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The Impact of Unemployment Rate on the Dimension of Shadow Economy in Spain: A Structural Equation Approach

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Abstract:

The paper uses annual data for the period 1970-2007 in order to estimate the size of Spanish shadow economy. In view to do so, the shadow economy is modelled like a latent variable using the structural equation model(SEM). The model includes tax burden, social benefits, subsidies, government employment, self-employment and unemployment rate as main causes of shadow economy and the results indicates that the size of informal sector oscillates between 22% and 18% of GDP in the last ten years. Investigating the relationship between the shadow economy and unemployment rate a positive relationship is marked out between this two variables.

Keywords: *Shadow economy, MIMIC mode, unemployment rate*

JEL Classification: *C22, E26, O17*

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1. Definition of the Shadow Economy

In the attempt of defining the shadow economy, one commonly used working definition is: all currently unregistered economic activity which contributes to the officially calculated (or observed) Gross National Product[3]. Smith (1994) defines it as „market-based production of goods and services, whether legal or illegal that escapes detection in the official estimates of GDP."

The System of National Accounts (SNA93) and the European System of National Accounts (ESA95) define the "non observed economy", as all product activities that can be classified into the following three areas:

(1) Underground production;
(2) Informal production;
(3) Illegal production.

The Underground production represents the area of production activities that are not directly observed due to:

(1.a) Economic reasons (the activities carried out outside government regulations such as avoiding tax, minimum wages, number of work hours, and working conditions for labourers.

(1.b) Statistical reasons (production activities that are not registered due to failure to fill statistical questionnaires. Their activities go undetected using traditional survey methods due to the small nature of the enterprise.

The Informal production refers to productive institutional units characterised by:

(2.a) a low level of organisation;

(2.b) little or no division between work and capital;

(2.c) work relations based on occasional jobs, kinship, or personal relations. (This context comprises the activity of craftsmen, peddlers without licences, farm workers, home workers, and the unregistered activities of small merchants).

Illegal production includes the activities oriented at the production of goods and services whose sale, distribution or possession is prohibited by law. Included in this area are also productive activities carried out by unauthorised operators.

2. Empirical Strategy and Data

In the process of econometric modelling of Spanish shadow economy we used a different type of models-Structural Equations Models (SEM).The Structural Equation Models (SEM) represents statistical relationships among latent

[3] *This definition is used by Feige (1989-„ economic activities include conscious efforts to avoid official detection) and by Schneider and Enste(2000- all economic activities which contribute to officially calculated gross national product)*

(unobserved) and manifest (observed) variables. A special case of SEM is the Multiple Indicators and Multiple Causes model. It allows to consider the SE as a "latent" variable linked, on the one hand, to a number of observable indicators (reflecting changes in the size of the SE) and on the other, to a set of observed causal variables, which are regarded as some of the most important determinants of the unreported economic activity(Dell'Anno, 2003).

Frey and Weck-Hannemann in 1984 have been the first economists that consider the dimension of the hidden economy as an "unobservable variable".

This type of models is composed by two sorts of equations, the structural one and the measurement equations system. The equation that captures the relationships among the latent variable (η) and the causes (X_q) is named "structural model" and the equations that links indicators (Y_p) with the latent variable (non-observed economy) is called the "measurement model".

So the shadow economy (η) is linearly determined, subject to a disturbance ζ, by a set of observable exogenous causes $X_1, X_2, ...X_6$:

$$\eta_t = \gamma_1 X_{1t} + \gamma_2 X_{2t} + ...\gamma_6 X_{6t} + \xi_t \quad (1)$$

The structural model ties the latent variable [□: shadow economy index] and the causes [tax burden (*X*1), social benefits paid by government (*X*2), subsidies (*X*3), government employment in civilian labour force (*X*4), self-employment in civilian labour force (*X*5), unemployment rate (*X*6)].

The latent variable (η) determines, linearly, subject to disturbances ε_t, a set of observable endogenous indicators Y_1, Y_2 :

$$Y_{1t} = \lambda_1 \eta_t + \varepsilon_{1t} \quad (2)$$

$$Y_{2t} = \lambda_2 \eta_t + \varepsilon_{2t} \quad (3)$$

The measurement model links the indicators [*Yp*: real gross domestic product index (Y_1), civilian labour force participation rate (Y_2)] and the unobservable variable (η). The structural disturbance ζ, and measurement errors **ε** are all normal distributed, mutually independent and all variables are taken to have expectation zero.

