The Shadow Economy of Italy and other OECD Countries:

What do we know?

Roberto Dell'Anno*

Department of Economics and Statistics

University of Salerno

Via Ponte Don Melillo 1, 84084

   Fisciano (SA) / ITALY

Phone: 0039-089-96-2168, Fax: -2049

rdellanno@unisa.it

Prof. Dr. DDr.h.c. Friedrich Schneider

Department of Economics

Johannes Kepler University Linz

A-4040 Linz-Auhof / AUSTRIA

  Phone: 0043-732-2468-8210, Fax: -8209

  friedrich.schneider@jku.at

* Corresponding author

Abstract

Various methods to estimate the size of the shadow economy are discussed and the results of the shadow economy of 21 OECD countries are presented. Then the specific case of Italy is investigated and the aim of this section is to produce an estimate of the Italian shadow economy with the MIMIC (**M**ultiple **I**ndicators and **M**ultiple **C**auses) method. The procedure to obtain the underground economy as a share of official GDP is presented. The paper ends with some general conclusions about the reliability of the model approach and the efficacy of economic policy to reduce the shadow economy.

1. – *Introduction*

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

Although quite a large literature[1] on single aspects of the hidden economy exists and a comprehensive survey has just been written by SCHNEIDER and ENSTE, the subject is still quite controversial[2], as there are disagreements about the definition of shadow economy activities, the estimation procedures and the use of their estimates in economic analysis and policy aspects.[3] Nevertheless around the world, there are strong indications for an increase of the shadow economy and little is known about the size of the shadow economies in OECD countries for the years 2002/03. Especially in Italy we have a controversial debate about the size of the shadow economy and their growth over time[4].

The scientific fascination of the underground economy has inspired us to tackle this difficult question and undertake the challenging task of collecting all available data on the shadow economy for 21 OECD countries with special emphasis to the Italian case, and finally provide some insights about the main causes of the shadow economy. In section 2 an attempt is made to define the shadow economy. Section 3 presents the empirical results of the size of the shadow economy of 21 OECD countries. Section 4 examines the case of Italy specifying the

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[1] The literature about the 'shadow', 'underground', 'informal', 'second', 'cash-' or 'parallel', economy is increasing. Various topics, on how to measure it, its causes, its effect on the official economy are analyzed. See for example, survey type publications by FREY – POMMEREHNE [1984]; THOMAS [1992]; LOAYZA [1996]; LIPPERT – WALKER [1997]; SCHNEIDER [1994a, 1994b, 1997, 2005]; JOHNSON *et al.* [1997], JOHNSON *et. al* [1998]; and GERXHANI [2003]. For an overall survey of the global evidence of its size in terms of value added SCHNEIDER – ENSTE [2000, 2002].

[2] Compare *e.g.* in the Economic Journal, 109, no. 456, June 1999 the feature «controversy: on the hidden economy».

[3] Compare the different opinions of TANZI [1999], THOMAS [1999] and GILES [1999b].

theoretical background and then the empirical estimations are shown. Finally, in section 5, the reliability of the model approach is discussed and some policy conclusions are drawn.

2. – *The Definition of a Shadow Economy: An Attempt*

Most authors trying to measure the shadow economy face the difficulty of how to define it. One commonly used working definition is: all currently unregistered economic activities which contribute to the officially calculated (or observed) Gross National Product.[5] SMITH [1994, p. 18] defines it as «market-based production of goods and services, whether legal or illegal that escapes detection in the official estimates of GDP.» Or to put it in another way, one of the broadest definitions of it, includes «…those economic activities and the income derived from them that circumvent or other wise government regulation, taxation or observation»[6]. As all these definitions still leave open a lot of questions, table 1 may be helpful for developing a better feeling for what could be a reasonable consensus definition of the legal and illegal underground or shadow economy.

From table 1 it becomes clear that the shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions - hence all economic activities which would generally be taxable were they reported to the state (tax] authorities. In general, a precise definition seems quite difficult, if not impossible as «the shadow economy develops all the time according to the 'principle of running water': it adjusts to changes in taxes, to sanctions from the tax authorities and to general moral attitudes, etc.» [MOGENSEN et. al., 1995, pp. 5]. This paper does not focus on tax evasion or tax compliance, because it would get to long, and moreover tax evasion is a different subject, where already a lot of research has been underway.[7]

[Table 1: *A Taxonomy of Types of Underground Economic Activities[1)]***]**

3. – *The Size of the Shadow Economies of 21 OECD countries*

For 21 OECD countries the results are not only shown for one year but also over an extended time period, *i.e.* from 1989 to 2002/2003. The size and development of the shadow economy

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[4] Compare the different estimates in table 5 of this paper.

[5] This definition is used for example, by FEIGE [1989, 1994], SCHNEIDER [1994a], FREY – POMMEREHNE [1984], and LUBELL [1991].

[6] This definition is taken from DELL'ANNO [2003] and FEIGE [1989]; see also THOMAS [1999], FLEMING *et al.* [2000].

[7] Compare, *e.g.* the recent survey of ANDREONI *et al.* [1998] and the paper by KIRCHLER *et al.* [2002].

of 21 OECD[8] countries is presented in table 2. For the 21 OECD countries either the currency demand method or the DYMIMIC method are used. Considering again the latest period 2002/2003, Greece has with 28.3% of official GDP the largest shadow economy, followed by Italy with 26.2% and Portugal with 22.3%. In the middle-field are Germany with a shadow economy of 16.8% of official GDP, followed by Ireland with 15.5% and France with 14.8% of official GDP. At the lower end are Austria with 10.8% of GDP and the United States with 8.6% of official GDP. For these OECD countries one realizes an increase of the shadow economies over time quite during the 90s. On average the shadow economy of these 21 countries was 13.2% in the year 1989/90 and it rose to 16.4% in the year 2002/2003. If we consider the second half of the 90s, we realize that for the vast majority of these 21 OECD countries the shadow economy is not further increasing, even (slightly) decreasing, like for Belgium from 22.5% (1997/98) to 21.5% (2002/2003), for Denmark from 18.3% (1997/98) to 17.5% (2002/2003) or for Finland from 18.9% (1997/98) to 17.6% (2002/2003) or for Italy from 27.3 (1997/98) to 26.2 (2002/2003). For others, like Austria, it is still increasing from 9.0% (1997/98) to 10.8% (2002/2003), or Germany from 14.9% (1997/98) to 16.8 (2002/2003). Hence, one can't draw a general conclusion whether the shadow economy is further increasing or decreasing at the end of the 90s. It differs from country to country but in some countries some efforts have been made to stabilize the size of the shadow economy and in other countries (like Germany) these efforts were not successfully.

