



ISTITUTO DI STUDI E ANALISI ECONOMICA

**Treasury v dodgers.
A tale of fiscal consolidation and tax evasion**

by

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ABSTRACT

The government influences the equilibrium size of hidden activity. Higher taxes give an incentive to evade. The provision of public services, social transfers and public employment may have offsetting effects on the underground economy. The budget constraint makes the relation between the shadow economy, taxes and spending inherently dynamic. A lack of time series data has prohibited the analysis of these feedback effects. We take advantage of a unique dataset on the Italian underground economy. We find that over the period 1980-2004 the underground economy reacts to changes in government spending as well as to variations in the tax burden.

Keywords: fiscal policy, policy rules, taxes, debt, shadow economy, Italy.

JEL codes: E62, E63, O17.

NON TECHNICAL SUMMARY

In recent years, not least because of the European Monetary Union (EMU) and its consequences for public finances in the EMU member countries, fiscal policy issues have moved again to the core of academic and public interest in Europe. Central to this debate is the role of fiscal policy as an instrument of national economic policy. A sound theoretical and empirical knowledge of the characteristics of fiscal policy is indispensable. Even more so when fiscal policy is constrained by both high public debt and tax evasion. The government influences the equilibrium size of hidden activity. Higher taxes give an incentive to evade. The provision of public services, social transfers and public employment may have offsetting effects on the underground economy. The budget constraint makes the relation between the shadow economy, taxes and spending inherently dynamic. A lack of time series data has prohibited the analysis of these feedback effects. We take advantage of a unique dataset on the Italian underground economy. We find that over the period 1980-2004 the underground economy reacts to changes in government spending as well as to variations in the tax burden.

CONTENERE IL DEBITO PUBBLICO E L'EVASIONE FISCALE. IL RUOLO DELLA SPESA

SINTESI

La dimensione del debito pubblico e l'entità dell'evasione fiscale sono tra le maggiori fonti di preoccupazione per le autorità di politica economica italiane. Ciò non può sorprendere. Si tratta di "emergenze strutturali" la cui complessità è peraltro esacerbata dai forti legami che caratterizzano i due fenomeni. Se perseguite con modalità e tempi sbagliati, le azioni volte alla loro risoluzione possono presentare incoerenze e contraddizioni. Consolidare il debito attraverso maggiori aliquote potrebbe costituire un incentivo all'evasione ma, secondo alcuni punti di vista, anche la modifica della spesa pubblica potrebbe influenzare le scelte dei cittadini-contribuenti. A parità di altre condizioni (in particolare con riferimento alla crescita e alla capacità di assorbimento del settore privato), ad esempio, il contenimento del numero dei pubblici dipendenti potrebbe indurre un aumento nell'offerta di lavoro nero e, quindi, dell'evasione fiscale. In merito, infatti, si è talvolta parlato dello Stato come il datore di lavoro di ultima istanza per i potenziali lavoratori in nero. In un contesto con alto debito pubblico e diffusa evasione fiscale, insomma, la spesa pubblica potrebbe non essere una variabile "indipendente".

Va inoltre osservato che le citate relazioni sono intrinsecamente dinamiche. Le scelte pubbliche di oggi incidono sull'andamento presente e futuro dei conti pubblici ed è immaginabile che le scelte private ne possano risentire. Se il contribuente pensa che l'odierna riduzione del gettito - e/o l'aumento della spesa - comporta il deterioramento dei saldi di finanza potrebbe dedurre che, per ripagare il debito così generato, azioni di segno contrario dovranno essere implementate nel prossimo futuro. La decisione di evadere - o di non emergere - oggi, dipenderebbe quindi anche dalle tasse future e ciò pur in presenza di minori tasse oggi. Analogamente, una valida azione di recupero di base imponibile potrebbe far ritenere più probabile la riduzione delle aliquote in futuro e spingere, *ipso facto*, verso una ulteriore emersione fin da oggi. La probabilità di generare extra gettito da emersione potrebbe trovare – ed è questo il punto – un valido elemento di supporto nel coerente andamento della spesa pubblica. A prima vista questo genere di reazioni da parte degli evasori possono sembrare sorprendenti. Tuttavia, la teoria economica insegna che gli individui decidono oggi scrutando anche il futuro e che le politiche economiche incidono (e sono incise) anche sulle (dalle) scelte dei privati. Altrimenti detto, il

