*	(3.00)*	(4.72)*	(2.06)**	(2.40)**
$\log(gGDP)_t$		0.052	0.305	0.333	0.077
		(0.34)	(2.60)**	(3.67)*	(0.51)
$\log(economicfreedom)_t$			1.372		
			(1.47)		
$\log(politicalfreedom \& stability)_t$				0.282	
				(1.21)	
$\log(governmentefficincy)_t$					0.455
					(1.96)***
$DUM(2001/2002)$	-0.219	-0.276	-0.271	-0.272	-0.302
	(-2.30)**	(-3.34)*	(-2.75)*	(-3.43)*	(-3.63)*
$DUM(2002/2003)$	-0.161	-0.192			-0.179
	(-2.22)**	(-1.78)***			(-1.75)***
$DUM(2003/2004)$	-0.054	-0.101			-0.765
	(-0.84)	(-1.68)***			(-1.60)
$-cons$	-1.614	-1.727	-7.99	-2.855	-3.194
	(-2.66)*	(-2.41)**	(-2.02)**	(-2.04)**	(-2.63)**
Number of observation	540	527	483	523	527
Arellano-Bond test for AR(1), (p value)	0.025	0.022	0.006	0.017	0.032
Arellano-Bond test for AR(2), (p value)	0.600	0.462	0.255	0.378	0.517
Hansen test of overid. (p value)	0.593	0.636	0.467	0.402	0.587
Wald test $\left(H_0 : \log(shadow)_{t-1} = 0\right)$	(8.58)*	(9.03)*	(22.29)*	(4.24)**	(5.76)**
Wald test $\left(H_0 : DUM = 0\right)$	(2.90)***	(2.69)***	(7.59)*	(11.78)*	(4.32)**

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations (Stata xtabond2 command). Figures in the parentheses are t-statistics. * Significant at the 1 percent level, ** Significant at the 5 percent level and*** Significant at the 10 percent level. Political Freedom and Stability = average of voice & accountability and political stability. Government Efficiency = average of government effectiveness, regulatory quality, rule of law and corruption.

Table 4b: Effect of shadow economy on FDI, two step system GMM estimation (Robustness Checks)

Dependent variable: $\log(FDI)_t$	(1)	(2)	(3)	(4)	(5)
$\log(FDI)_{t-1}$	0.633 (4.13)*	0.771 (10.04)*	0.804 (9.66)*	0.810 (12.72)*	0.773 (9.26)*
$\log(shadow)_{t-1}$	0.488 (2.30)*	0.395 (2.03)*	0.446 (1. 93)***	0.342 (2.00)**	0.441 (1.72)***
$\log(gGDP)_t$		0.203 (1.89)***	0.398 (2.82)*	0.249 (2.21)**	0.223 (2.40)**
$\log(economicfreedom)_t$			-0.808 (-0.76)		
$\log(politicalfreedom \& stability)_t$				-0.0007 (-0.00)	
$\log(governmentefficincy)_t$					-0.074 (-0.33)
$\log(laborforce)$		-0.258 (-1.51)	-0.385 (-1.07)	-0.226 (-1.30)	-0.332 (-1.19)
$\log(HDI)$		0.225 (0.83)	0.271 (0.66)	0.158 (0.59)	0.438 (1.22)
$\log(investment)$		0.069 (0.21)	-0.319 (-0.64)	-0.110 (-0.34)	0.102 (0.27)
$DUM(2001/2002)$	-0.216 (-2.14)**	-0.221 (-1.88)***	-0.369 (-3.15)*	-0.243 (-2.37)*	-0.221 (-1.89)***
$DUM(2002/2003)$	-0.152 (-2.03)**				
$DUM(2003/2004)$	-0.032 (-0.49)				
$-cons$	-1.43 (-2.03)**	2.353 (0.99)	8.374 (1.19)	2.469 (0.88)	3.413 (0.81)
Number of observation	513	481	450	479	481
Arellano-Bond test for AR(1), (p value)	0.022	0.003	0.002	0.002	0.005
Arellano-Bond test for AR(2), (p value)	0.522	0.539	0.414	0.501	0.543
Hansen test of overid. (p value)	0.583	0.441	0.578	0.606	0.346
Wald test $\left(H_0 : \log(shadow)_{t-1} = 0\right)$	(5.31)*	(4.12)**	(3.73)***	(4.00)**	(2.95)***
Wald test $\left(H_0 : DUM = 0\right)$	(2.99)**	(3.53)***	(9.95)*	(5.62)*	(3.57)***

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations (Stata xtabond2 command). Figures in the parentheses are t-statistics. * Significant at the 1 percent level, ** Significant at the 5 percent level and*** Significant at the 10 percent level. Political Freedom and Stability = average of voice & accountability and political stability. Government Efficiency = average of government effectiveness, regulatory quality, rule of law and corruption.

Table 5: Countries included in the Analysis

ALBANIA	ETHIOPIA	MARSHALL ISLANDS	SPAIN
ALGERIA	FIJI	MAURITANIA	SRI LANKA
ANGOLA	FINLAND	MEXICO	SWEDEN
ARGENTINA	FRANCE	MICRONESIA	SWITZERLAND
ARMENIA	GEORGIA	MOLDOVA	SYRIA
AUSTRALIA	GERMANY	MONGOLIA	TAIWAN
AUSTRIA	GHANA	MOROCCO	TANZANIA
AZERBAIJAN	GREECE	MOZAMBIQUE	THAILAND
BANGLADESH	GUATEMALA	NAMIBIA	TOGO
BELARUS	GUINEA	NEPAL	TONGA
BELGIUM	HAITI	NETHERLANDS	TUNISIA
BENIN	HONDURAS	NEW ZEALAND	TURKEY
BHUTAN	HONG KONG	NICARAGUA	UGANDA
BOLIVIA	HUNGARY	NIGER	UKRAINE
BOSNIA-HERZEGOVINA	INDIA	NIGERIA	UNITED ARAB EMIRATES
BOTSWANA	INDONESIA	NORWAY	UNITED KINGDOM
BRAZIL	IRAN	OMAN	UNITED STATES
BULGARIA	IRELAND	PAKISTAN	URUGUAY
BURKINA FASO	ISRAEL	PALAU	UZBEKISTAN
BURUNDI	ITALY	PANAMA	VANUATU
CAMBODIA	JAMAICA	PAPUA NEW GUINEA	VENEZUELA
CAMEROON	JAPAN	PARAGUAY	VIETNAM
CANADA	JORDAN	PERU	YEMEN
CENTRAL AFRICAN	KAZAKHSTAN	PHILIPPINES	ZAMBIA
CHAD	KENYA	POLAND	ZIMBABWE
CHILE	KIRIBATI	PORTUGAL	
CHINA	KOREA, SOUTH	PUERTO RICO	
COLOMBIA	KUWAIT	ROMANIA	
CONGO	KYRGYZSTAN	RUSSIA	
CONGO, Dem. Rep.	LAOS	RWANDA	
COSTA RICA	LATVIA	SAMOA	
COTE D'IVOIRE	LEBANON	SAUDI ARABIA	
CROATIA	LESOTHO	SENEGAL	
CZECH REPUBLIC	LITHUANIA	SERBIA	
DENMARK	MACEDONIA	SIERRA LEONE	
DOMINICAN REPUBLIC	MADAGASCAR	SINGAPORE	
ECUADOR	MALAWI	SLOVAKIA	
EGYPT	MALAYSIA	SLOVENIA	
EL SALVADOR	MALDIVES	SOLOMON ISLANDS	
ESTONIA	MALI	SOUTH AFRICA	