[Table 2: *The Size of the Shadow Economy in OECD Countries***]**

4. – *The Size and Development of the Shadow Economy in Italy*

4.1 – **Specification of Model: the Theoretical Background**

The model approach (or MIMIC method) is based on the statistical theory of latent variables, which considers several causes and several indicators of the hidden economy. FREY – WECK-HANNEMAN [1984] have been the first to consider the size of the hidden economy as an 'unobservable variable'. They introduced the MIMIC model of ZELLNER [1970], JÖRESKOG – GOLDBERGER [1975] and others in this field. It is a member of the LISREL '**L**inear **I**nterdependent **S**tructural **Rel**ationships' family of models (see JÖRESKOG – SÖRBOM, [1993]). Following FREY – WECK-HANNEMAN's example, others economists used this approach for their statistical analysis of the 'unofficial' economy: AIGNER *et al.* [1988], HELBERGER – KNEPEL [1988], LOAYZA [1996], GILES [1995, 1999a 1999b], EILAT – ZINNES

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[8] The case of Australia has been extensively investigated by BAJADA [2002] and BAJADA – SCHNEIDER [2003].

[2000][9], SALISU [2000][10], CASSAR [2001], GILES – TEDDS [2002], CHATTERJEE, *et al.* [2003], DELL'ANNO [2003], Schneider [2005].

The identification procedure starts from the most general specification (MIMIC 6-1-2)[11] and continues leaving out the variables which are not statistically significant[12]. An example for Italy is shown in Figure 1.

[Figure 1: *MIMIC Model (6-1-2)*[13] *for Italy***]**

The size of the shadow economy is obviously restricted to be examined as a linear combination of a small set of variables, and certainly other and/or more suitable data can be employed, to explain a very complex phenomenon like the underground economy. As DUNCAN [1975, p.149] points out: «The meaning of the latent variable depends completely on how correctly, precisely and comprehensively the causal and indicator variables correspond to the intended semantic content of the latent variable»[14], likewise THOMAS [1992] argues that the choice of variables the only real limit of this approach.

4.1.2 – Explanatory variables (Causes)

(1) Tax Burden

In literature the most popular determinants of tax evasion and of the shadow economy are tax rates. The common hypothesis is that an increase of the tax burden is a strong incentive to work in the unofficial economy. In the econometric framework, the tax burden is measured by means of the total share of direct and indirect taxes and social contribution - all as a percentages of gross domestic product. The higher the tax burden the higher is the incentive to work in the shadow economy, ceteris paribus.

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[9] They use a Single Indicators Multiple Causes (SIMIC) model.

[10] He applies a Single Indicators Multiple Causes (SIMIC) model

[11] This nomenclature means a structure with six determinants and two indicators of one latent variable.

[12] The SEM permits to consider and estimate the correlations between the X-variables. In my analysis as expected is statistically different from zero the correlation between tax burden and government consumption as well as the index of efficacy of justice and the index of illegality.

[13] In order to eliminate the non-stationarety of the variables, the variables: X_1, X_2, X_3, X_4, X_5 are taken as first differences, X_6, Y_1, Y_2 are converted in the first differences of logarithm. «Usually, […] one would consider the possibility of cointegration. Unfortunately, there is no established literature to serve as a guide to this procedure in the context of the MIMIC model.» [GILES – TEDDS, 2002, p. 128].

[14] Cited in GILES – TEDDS, 2002, p. 103.

(2)   Real Government Consumption

According to AIGNER *et al.* [1988], a rise in the size of the public sector, and/or the degree of regulation of the economic system, provides a relevant incentive to enter the informal economy. To consider this, the real government consumption (in percent of GDP) is introduced as a proxy of all State activities. A positive sign of this coefficient will support the hypothesis that 'more State' in the market, and subsequently an increase in regulation, gives an incentive to operate in the unofficial economy.

(3)   Unemployment rate

TANZI [1999, p. 341] writes that «…the relation between the shadow economy and the unemployment rate is ambiguous». With this statement he means that very heterogeneous workers compose the labour force of hidden economy; one part of those is classified as unemployed because they are components of the official labour force, the other part of 'hidden' workers is composed by retired people, illegal immigrants, minors or housewives who are not part of the official work force. Furthermore, there are people who have at the same time an official and unofficial job [TANZI, 1999, p. 343]. In this sense, the official unemployment rate is weakly correlated with the shadow economy[15] and no sign is derived here.

(4)   Self-Employment

The rate of self-employment as a percentage of the labour force is considered as a determinant of informal economy. According to BORDIGNON – ZANARDI [1997], the significant diffusion of small firms and the large proportion of professionals and self-employed respect to the total workforce[16] are the most important characteristics that distinguish the Italian productive system from the other economies of Western Europe. The higher the rate of self-employed the larger is the shadow economy, ceteris paribus.

Indexes of 'Rule of Law':
1) The lasts two determinants of illegal economy are linked with sociological characteristics and aspects of system for the repression of crime.

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[15] To confirm this view, the Italian empirical evidence shows that only the 30% of non-regular workers are components of the official labour force [ISTAT, 2001].

[16] «According to OECD estimates for 1993, the ratio of self-employed to the total workforce, net of farm workers, was 26,7% in Italy as compared to 8,4% in Germany, 8,8% in France, and 13,1% in the United Kingdom. Companies with more than 100 employees at the end of 1980s accounted for just a little over 20% of the total workforce as compared to over 80% in the UK and Germany.» [BORDIGNON – ZANARDI, 1997, p. 172].

Obviously, the proposed variables are only an attempt in order to take account of these factors in the analysis of the shadow economy that, to our opinion, play an important role to understand correctly the dynamics of the hidden economy. Unfortunately the reliability of these proxies[17] can be questioned for several reasons. First, to quantify with an index the relationship between State citizen and/or community citizen is a very hard task. Second, objections can be raised with reference to the first assumption (*i.e.* hypothesis that the capacity of the State to respect for fiscal laws is similar to its ability to punish crimes) the two systems are different in terms of procedure, structure, personnel and political interest.

(5) Index of Efficacy of Judicial System

An index based on statistical crimes published by ISTAT [2000] was built in order to consider the efficacy of the judicial system. It is measured by dividing the number of condemned for theft, robbery, extortion and kidnapping, for the number of the same-recorded crimes.

If the hypothesis that the efficacy of criminal judicial system is accepted as proxy of efficacy in the fiscal auditing, then a negative relationship between the variable and the hidden economy is expected.

(6) Index of Illegality

The last potential cause considered is the growth rate of the recorded crimes[18]. This index can have a double meaning: (1) it is a proxy of the illegality in the society. Increase in the recorded crimes lead to decrease in the contributors' fair attitude towards the State therefore a decline of social stigma (or reputational cost); (2) it measures the efficacy of police force to contrast the crime. About the relevance of this kind of variables, EILAT – ZINNES [2000] argue that the receipt of police protection is a fundamental element to evaluate the 'cost' to participate in the illegal activities.