For the modelling of shadow economy in Spain, we use annual data from 1970-2007(fig.1). Appendix A reports the data sources for each variable in the empirical model. The series in levels or differences have been tested for the existence of unit roots using Augmented-Dickey Fuller (ADF) test.

All the data has been differentiated for the achievement of the stationarity. While all the variables have been identified like integrated on first order, the latent

variable is estimated in the same transformation of independent variables (first difference).

3. The Causes of the Shadow Economy

Tax burden (X_1): The tax burden is considered to be the most important determinants of SE. Usually an increase in the tax burden offers a strong incentive to work in the unofficial economy, so the expected sign for this variable is a positive one. In the model, tax burden is calculated as ratio of total taxes (direct, indirect taxes and social security contributions) in gross domestic product.

The second variable in the model are *social benefits paid by government* (X_2) that includes all current transfers received by households: unemployment, retirement, sickness, housing, education. They represents an incentive to participate and remain in the irregular market, by reducing the willingness of the unemployed to work and providing incentives to under-declare official income in order to receive undue social benefits.They have been calculated by raporting to gross domestic product.

Subsidies (X_3): They are current unrequited payments that government units make to enterprises on the basis of their level of production or the quantities or values of the goods or services which they produce, sell or import (SNA 1993). Subsidies are declared like percentage of GDP.

Government employment (X_4): This variable quantifies the degree of regulation in the economy. Regarding the sign of this indicator, it could be a negative one, the presence of the state could disincentive people to incorporate in the shadow economy or positive one, capturing the fact that most regulated the economy is, firms find more incentive to develop their activities in the underground economy. This cause is measured as ratio of government employment in civilian labour force.

Self-employment (X_5): The rate of self-employment as a percentage of the civilian labour force is considered as a determinant of the informal economy. According to (Bordignon and Zanardi, 1997) the significant diffusion of small firms and the large proportion of professionals and self-employed respect to the total workforce are important characteristics that justify higher level of the shadow economy. This kind or workers have more possibilities to evade as they usually have greater number of deductions in base and deductions in quote in personal income taxes. Therefore, ceteris paribus, the higher the rate of self-employed, and the larger the shadow economy would be.

Unemployment rate (X_6): Regarding the relationship between unemployment rate and shadow economy, an increase in unemployment could imply a decrease in the black economy as underground economy could be positively related to the

growth rate of GDP and the latter is negatively correlated to unemployment. On the other side some "official" unemployed spend a part of their time working in the black economy, thus we may find a positive correlation (Gilles and Tedds, 2002).

Therefore, economic theory does not give a clue to determine whether the expected sign of this variable is positive or negative, it has to be solved by the empirical analysis in each country.

Indicators:

Index of Real gross domestic product index (Y_1 scale variable, base year 1990=100). In the problem of identification of the model, this variable is very important, mainly because it is chosen as a *variable of scale* (or *reference variable*). MIMIC approach suggests the necessity to fix a scale in order to estimate the rest of the parameters as a function of this scale variable. The value of fix parameter is arbitrary, but using a positive (or negative) unit value is easier to find out the relative magnitude of the other indicator variables.

There is no common view about the sign of the relationship between shadow economy and economic growth. Some authors like Adam and Ginsburgh (1985) for Belgium, Giles and Tedds (2002) for Canada, Chatterjee, Chaudhuri and Schneider (2003) for Asian countries, find a positive relation between SE and official GDP, while others like Frey and Weck-Hannemann (1984) for 17 OECD countries, Loayza (1996) for 14 Latin America countries, Kaufmann and Kaliberda (1996) for Transition countries, Eilat and Zinnes (2000) for transition countries, Schneider and Enste (2000) for 76 Countries, Dell'Anno (2003) for Italy, Dell'Anno, Gomez and Alañón (2007) for France, Greece and Spain, find a negative relationship. Schneider in 2005 find a negative sign for transition and developing countries and a positive relationship for developed ones.