4.1.3 – Indicators

(1) Real Gross Domestic Product (variable of scale)

The discussion about this variable is crucial to the problem of identification, as well as for the theoretical consequences it implies, mainly because it is chosen as *variable of scale* (or *reference variable*). A priori, it is not possible to determine what is the effect of the 'regular' economy on underground economy. On the one side a downturn in the economic official

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[17] Previous versions of models herein estimated utilized alternative indexes proposed in literature (*e.g.* corruption indexes, index of economic freedom, etc.); unlikely these time series have not sufficiently sample size to allow a correct application with the Model approach.

[18] Only the offences that involve in criminal proceedings are considered.

activities may lead to a loss of jobs and thus drive more individuals into the hidden economy or, on the other side, a contraction in the GDP, may reduce the demand for underground products and thus offset the first effect? The shadow economy represents a 'life jacket' for firms and individuals in financial troubles and for that reason, it increases when the GDP decreases, or rather more growth means more opportunity to evade?

Giving an answer to these scientific puzzles is a very hard task moreover, in the specified SEM, it is required as exogenous choice of the researcher[19].

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[20]. To choice the 'sign' of coefficient of scale (λ_{11}) is based on theoretical and empirical arguments. However, in the literature there is no agreement about the effects of the shadow economy on economic growth. In our analysis, we find evidences to support the hypothesis of negative relation between Italian shadow economy and official growth rate of GDP[21].

(2)   Currency in circulation outside of banks

The monetary approach to estimate the size of the shadow economic activities is based on the assumption that the irregular transactions only are paid in cash instead of cheque or credit card in order to circumvent the auditing controls.

In accordance with GILES – TEDDS' [2002] the hypothesis, the growth rate of currency in circulation outside of banks is considered as more reliable then the ratio between currency and

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[19] The statistical reason is that the reduced forms remain unchanged when λ is multiplied by a scalar and γ and σ are divided by the same scalar. Consequently, in order to estimate not only the relative size of the parameters but their levels, is necessary to fix a scale for the unobserved variable. A natural normalization would be to assign a unit variance to latent variable but a more convenient alternative is fix one non-zero coefficient to reduced form. That is, changing the scale of η would violate the normalization. In this sense, fixing the scale of measurement coefficient matrix fixes the scale of η [STAPLETON, 1978].

[20] «For instance if the estimate of one of the other elements of λ is 3, then the corresponding indicator variable is 3 times as important as the variable that is the basis for normalization.» [GILES – TEDDS, 2002, p. 109].

[21] Important caveat about this variable is that from 1992 to 1998 data are 'revalued' with the shadow economy estimated by ISTAT [2003].

[22] A relevant point, often undervalued in the previous analyses of shadow economy with SEM, is the detection of multivariate normality. This assumption is central to preserve the statistical properties of estimators, as well as the 'chi-square' tests used to evaluate the fitting of models with the dataset. To determine whether multivariate nonnormality is present, MARDIA's test is used. Given an unacceptable level of nonnormality, we have some possible corrections [BOLLEN, 1989], for the analysis of the Italian shadow economy in order to obtain a better approximate to multinormality and in some cases, to eliminate the non-stationarity in the time series, the variables are transformed (first differences and growth rates).

some broader measure of monetary aggregate. The reasons for this choice are: (1) A greater fluctuation of the interest rate in the considered sample, which strongly changes the 'opportunity cost' to keep currency instead of deposits. (2) The innovations in the bank system, the rise of credit cards, new kinds of debit system, etc. encourage people to put more of their money into deposit instead to keep currency [GILES – TEDDS, 2002, p. 125].

4.2 – Model Identification and Estimates

For the Lisrel nomenclature, the equations system with the relationships among the latent variable (η) and the causes (X_q) is called 'structural model'; the links among indicators (Y_p) and underground economy is the 'measurement model'. An analytical representation of the most general model identified (MIMIC 6-1-2) is below:

Structural Model: $\eta = \gamma_{11}X_1 + \gamma_{12}X_2 + \gamma_{13}X_3 + \gamma_{14}X_4 + \gamma_{15}X_5 + \gamma_{16}X_6 + \zeta$

Measurement Model: $Y_1 = \lambda_{11}\eta + \varepsilon_1$ and $Y_2 = \lambda_{21}\eta + \varepsilon_2$

The MIMIC models are built to estimate the size of the shadow economy as percentage of GDP[22]. In table 3, the estimates of fourteen different specifications of the Italian informal economy are presented.

The choice among the different estimated models is based on the statistical significance of the estimated parameters, the parsimony of specification, the p-value of 'chi-square' and the Root Mean Square Error of Approximation (RMSEA) test[23], if the model is multinormally distributed. Fortunately, the choice is made easier by the alikeness and stability of coefficients. The in a statistically sense four best models are the models 5-1-2, 4-1-1, 3-1-2a and 3-1-2b, which were chosen to calculate the shadow economy.

[**Table 3:** *Estimations of the size and development of the Italian shadow economy - LISREL*
        *Output - Coefficients and Tests -***]*

*Table 3 **and the relative** Notes **should be in a separate (horizontal) page***

Notes:
  t-statistic are given in parentheses; and * means |t-statistic|>1,96.
[1] If the structural equation model is correct and the population parameters are known, then the matrix S (sample covariance matrix) will equal to $\Sigma(\theta)$ (model-implied covariance matrix) therefore the perfect fitting correspond to p-value=1,000. This test has a statistical validity if there are large sample and multinormal distributions.
[2] p-value for Test of Close Fit (RMSEA < 0,05)
[3] Is reported the output of PRELIS 2.53: Test of Multivariate Normality for Continuous Variables, p-value of skewness and kurtosis.

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[23] Unfortunately, the LISREL package does not perform other *goodness of fit statistics* if the dataset includes missing values.

The index of shadow economy is estimated by equation (1), the structural coefficients are multiplied for the 'filtered' data for stationarity, therefore the latent variable is estimated in the same transformation of independent variables (first difference):

$$\Delta\hat{\eta} = \hat{\gamma}_{11}\Delta X_1 + \hat{\gamma}_{12}\Delta X_2 + \hat{\gamma}_{13}\Delta X_3 + \hat{\gamma}_{14}\Delta X_4 + \hat{\gamma}_{15}\Delta X_5 \qquad [1]$$

Successively, the index is converted in a 'level' time series. In order to obtain the actual values of the underground economy in term of official GDP, *a priori* known value is required. To guarantee greater truthfulness of this exogenous information, a year is chosen in which there are several estimates of the hidden economy. The year elected is the 1978 because it is possible to build an average with six different estimates and almost all the kinds of methodologies,[24] the values are shown in table 4.

[Table 4: *The Estimates of the Size of the Shadow Economy in Italy (1976-1980)*]

Sources:
Taken by SCHNEIDER – ENSTE [2000][25], tab.12, p. 43.
^{a} This value is the mean between 13,2 [SCHNEIDER – ENSTE, 2000] and 18,6 [BOVI – CASTELLUCCI, 2001].

The results of the size and development of the Italian shadow economy of the four chosen models is shown in figure 2. From 1962 to 1980 the development of the shadow economy is similar using these four models but for the remaining period 1980–2000 the development is somewhat difficult.

[Figure 2: *Estimates MIMIC (5-1-2); SIMIC (4-1-1); MIMIC (3-1-2a); MIMIC (3-1-2b)*]

In order to undertake a further selection to one model we consider the statistical significance and within we achieve the theoretically expected signs and the theoretical assumptions on the signs of the coefficients; in particular, the 'wrong' sign of the estimated coefficient for the 'Index of efficacy of judicial system' is disturbing and for that reasons the model MIMIC 3-1-2b is chosen. A comparison with the estimates obtained by the other methods, the currency demand approach and MIMIC [SCHNEIDER[26], 2000, 2002; SCHNEIDER – ENSTE[27], 2000],

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[24] SCHNEIDER – ENSTE [2000] group the estimates for the period '76-'80; here is averaged and assigned this value to year 1978. We don't consider the methods of: 'tax auditing' (3,9%) and 'discrepancy between expenditure and income' (4,3%) because these estimates are regarded as unreliable.

[25] The authors using as sources: THOMAS [1992], LIPPERT – WALKER [1997], SCHNEIDER [1994a, 1994b, 1997], BENDELAC – CLAIR [1993], FREY – WECK-HANNEMANN [1984].

[26] SCHNEIDER [2000, p. 86], for the estimates from 1994 to 1998; SCHNEIDER [2002] for 1999 and 2000.

Tanzi's method [BOVI – CASTELLUCCI, 2001] and the 'Italian approach' [ISTAT, 2003], is shown in figure 3 (see appendix 2 for numerical values). The comparisons show some similarities in the development of the Italian shadow economy over the period 1985-2000 but considerable difference in the level.

[**Figure 3:** *A comparison of different estimates of the shadow economy for Italy*]

The 'econometric' conclusions from our model 3-1-2b with respect to the development of the Italian shadow economy for the period 1962 to 2000 are:

1) The size of the underground economy ranges from 41 percent, in the 1962, to 15 percent of official GDP in the 1974 and rises again to 22 percent in 2000.

2) A comparison to the other estimate (shown in figure 3) shows somewhat different development, *i.e.* a slightly increasing trend of the SCHNEIDER's estimate: 10 percent in 1970 to 27 percent in 2000.

In particular, in agreement with the SCHNEIDER's estimates, there are: the increase of the shadow economy in the period between 1975 to 1984 and the size (around 25 percent of the official GDP) in the last seven years. With reference to Tanzi's method and the 'Italian approach', although the figures calculated here are bigger than BOVI – CASTELLUCCI's [2001] and ISTAT [2003] (about 10 percent), there is a convergence with their result of substantial stability over the period 1995-2000.

Coming back the tests of statistical significance of the estimated coefficients, we find:

(1) The tax burden (X_1) and the size of the State, measured by government consumption (X_2) are always statistically significant and positively related to the shadow economy (theoretically expected sign!).

(2) The variables concerning the labour market (X_3 and X_4) do not have an important quantitative influence on the hidden economy. Also, their statistical significance is uncertain: in nine estimated models where these variables are included, the coefficients of unemployment and self-employment are statistically significant only in five cases; if they are statistically significant, we achieve the 'right' sign; *i.e.* a rise in the unemployment rate or self-employment causes an increase in the shadow economy.

With respect to results of the determinants of the underground economy connected with efficiency of penal justice and the index of illegality, the empirical results are:

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[27] SCHNEIDER – ENSTE [2000, p. 41]. For the period 1970-1994 are available only the data of 1970, 1980, 1994, to calculate the time series index is been considered a linear interpolation.

(3) The efficacy of justice measured as ratio of sentences about some crimes (with economic aims) on the number of reports for the same kind of crimes (X_5) is positively related with the shadow economy. This outcome is difficult to understand. A possible explanation of this unexpected sign of coefficient could be that, the ability of the State authorities to punish crimes is unconnected to the efficacy of tax auditing, and hence the statistical significance of the coefficient is a product of spurious correlation with tax evasion[28].

(4) The total amount of recorded crimes (X_6), used as an index of illegality, is not statistically significant in all the estimated models. Therefore, if it is considered a good enough approximation to 'respect of Law' in the Italian socio-economic system, the theories based on 'social habits' to explain the parallel economy could be not confirmed.

Finally, regarding the two indicator variables, the results in the Italian context are:

(5) The relationship between underground economy and growth rate of GDP (Y_1) is negative.

(6) The tests of statistical significance performed of the coefficient of the currency variable is: the growth rate of currency outside of banks (Y_2), is only in two models (4-1-2, 3-1-2a,) statistically different from zero, in all other cases not!

5 – *Evaluation of the Model approach and policy conclusions*

5.1 – **Evaluation and Reliability of the Model approach**

Following the pioneering work of FREY – WECK-HANNEMAN [1984], the Italian shadow economy over the last forty years is estimated using the model approach and semi-annual data. In our paper, the multinormal distributions[29] of our statistical models are tested. This procedure is specifically designed to ensure the correct use of the MLE and therefore to have asymptotically unbiased, consistent and asymptotically efficient estimators [BOLLEN, 1989]. Following GILES [1995, 1999a, 1999b], the presence of unit roots is detected and the subsequently corrections are applied. Likewise, to preserve the asymptotical distributions of tests a large time series is employed consisting of approximately eighty observations.

These preliminary tests make inapplicable the main objections identified by HELBERGER – KNEPEL [1988] and SCHNEIDER [1997, 2005]. HELBERGER – KNEPEL's [1988] criticisms to

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[28] In particular, the empirical results show a statistically significant covariance between self-employment and index of efficacy of judicial system; however this variable is sensitive to decrease of sample: if the dataset is reduced of 30 observations the coefficient (γ_{51}) becomes not statistically different from zero. For details, see DELL'ANNO [2003].

[29] Precisely is tested if skewness and kurtosis are jointly approximable to the multinormal distribution (Mardia's test) and the univariate normality (Jarque-Bera's test). For more details, see BOLLEN [1989].

FREY – WECK-HANNEMAN's [1984] work showed that the results of MIMIC changed dramatically to change of the sample size and model specification. Specifically, their criticisms about the intertemporal instability of the parameters [HELBERGER – KNEPEL, 1988, p. 969] and the sensibility of coefficients to «…*alternative schemes of weighting the index they* [namely, FREY – WECK-HANNEMAN] *use»* [HELBERGER – KNEPEL, 1988, p. 966], does not apply to our estimates.