If we change the "sign" of the coefficient of scale (λ_1), the parameters of the causes became from positive negative (keeping the same absolute values. A value (+1) is assigned to λ_1 ($Y_1 = \lambda_1\eta + \varepsilon_1$) consequently, the coefficients of X_1 *and* X_4 are negative[4], but this result completely diverges from well-known theories and empirical studies that assign a "positive" link between underground economy and tax burden and/or government employment. That is the reason why we choose in the model the "minus" sign for the relationship between shadow economy and growth rate of GDP. A disadvantage of the MIMIC method is the strong dependence of the outcomes by the (exogenous) choice of the coefficient of scale (λ) (Dell'Anno, 2003).

Civilian labour force participation rate (Y_2): The civilian labour force participation rate is calculated as the ratio of the total civilian labour force in working age

[4] The shadow economy decreases by increasing tax burden and government employment.

population (15-64 years old). According to Giles (1998) a decrease in this rate over time may reflect a movement of the workforce from the measured economy into hidden activities. By including this variable as an indicator, we investigate if there is a flow of resources between official and underground economy.

The identification procedure starts from the most general model specification (MIMIC 6-1-2) presented in figure 2.1 and continues removing the variables which have not structural parameters statistically significant.

The following table presents the maximum likelihood estimated coefficients of various MIMIC models considered for the informal economy of Spain. The models have been estimated using LISREL 8.8. The coefficient of the index of real GDP[5] is normalised to -1 to sufficiently identify the model ($\lambda_1 = -1$).This indicates an inverse relationship between the official and shadow economy. Since the causal variables are expressed all in percentage of gross domestic product, they are comparable in order to investigate relative weight to explain the dynamics of SE.

For the Spanish case results, table 1 point out that unemployment rate presents a positive sign according with the negative one obtained by the indicator civilian labor force participation rate. It means that in Spain many workers from the official economy go underground when they are laid off. The positive sign of the unemployment rate indicates the existence of a flow of resources from official to shadow economy in recession cycles.

The government employment taken like percentage of civilian labor force has a positive sign meaning that this variable is acting like a good proxy for the grade of regulation in the economy.

The self employment variable is always significant in all the models and with a positive sign acting a one of the main causes of shadow economy in this country and one possible cause for this situation is that in the Spanish economy most of the underground activities are developed by this collective.

The indicator of labor force participation became also significant and negative, indicating that there is a flow of resources between official economy and hidden economy. As can be seen, the coefficients of tax burden, subsidies and social benefits measured like pecentage of GDP are not statistically significant.

4. Obtaining the Size of the Shadow Economy in Spain

Estimation outputs reveal that the main causes of shadow economy are: government employment/civilian labour force, unemployment rate, self-employment/civilian labour force, social benefits/GDP. Starting from MIMIC 6-1-

[5] $Index\ real\ GDP = \text{Re}al\ GDP_t \Big/ \text{Re}al\ GDP_{1990}$

2(fig.1) and removing the variables which have not structural parameters statistically significant, we obtain MIMIC 4-1-2 as the best model (fig.2).
The choice of the model is based on: the statistical significance of parameters, the parsimony of specification, the p-value of chi-square, and the Root Mean Square Error of Approximation (RMSEA) test, adjusted goodness-of-fit index (AGFI).

Taking into account the reference variable (Y_1, $\mathrm{Re}\,al\,GDP_t \big/ \mathrm{Re}\,al\,GDP_{1990}$) the shadow economy is scaled up to a value in 1990, which is our base year, the year in which there are several estimates of the Spanish shadow economy. Further, we build an average of these estimates (table 2).
The index of changes of the shadow economy in Spain measured as percentage of GDP in the 1990 is linked to the index of changes of real GDP as follow:
Measurement Equation:

$$\frac{GDP_t - GDP_{t-1}}{GDP_{1990}} = -\frac{\tilde{\eta}_t - \tilde{\eta}_{t-1}}{GDP_{1990}} \quad (4)$$

The estimates of the structural model are used to obtain an ordinal time series index for latent variable (shadow economy):
Structural Equation:

$$\frac{\Delta\tilde{\eta}_t}{GDP_{1990}} = 0.15\Delta X_{2t} + 2.36\Delta X_{4t} + 0.66\Delta X_{5t} + 0.98\Delta X_{6t} \quad (5).$$