In the Italian case, for reduction of the sample size less then 37 percent [see for details DELL'ANNO, 2003, p. 36] and for several model specifications (see table 3), there are no "fluctuations" about the relative importance among the variables and their statistically significance. These results allow to overcome two of the strongest criticisms against the reliability of the Model approach.

However, considering the difficulties with the MIMIC approach to undertake a time-series analysis (pointed out by SCHNEIDER [1997, 2005]), remains one of the main limitations of our approach. In particular the difficulties (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[30]; (3) to identify exhaustively the properties of the residuals; (4) to apply the SEM approach to small sample sizes and time series analysis. These difficulties remain relevant obstacles in order to assign full reliability to outcomes. Referring to the low reliability of indicator and explanatory variables [SCHNEIDER, 1997] and the real meaning of the latent variable [THOMAS, 1992 and SCHNEIDER 1997] realise, that there are difficult objections to overcome.

According with our estimates, other criticisms could be exposed to question this methodology:

– In our analysis, the amount of variance explained by the models in the shadow economy is very low: ranging from 1 percent (MIMIC 5-1-2; 3-1-2) to 34 percent (SIMIC 4-1-1)[31].

– The frequent possibility that the model approach encounters indefinite matrix problems. As Monte Carlo studies demonstrate that, when the data provides relatively little information (small sample size, few observed indicator variables, small factor

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[30] It is not rejected in our analysis. The results are available on request by corresponding author, they are obtained following the methodology proposed by DELL'ANNO [2003].

[31] These values are calculated by LISREL 8.54 (so-called Squared Multiple Correlations for Structural Equations). This index « can be considered as the R^2 value in the regression analysis, but does not assigning to it the meaning of measures of model fit» [KELLOWAY, 1998, p. 28].

loadings, missing values), non-positive definite matrix troubles arise frequently [BOLLEN – LONG, 1993]. Unfortunately, these are the usual obstacles met by this kind of estimation procedure.

Although the highlighted objections and the few implementations of this technique are there and, if we consider the econometric alternatives to measure/estimate the shadow economy, the model approach could be considered as a relatively robust methodology in this field. Nonetheless, we come to the same conclusion as GILES – TEDDS [2002], that the model approach is a work in progress and supplementary improvement is «not only possible but necessary» [GILES – TEDDS, 2002, p. 103].

5.2 – Policy Conclusions

Analysing the outcomes of MIMIC model it is possible to give some reasons in order to explain the dynamics of the Italian shadow economy and to propose some suggestions of economic policy:

(1) The strong reduction in the black economy over the period 1966 - 1974 (-10%)[32] is due mainly to the decrease of the self-employment rate (-2%) in those years.

As BORDIGNON – ZANARDI [1997] state, the characteristic of the Italian production system to have a high number of self-employed, plays a very important role to explain the high level of the shadow economy compared to the other European countries.

(2) The substantial stability of the Italian shadow economy up to the mid nineties is mainly caused by the steadiness of the tax and social security burden.

(3) Referring to the negative relation between the growth rate of GDP and the hidden economy, we assume that the strong growing of the official economy may have some incentive effects to attract workers from black market to regular economy.

In this view, the efficacy of the economic policies to reduce the shadow economy is determined not only by the choice of the variables but also by the business cycle phase.

(4) About the possible measures to achieve a decrease in the shadow economy this analysis[33] confirms again a significant effect of tax burden and the presence of the public sector on the dynamics (increase) of the irregular economy.

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[32] In parentheses are reported the averages value of the annual growth rates.

[33] These empirical findings are in accordance with the conclusions founded by almost all empirical studies: THOMAS [1992]; LIPPERT – WALKER [1997]; JOHNSON *et al.* [1998]; TANZI [1999]; GILES [1999a]; SCHNEIDER [1997, 2000, 2005]; SCHNEIDER – ENSTE [2000]; GILES – TEDDS [2002].

These estimates point to the effectiveness of the fiscal policies to offer incentives in order to stabilize and/or decrease the underground production[34], as well as the liberalization of the economic system necessary to achieve and keeping the parameters valid by the Maastricht Treaty (1992).

In order, to reduce the size of the shadow economy, recently, the Italian government has carry out a plan based on several (economic) policy measures:

(i) The establishment of a national committee, (Comitato per l'Emersione del Lavoro Non Regolare; law n.448/1998) founded to manage and coordinate the fight against the hidden economy. More recently, a local committee (CLES[35]) has been founded for each province. The CLES are improving the coordination among the social partners, the trade associations and the tax audit authorities and resulted in an increased efficacy to check locally the underground activities.

(ii) The amnesty for the illegal immigrants (law n.189/2002 so-called Legge Bossi-Fini). It permitted the emersion of 700.000 irregular non-EEC workers within two months[36].

(iii) A specific strategy was implemented to create incentives for the entrepreneurs and the shadow economy workers to legalize their activities. The current legislature allows the reduction of the social security contributions and grants tax relievers for the previous shadow economy activities over the triennium 2002/2004, for those who 'leave' the shadow economy. Additionally, a tax amnesty (law n.289/2002) opened to a wide range of tax evaders has been promulgated.

With respect to the last initiative (started by the law n.383 in the year 2001), the empirical results are quantitatively disappointing: Only 1800 applications for the 'emersione automatica' and 876 for the 'emersione progressiva'. Trying to explain the reasons for the failure of this strategy/initiative, we came to the following four conclusions:

(1) A campaign against the shadow economy should aim to provide incentives to switch to the official economy and to provide a fair and equal tax treatment among the economic agents. These goals are not compatible with an indiscriminate tax amnesty that provides a 'reward' for the tax cheaters and shadow economy workers.

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[34] See laws: n. 290/1990, n. 608/1996, n. 196/1997 (Pacchetto Treu), n. 448/1998.

[35] 'Comitati per il Lavoro e l'Emersione del Sommerso'.

[36] In Italy, the amnesty for illegal immigrant is almost periodic: in the 1986 (120.000), in the 1990 (215.000), in the 1995 (244.000) in the 1998 (217.000).

(2) Such initiatives increase the people's distrust towards the State, and decrease their tax morale. Such policy measures provide strong incentives to work again in the shadow economy and to wait and speculate for the next tax amnesty[37].

(3) Finally, the latest Italian experiences with these policy measures point out the complexity to reduce the shadow economy.

(4) Trying to provide some recommendations for policymakers, in order to reduce the size of the hidden economy, we suggest the following measures:

  (i) A greater flexibility and simplification of the Italian labour market regulations[38].

 (ii) A granting of tax relief for those who decide to leave shadow activities. This policy should go 'hand in hand' with the structural tax reform. The conditional amnesties for the tax evaders are effective only if they appear as extraordinary in the taxpayers' view.

(iii) An improved efficiency of the rule of law; *e.g.* by improving the enforcement action against the tax dodgers and by reducing the chronic slowness of the Italian judicial system.

 (iv) The previous measures should be combined by a massive reduction of tax rates and social security burden.

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[37] Such wide and generous conditional amnesties for tax evaders (before the 2002) took already place in 1982, 1991, 1995 (building amnesty) and 1997. In addition, in the 1997 a measure has been introduced (*i.e.* 'accettazione con adesione' or 'concordato') that reduces of the 75 percent the tax penalties if the tax evader accepts to pay taxes without to start a fiscal trial, once he is discovered by tax inspectors.

[38] This reform is started with the law n.30/2003 so-called Legge Biagi.

Appendix 1: *Sources of data*

Var.	CAUSES	Sources	Unit root	Transf. Used[1]	Skewn. & Kurt.[2]	Jarque-Bera p-value[3]	Kurtosis p-value[2]	Annotations
X_1	Tax Burden / GDP	OECD – Economic Outlook.	I(1)	$\Delta(X_1)$	0,881	0,789	0,728	(Revenue Direct Taxes+ Revenue Indirect Taxes+Social Security Contributions received by Government)/GDP
X_2	Real Government Consumption	OECD - Economic Outlook.	I(1)	$\Delta(X_2)$	0,190	0,172	0,481	Government Consumption, Value (Appropriation Account)/deflator of Government consumption
X_3	Rate of Unemployment	OECD - Economic Outlook.	I(1)	$\Delta(X_3)$	0,001	0,000	0,000	-
X_4	Self Employment / Labour Force	OECD - Economic Outlook.	I(1)	$\Delta(X_4)$	0,224	0,287	0,124	-
X_5	Condemneds for crimes with economic aims / number of the same recorded crimes	ISTAT - Annuario statistiche giudiziarie penali - anno 2000 Tav.8.1 , Tav.8.2	I(1)	$\Delta(X_5)$	0,151	0,074	0,064	Is modified the frequency from annual to half-annual by interpolating two years. To calculate the II semester 2000 is supposed 2001 equal to 2000. There are missing data in the years 1974 and 1975. They are substituted by the averages over the period '70-'78.
X_6	Number of recorded crimes for 100.000 residents	ISTAT - Annuario statistiche giudiziarie penali - anno 2000 Tav 8.1	I(1)	$\Delta LN(X_6)$	0,004	0,000	0,001	Is modified the frequency from annual to half-annual by interpolating two years. To calculate the II semester 2000 is supposed 2001 equal to 2000.
	INDICATORS							
Y_1	Real Gross Domestic Product	OECD - Economic Outlook.	I(1)	$\Delta LN(Y_1)$	0,242	0,549	0,117	GDP /deflator of GDP
Y_2	Currency outside of banks	B.I.P. (Bank of Italy's publicly available statistical data base) TDA00100-S787365M TAME0210-S445908M	I(1)	$\Delta LN(Y_2)$	0,276	0,384	0,166	Is modified the frequency from monthly to half-annual. In the 1998, there is a change in the method to estimate in one among the components of series (*cassa contante*). Therefore to make homogeneous the series is subtracted a constant (€ 677 mil) for the lasts six semesters.

Notes: (p-value are calculated on transformed data).
[1] '∆' means first difference, 'LN' means natural logarithm.
[2] P-value are computed by PRELIS 2.53.
[3] P-value of Jarque-Bera test is calculated by Eviews 4.1.

Appendix 2: *Precise values of different estimates of the Italian shadow economy*

The results of our estimate (model 3-1-2b) find partial support in the latest empirical studies for Italy. The estimates over the period 1992-2000 are shown in table 5:

- The minimum and the maximum values of the estimates published by ISTAT [2003]

Tanzi's Method calculated by BOVI - CASTELLUCCI, [2001];

Currency demand approach and MIMIC method estimated by SCHNEIDER [2000, 2002, 2005], SCHNEIDER - ENSTE [2000].

[Table 5: *A comparison of different estimates of the shadow economy for Italy***]**

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Table 1: *A Taxonomy of Types of Underground Economic Activities[1]*

Type of Activity	Monetary Transactions		Non Monetary Transactions	
Illegal Activities	Trade with stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud; etc.		Barter of drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	**Tax Avoidance**	**Tax Evasion**	**Tax Avoidance**
Legal Activities	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

[1] Structure of the table is taken from LIPPERT – WALKER [1997, p. 5] with additional remarks.

Table 2: *The Size of the Shadow Economy in OECD Countries*

OECD-Countries	Size of the Shadow Economy (in % of GDP) using the Currency Demand and DYMIMIC Method					
	Average 1989/90	Average 1994/95	Average 1997/98	Average 1999/2000	Average 2001/02	Average 2002/03[1]
1. Australia	10.1	13.5	14.0	14.3	14.1	13.8
2. Belgium	19.3	21.5	22.5	22.2	22.0	21.5
3. Canada	12.8	14.8	16.2	16.0	15.8	15.4
4. Denmark	10.8	17.8	18.3	18.0	17.9	17.5
5. Germany	11.8	13.5	14.9	16.0	16.3	16.8
6. Finland	13.4	18.2	18.9	18.1	18.0	17.6
7. France	9.0	14.5	14.9	15.2	15.0	14.8
8. Greece	22.6	28.6	29.0	28.7	28.5	28.3
9. Great Britain	9.6	12.5	13.0	12.7	12.5	12.3
10. Ireland	11.0	15.4	16.2	15.9	15.7	15.5
11. Italy	22.8	26.0	27.3	27.1	27.0	26.2
12. Japan	8.8	10.6	11.1	11.2	11.1	11.0
13. Netherlands	11.9	13.7	13.5	13.1	13.0	12.8
14. New Zealand[2]	9.2	11.3	11.9	12.8	12.6	12.4
15. Norway	14.8	18.2	19.6	19.1	19.0	18.7
16. Austria	6.9	8.6	9.0	9.8	10.6	10.8
17. Portugal	15.9	22.1	23.1	22.7	22.5	22.3
18. Sweden	15.8	19.5	19.9	19.2	19.1	18.7
19. Switzerland	6.7	7.8	8.1	8.6	9.4	9.5
20. Spain [3]	16.1	22.4	23.1	22.7	22.5	22.3
21. USA	6.7	8.8	8.9	8.7	8.7	8.6
Unweighted average over 21 OECD countries	13.2	15.7	16.7	16.8	16.7	16.4

Sources: Currency demand and DYMIMIC approach, own calculations

1) Preliminary values.

2) The figures are calculated using the MIMIC-method and Currency demand approach. Source: GILES [1999b].

3) The figures have been calculated for 1989/90, 1990/93 and 1994/95 from MAULEON [1998] and for 1997/98 and 1999 own calculations.