The index is scaled to take up to a value of 18.8% in 1990 and further transformed from changes respect to the GDP in the 1990 to the shadow economy as ratio of current GDP.These operations are show in the benchmark equation[6]:

$$\frac{\tilde{\eta}_t}{GDP_{1990}} \frac{\eta^*_{1990}}{\tilde{\eta}_{1990}} \frac{GDP_{1990}}{GDP_t} = \frac{\hat{\eta}_t}{GDP_t} \quad (6)$$

where:

[6] As the variables are all differenced to same degree, to calculate the levels of the latent variable multiplying the structural coefficients for raw (unfiltered) data, it is equivalent to compute the changes in the index by multiplying coefficients for the differenced causes and then to integrate them.

$\frac{\widetilde{\eta}_t}{GDP_{1990}}$ is the index of shadow economy calculated by equation (5)

$\frac{\eta^*_{1990}}{GDP_{1990}} = 18.8\%$ is the exogenous estimate of shadow economy

$\frac{\widetilde{\eta}_{1990}}{GDP_{1990}}$ is the value of index estimated by equation (5)

$\frac{GDP_{1990}}{GDP_t}$ is to convert the index of changes respect to base year in shadow economy respect to current GDP

$\frac{\hat{\eta}_t}{GDP_t}$ is the estimated shadow economy as a percentage of official GDP.

The shadow economy measured like percentage of official GDP, presented in the figure 3, records the value of 20.7% in 1970 and follows an ascendant trend reaching the value of 24.5% in 1985. Then it oscillates between 20% and 22% of official GDP, with a slow tendency of decreasing in the last five years.

The results of this estimation are not far from other method, the currency demand approach applied by Schneider who estimates the size of shadow economy at the level of 22.5% in 2001/02, 21.2% in 2003/04 and 20.5% in 2004/05.

5. The Impact of Unemployment Rate on Shadow Economy Dimension

Figure 4 point out a direct relationship between the size of shadow economy estimated by MIMIC as % of official GDP and unemployment rate. The correlation between this two variable [$Corr(\eta_t, UR_t) = 0.61$] confirms a positive relationship.

Giles and Tedds (2002) state that the effect of unemployment on the shadow economy is ambiguous (i.e. both positive and negative). An increase in the number of unemployed increases the number of people who work in the black economy because they have more time. On the other hand, an increase in unemployment implies a decrease in the shadow economy.

In order to investigate the impact of unemployment rate on the shadow economy dimension, we develop a structural relationship, taking into account also the growth rate
of official GDP (table 3):

$$g_t^{shad} = \gamma g_t^{off} + \lambda \Delta u_t + \varepsilon_t \text{ [7]} (7)$$

The parameter γ of the equation shows an inverse relationship between the growth of the official economy (g_t^{off}) and growth of the shadow economy (g_t^{shad}). On the other-hand, the parameter λ shows a direct relationship between changes in unemployment and the growth of the shadow economy.

The coefficients are statistically significant(prob.<5%) but the degree of determination in the model is moderate, only 41% of the variation of shadow economy is explained by the two exogenous variables unemployment rate and growth rate of official GDP. However these results, though statistically significant, should be interpreted carefully.

The estimation shows that the presence of the shadow economy acts as a buffer as it absorbs some of the unemployed workers from the official economy into the shadow economy. It reduces the impact of higher unemployment on official output.

6. Conclusions

The main objective of this paper is to explain the evolution of shadow economy in Spain using the structural equation models, taking into account the non-stationarity problems, very usual in the economic time series. The main conclusions that can be drawn are the following:

1) Unemployment appears as one of the main causes for the existence of the shadow economy. This indicator presents a positive sign in all the models. This aspect is very important if we have into account that these workers suppose a double cost for the State. In one hand, they receive monetary perceptions from State and, in the other hand, the State is losing the taxes they should be paying for their (hidden) incomes.

2) There is a positive relationship between the size of the non-observed economy and the self-employment indicator. It reflects that this variable is one of the main contributors to the growth of the shadow economy irrespective of the level of development of the economy.

3) The government employment taken like percentage of civilian labor force has a positive sign meaning that this variable is acting like a good proxy for the grade of regulation in the economy.