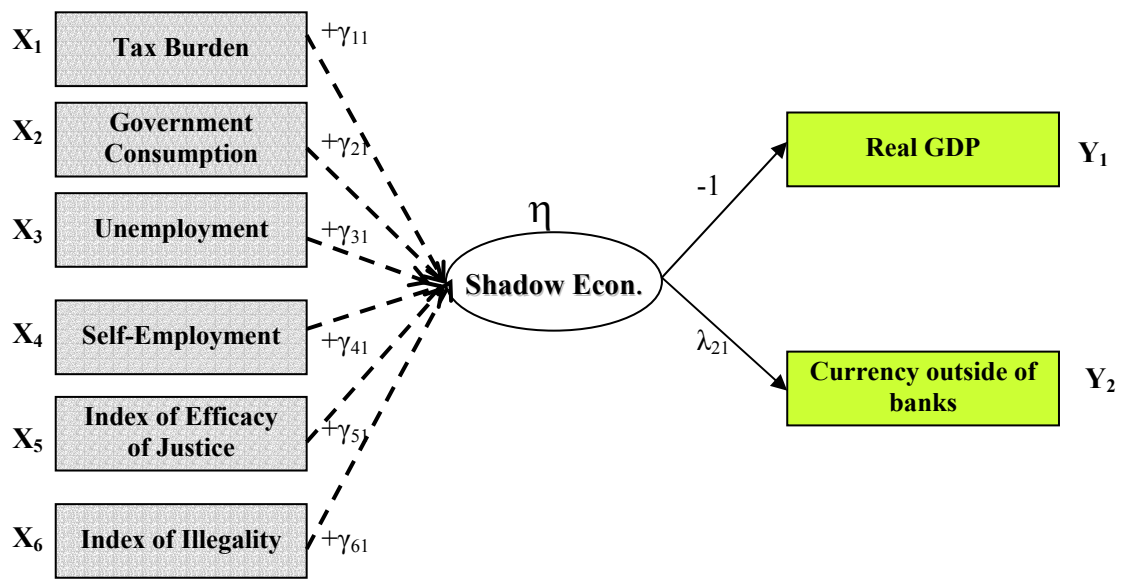**Figure 1:** *MIMIC Model (6-1-2)[13] for Italy*

Table 3: *Estimations of the size and development of the Italian shadow economy - LISREL Output - Coefficients and Tests -*

Models	Tax Burden	Governm. Consumpt.	Unemploym.	Self Employm.	Efficacy of the Justice	Index of Illegality	Currency	Chi-square (p-value)[1]	RMSEA (p-value)[2]	Multi Normal.[3]	Df[‡]
MIMIC 6-1-2	0,58* (2,89)	1,23* (3,79)	0,51 (1,94)	0,50 (1,78)	1,51* (2,75)	4,49 (1,52)	-0,01 (-1,84)	7,81* (0,9865)	0,000* (1,00)	0,000	18
MIMIC 5-1-2	0,56* (2,74)	1,31* (4,03)	0,53* (1,98)	0,72* (2,15)	1,17* (2,25)	--	-0,01 (-1,83)	7,40* (0,8804)	0,000* (0,94)	0.111*	13
MIMIC 4-1-2	--	1,49* (4,54)	0,74* (2,67)	0,77* (2,19)	1,33* (2,43)	--	-0,09 (-0,25)	5,78* (0,8332)	0,000* (0,91)	0,036	10
MIMIC 4-1-2	0,61* (2,92)	1,20* (3,63)	0,45 (1,66)	--	1,51* (2,98)	--	-0,01 (-1,71)	7,42* (0,4921)	0,000* (0,63)	0,183*	8
SIMIC 4-1-1	0,54* (2,53)	1,18* (3,51)	0,54* (1,97)	--	1,53* (3,15)	--	--	0,00* (1,00)	0,00* (1,00)	0,022	4
MIMIC 4-1-2	--	1,61* (4,79)	0,64* (2,29)	1,06* (3,13)	--	1,15 (0,41)	-0,02 (-1,54)	2,79* (0,9721)	0,000* (0,99)	0,014	9
MIMIC 4-1-2	0,64* (3,09)	1,28* (3,85)	--	0,62 (1,85)	1,13* (2,13)	--	-0,01* (-2,12)	4,42* (0,8176)	0,000* (0,89)	0.223*	8
MIMIC 4-1-2 No legality var.	0,57* (2,74)	1,37* (4,11)	0,50 (1,82)	0,96* (2,95)	--	--	0,00 (-2,08)	5,64* (0,6879)	0,000* (0,79)	0.188*	8
MIMIC 4-1-2 No labour var.	0,69* (3,37)	1,11* (3,35)	--	--	1,77* (3,36)	5,49 (1,95)	0,00* (2,02)	3,96* (0,8607)	0,000* (0,92)	0,000	9
MIMIC 4-1-2 No gover. var.	--	--	0,69* (2,26)	0,44 (1,12)	1,94* (3,04)	5,79 (1,79)	-0,26 (-1,20)	2,52* (0,9804)	0,000* (0,99)	0,000	9
MIMIC 3-1-2	0,85* (3,99)	--	--	0,43 (1,18)	1,31* (2,28)	--	0,00 (-1,78)	4,11* (0,6614)	0,000* (0,76)	0,100*	6
MIMIC 3-1-2	0,65* (2,98)	1,24* (3,57)	0,36 (1,28)	--	--	--	0,00 (2,05)	5,69* (0,2238)	0,073* (0,32)	0,284*	4
MIMIC 3-1-2a	0,67* (3,22)	1,19* (3,53)	--	--	1,43* (2,79)	--	-0,01* (-1,99)	4,04* (0,5441)	0,000* (0,65)	0.326*	5
MIMIC 3-1-2b	0,65* (3,08)	1,34* (3,95)	--	0,86* (2,64)	--	--	0,00* (-2,34)	2.77* (0,7351)	0,000* (0,81)	0.616*	5

Notes:

 t-statistic are given in parentheses; and * means |t-statistic|>1,96.

[1] If the structural equation model is correct and the population parameters are known, then the matrix S (sample covariance matrix) will equal to Σ(θ) (model-implied covariance matrix) therefore the perfect fitting correspond to p-value=0,000. This test has a statistical validity if there are large sample and multinormal distributions.

[2] p-value for Test of Close Fit (RMSEA < 0,05)

[3] Is reported the output of PRELIS 2.53: Test of Multivariate Normality for Continuous Variables, p-value of skewness and kurtosis.

[4] The degrees of freedom are determined by 0,5(p+q)(p+q+1)-t, where 'p' is the number of indicators, 'q' the number of causes and 't' is the number of free parameters.