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[7] (g_t^{off}) is the first difference of annual growth rate of the official GDP, g_t^{shad} is the first difference of the shadow economy, Δu_t is the first difference of unemployment rate, ε_t residuals;

The results indicate that the Spanish informal sector at the beginning of the 1970's initially accounted for 20.7 percent of official GDP while slightly increasing to 24.5 percent of GDP in the late 1985 and further, it oscillates between 22% and 18% of GDP until our days.

Regarding the relationship between unemployment rate and the size of shadow economy, the econometrical estimation shows a direct relationship between changes in unemployment and the growth of the shadow economy. We consider like an exogenous variable also the growth rate of official GDP, and the model reveals an inverse relationship between this variable and the growth of shadow economy.

The main limitations of the MIMIC approach remains: the difficulty (1) to calculate of the confidence intervals associated with estimates of the latent variable; (2) to test the hypothesis of independence between structural and measurement errors; (3) arise for undertaking a time-series analysis with the MIMIC model (to identify exhaustively the properties of the residuals, methods to perform co-integration analysis in the context of SEM); (4) to apply the SEM approach to small sample sizes and time series analysis and the strong dependence of outcomes by the (exogenous) choice of the coefficient of scale (λ_1).Altghought these limitations, from a methodological viewpoint, the MIMIC approach is considered helpful because it is based on a "structural approach" more appropriate than others given the nature of the SE and it provides supplementary knowledge to understand the economic phenomenon of "shadow activities"(Dell'Anno, 2007).

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Appendix A: Analysis of Non-Stationarity

In this appendix we display the tests employed to detect the order of integration in the time series. The pioneer in tackling the problem of non-stationarity in the MIMIC models has been (Giles, 2002) that point out "…to consider the non-stationary element is to consider the possibility of cointegration. To discover the unit roots, the Augmented Dickey-Fuller (ADF) Test are used. In the following table the p-value of ADF test is reported, while the null hypothesis is the presence of the unit root, and therefore a value greater than 0.05

Var	**CAUSES**	Sources	Unit root analysis	Analysis of Non-stationarity (ADF test)				Transf.used.
					Level	First diff.	Second diff.	
X_1	Total Direct Tax/GDP	OECD-Economic Outlook 2008	I(1)	T&C	0.83	0.0005*	0.000*	$\Delta(X_1)$
X_2	Total Indirect Tax/GDP	OECD-Economic Outlook 2008	I(1)	T&C	0.50	0.0040*	0.000*	$\Delta(X_2)$
X_3	Social Security Contributions received by Government/GDP	OECD-Economic Outlook 2008	I(1)	T&C	0.45	0.0063*	0.000*	$\Delta(X_3)$
X_4	Tax_burden/GDP	$X_1 + X_2 + X_3$	I(1)	T&C	0.90	0.0000*	0.000*	$\Delta(X_4)$
X_5	Social benefits paid by government/GDP	OECD-Economic Outlook 2008	I(1)	T&C	0.91	0.0329*	0.000*	$\Delta(X_5)$
X_6	Subsidies/GDP	OECD-Economic Outlook 2008	I(1)	C	0.16	0.0000*	0.000*	$\Delta(X_6)$
X_7	Government employment/ Civilian Labour force	OECD-Economic Outlook 2008	I(1)	T&C	0.99	0.0001*	0.000*	$\Delta(X_7)$
X_8	Self-employment/ Civilian Labour force	OECD-Economic Outlook 2008	I(1)	T&C	0.02	0.0002*	0.000*	$\Delta(X_8)$
X_9	Unemployment rate	OECD-Economic Outlook 2008	I(1)	T&C	0.27	0.0960	0.000*	$\Delta(X_9)$
	INDICATORS							
Y_1	Index of Real GDP	OECD-Economic Outlook 2008	I(1)	T&C	0.99	0.0618	0.000*	$\Delta(Y_1)$
Y_2	Civilian labour force participation rate	OECD-Economic Outlook 2008	I(1)	T&C	0.99	0.0034*	0.000*	$\Delta(Y_2)$

* Indicates non-stationary time series. The econometric software Eviews 6.0 was used to perform this analysis.