Table 4: *The Estimates of the Size of the Shadow Economy in Italy (1976-1980)*

Methods of Estimate	Average over '76-'80
1) Discrepancy between official and actual employment	18,4
2) Currency demand (Tanzi's method)[a]	15,9
3) Cash-deposit ratio	27,2
4) Transaction Approach	26,4
5) MIMIC Method	10,5
AVERAGE 1978	**19,7**

Sources:
Taken by SCHNEIDER – ENSTE [2000][26], tab.12, p. 43.
[a] This value is the mean between 13,2 [SCHNEIDER – ENSTE, 2000] and 18,6 [BOVI – CASTELLUCCI, 2001].

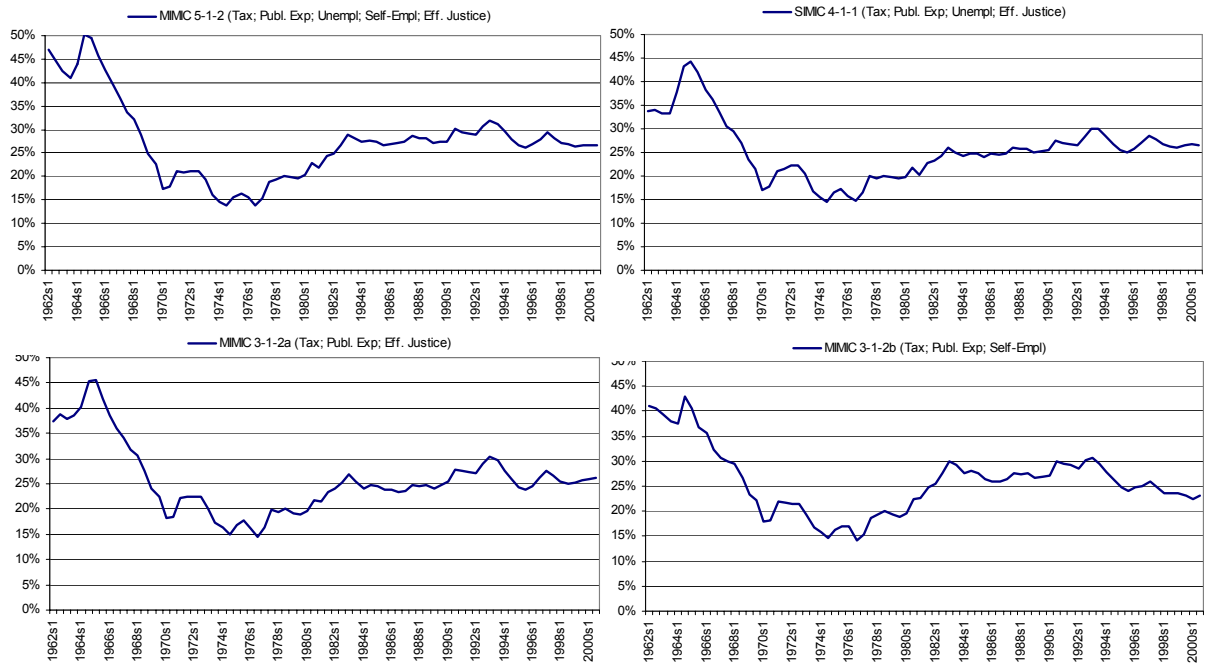**Figure 2:** *Estimates MIMIC (5-1-2); SIMIC (4-1-1); MIMIC (3-1-2a); MIMIC (3-1-2b)*

Figure 3: *A comparison of different estimates of the shadow economy for Italy*
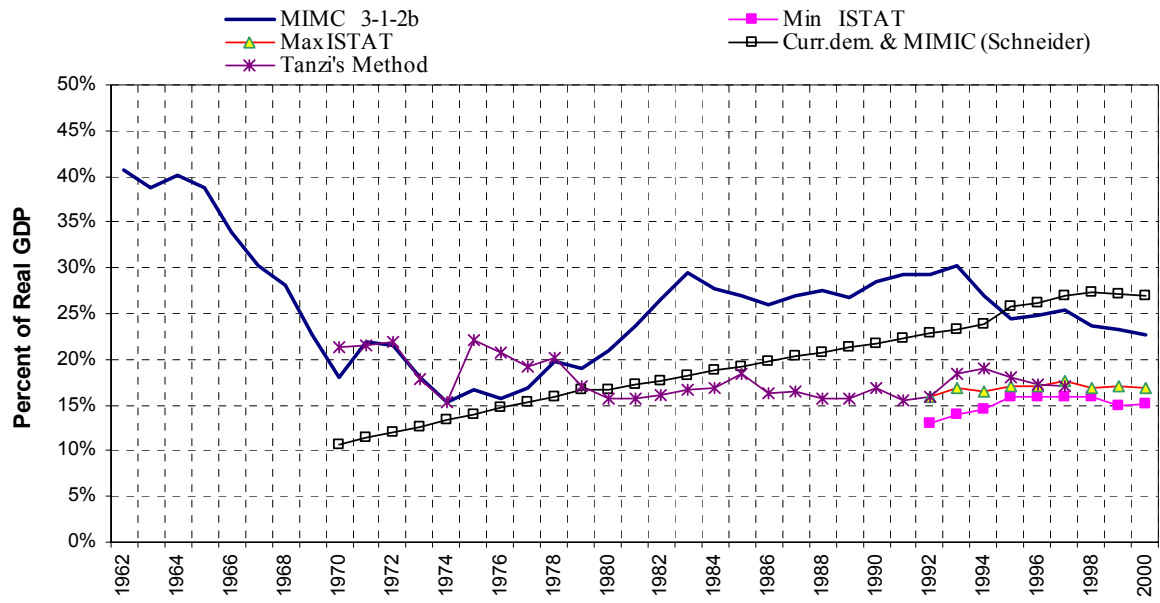
Table 5: *A comparison of different estimates of the shadow economy for Italy*

years	Min ISTAT	Max ISTAT	Tanzi's Method (BOVI – CASTELLUCCI)	Curr.dem. & MIMIC (SCHNEIDER)	MIMC 3-1-2b
1992	12,9%	15,8%	15,9%	22,8%	29,3%
1993	13,9%	16,8%	18,5%	23,3%	30,2%
1994	14,5%	16,5%	19%	23,8%	27%
1995	15,8%	17,1%	18,1%	25,8%	24,4%
1996	15,9%	17%	17,3%	26,2%	24,9%
1997	15,9%	17,7%	17%	27%	25,4%
1998	15,8%	16,8%	n.a.	27,3%	23,7%
1999	14,9%	17%	n.a.	27,1%	23,3%
2000	15,2%	16,9%	n.a.	27%	22,8%
average	**15%**	**16,8%**	**17,6%**	**25,6%**	**25,6%**
variance	**0,0110**	**0,0026**	**0,0121**	**0,0318**	**0,0700**