Table 1: Estimated Coefficients[8] of the MIMIC Models

Models	Tax burden/ GDP	Social Benefits/ GDP	Subsidies/ GDP	Bureaucracy Index	Self-employment/ Civilian Labour Force	Unemployment rate	Civilian Participation ratio	Chi-square (p-value)[9]	RMSEA ((p-alue)[10]	AGFI[11]	Df[12]
	X_1	X_2	X_3	X_4	X_5	X_6	Y_2				
MIMIC 6-1-2	-0.04 (-0.20)[13]	0.12 (0.26)	1.42 (0.94)	2.54* (4.28)	0.67* (2.39)	0.96* (8.28)	-0.26* (-5.17)	12.75+ (0.92)	0.000 + (0.95)	0.86	21
MIMIC 5-1-2a	------	0.08 (0.19)	1.48 (1.00)	2.56* (4.34)	0.67* (2.39)	0.97* (8.41)	-0.26* (-5.17)	12.70+ (0.63)	0.00+ (0.71)	0.83	15
MIMIC	-0.02 (-0.11)	------	1.50 (1.02)	2.61* (4.84)	0.61* (2.47)	0.98* (11.23)	-0.26* (-5.17)	11.37+ (0.73)	0.00+ (0.79)	0.85	15

[8] The estimations has been made with the software LISREL 8.8

[9] If the structural equation model is correct and the population parameters are known, then the matrix S(Sample covariance matrix) will equal to $\sum(\theta)$ (model implied covariance matrix) therefore the perfect fitting correspond to p-value=1.0.This test has a statistical theory if there are large sample and multinormal distributions.

[10] P-value for Test of Close Fit (RMSEA<0.05). + means good fitting (p-value>0.05).

[11] Adjusted goodness-of-fit index, AGFI.This indicator takes values into the interval [0, 1].

[12] The degrees of freedom are determined by 0.5(q+p)(q+p+1)-t, where p=number of indicators, p=numbers of causes, t=number of free parameters..

[13]T-statistic is given in parentheses. * means $|t - statistic| > 1.96$

5-1-2b											
MIMIC 5-1-2c	-0.09 (-0.40)	0.22 (0.47)	-----	2.35* (4.17)	0.66* (2.33)	0.97* (8.27)	-0.26* (-5.17)	11.34+ (0.73)	0.00+ (0.79)	0.85	15
MIMIC 4-1-2a	-----	-----	1.53 (1.04)	2.60* (4.84)	0.68* (2.46)	0.98* (11.34)	-0.26* (-5.17)	11.31+ (0.33)	0.06+ (0.41)	0.80	10
MIMIC 4-1-2b	-----	0.15 (0.34)	------	2.36* (4.19)	0.66* (2.32)	0.98* (8.45)	-0.26* (-5.17)	11.13+ (0.35)	0.056 + (0.42)	0.80	10
MIMIC 4-1-2c	-0.05 (-0.24)	-----	------	2.45* (4.68)	0.69* (2.43)	1.01* (11.89)	-0.26* (-5.17)	9.24+ (0.51)	0.00+ (0.58)	0.83	10
MIMIC 3-1-2	-----	-----	-----	2.44* (4.68)	0.68* (2.42)	1.01* (11.93)	-0.26* (-5.17)	9.24+ (0.16)	0.12+ (0.21)	0.77	6

Table 2: Estimates of the size of Spanish shadow economy (1990)

Author	***Method***	***Size of Shadow Economy***
Johnson et. Al(1998)	Currency Demand Approach	16.1%
Lacko(1999)	Physical Input(Electricity)	22.9%
Schneider and Enste(2000)	Currency Demand Approach	17.3%*
Mean 1990		***18.8%***

*means for 1990-1993

Table 3: Estimation output of regression $g_t^{shad} = \gamma g_t^{off} + \lambda \Delta u_t + \varepsilon_t$

Dependent Variable: G_SHAD
Method: Least Squares
Date: 09/30/08 Time: 00:59
Sample: 1971 2007
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DU	0.274501	0.066990	4.097607	0.0002
G_OFF	-0.051108	0.023163	-2.206492	0.0340

R-squared	0.414485	Mean dependent var	-0.094192
Adjusted R-squared	0.397756	S.D. dependent var	0.884133
S.E. of regression	0.686126	Akaike info criterion	2.137027
Sum squared resid	16.47691	Schwarz criterion	2.224104
Log likelihood	-37.53501	Durbin-Watson stat	0.901101

GRAPHICS

Fig.1. Diagram Path MIMIC 6-1-2

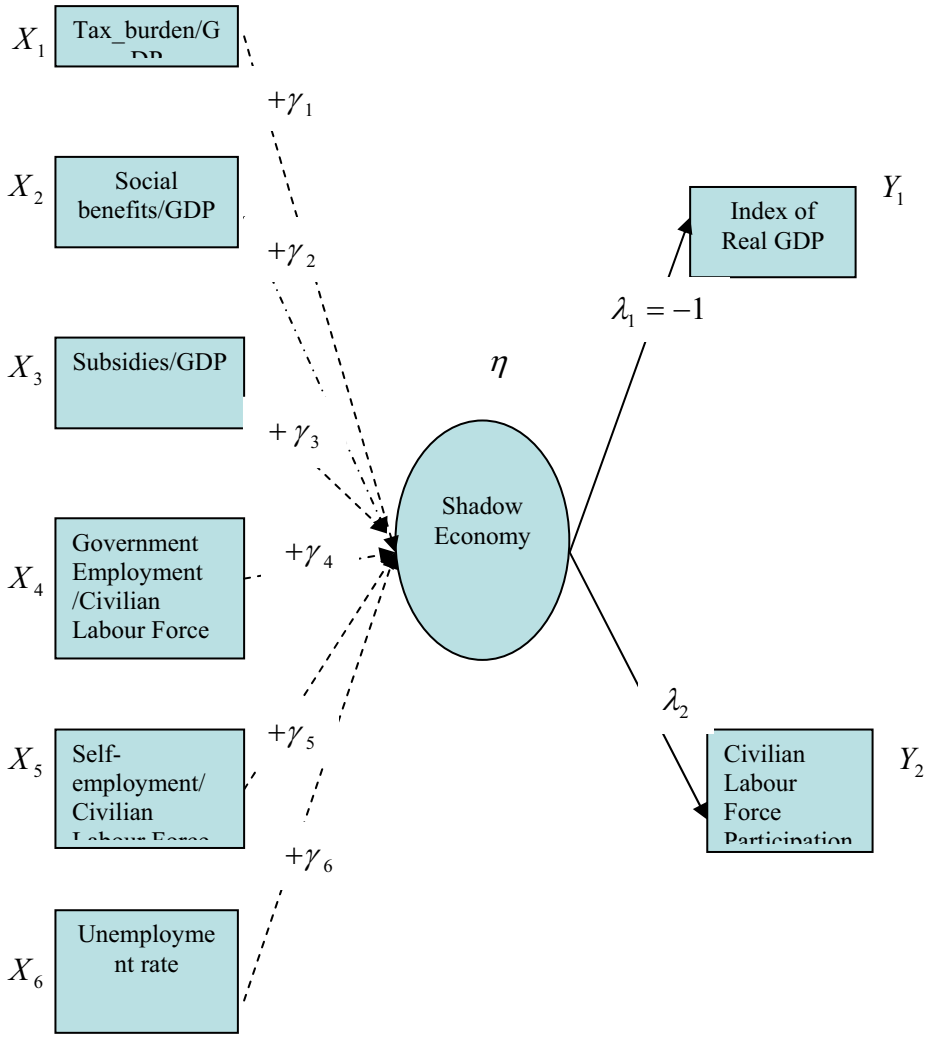

Fig.2. Path diagram of 4-1-2 MIMIC model

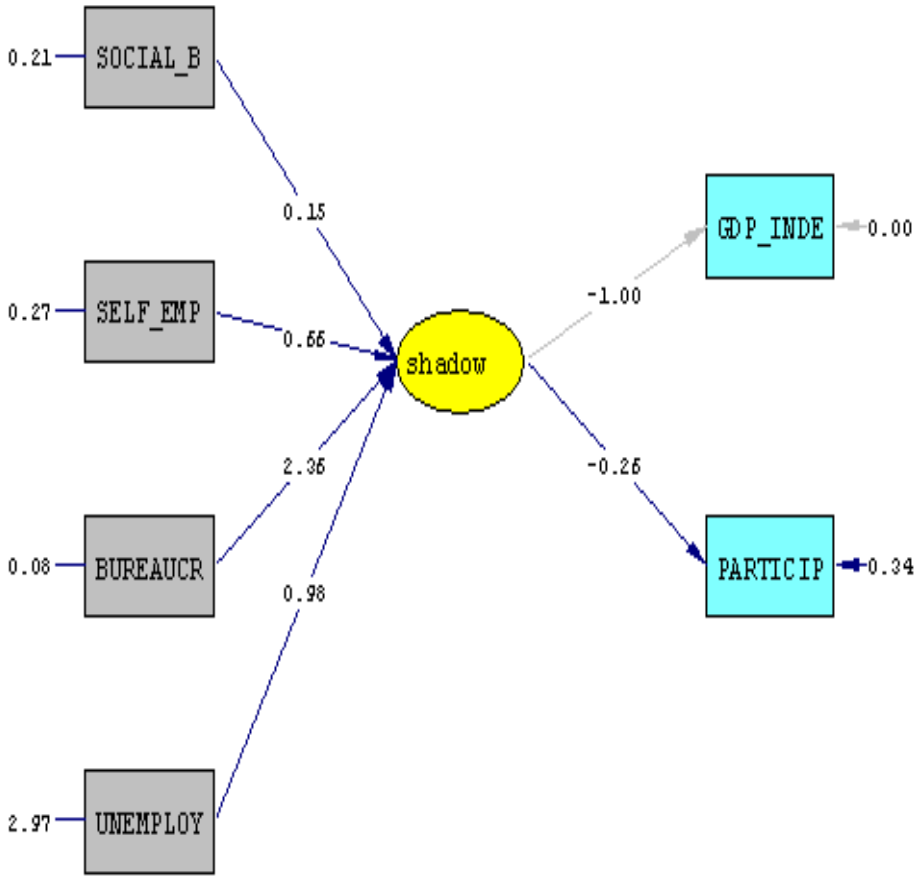

Fig.3.The size of shadow economy as % of GDP

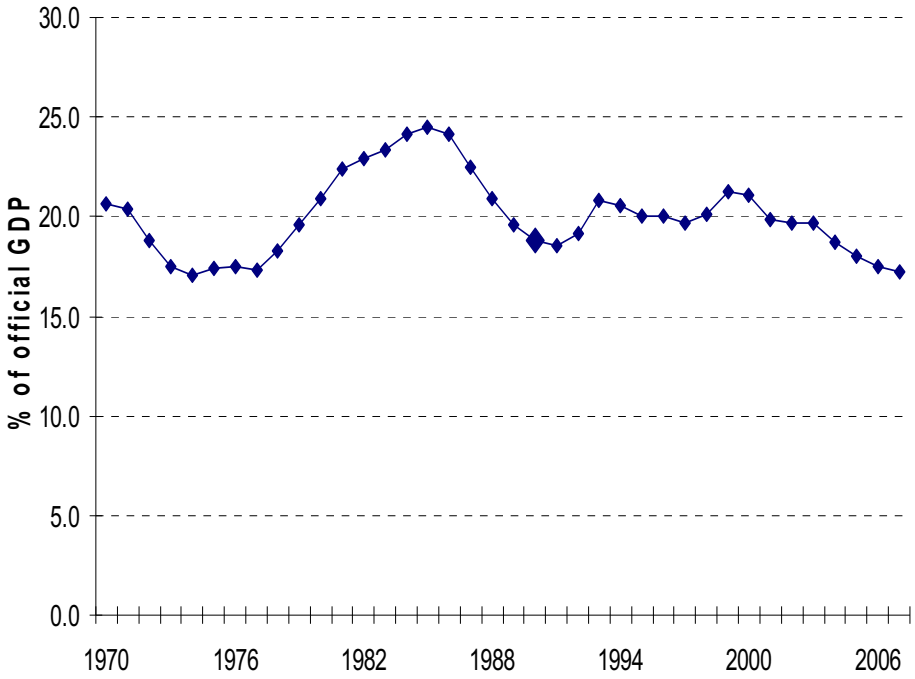

Fig.4.Shadow Economy vs.Unemployment rate