sentiero temporale del debito pubblico e quello dell'evasione fiscale tendono a intrecciarsi e vanno considerati nella loro interezza.

Sfruttando i dati sull'economia sommersa pubblicati dall'Istat, è possibile analizzare empiricamente queste problematiche attraverso l'utilizzo di un modello macroeconomico dinamico. Questo modello è costruito in modo da replicare quegli aspetti della realtà economica che sono qui allo studio. La rappresentazione che ne deriva è quella di un sistema necessariamente semplificato e aggregato in cui, ad esempio, non è possibile studiare esplicitamente gli effetti connessi alla qualità della spesa pubblica o quelli legati a interventi anti-evasione del tipo "moral suasion" e/o aumento della qualità/quantità dei controlli. In effetti, il senso dell'analisi è piuttosto quello di inserire indicazioni complementari in un quadro particolarmente complesso. Nondimeno, nell'esercizio proposto i comportamenti degli individui e del Governo seguono le indicazioni della teoria economica. Più in particolare, i) gli individui reagiscono alla politica di bilancio nascondendo, o meno, il loro reddito imponibile; ii) il Governo controlla il debito pubblico con interventi che seguono la seguente "regola fiscale": ogniqualvolta il rapporto debito/PIL cresce, il Governo genera surplus di bilancio; ciò rende sostenibile il debito.

L'indagine mostra che la maggiore responsabilità dell'evasione fiscale va attribuita all'incremento della pressione fiscale. Andando più in dettaglio si evidenziano delle criticità notevoli. Le stime indicano che, partendo da una (realistica) aliquota media effettiva del 50% e portandola al 51%, l'80% dei potenziali incassi aggiuntivi non vengono incamerati. Come a dire che al Fisco rimangono solo venti dei cento euro che si potevano ottenere non considerando la reazione degli evasori. Aliquote effettive più elevate potrebbero far scattare una spirale perversa: qualora si continuasse ad incrementare la pressione sui contribuenti onesti non si può escludere che il gettito possa ridursi, peggiorando la situazione debitoria. D'altronde, però, il Governo non può neanche abbassare le aliquote sperando di far emergere base imponibile se ciò implica un deterioramento del quadro di finanza pubblica: l'aspettativa dei futuri aggiustamenti impliciti in questa manovra farebbe da subito aumentare l'evasione e non consentirebbe di contenere il debito. Il dilemma di politica fiscale potrebbe essere risolto anche grazie ad interventi dal lato delle spese. Il modello analizza varie tipologie di spesa: consumi collettivi, investimenti pubblici, spesa per interessi sul debito, trasferimenti sociali, numero e stipendi dei dipendenti pubblici. Le indicazioni empiriche portano a ritenere che a provocare la maggiore reazione tra gli operatori in nero è la spesa sostenuta per i dipendenti pubblici. Va menzionato che i risultati ottenuti sia per le spese che per le entrate sono robusti alla modifica di alcuni elementi dell'esercizio (ad esempio, introducendo anche il comportamento delle autorità di politica

monetaria e/o calcolando la pressione fiscale sui soli redditi dichiarati). Mentre gli esiti riguardanti il lato delle entrate non giungono totalmente inattesi, lo stesso non si può dire per quelli relativi alle spese.

Parole chiave: politica fiscale, debito pubblico, evasione fiscale.

Classificazione JEL: E62, E63, O17.

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1 INTRODUCTION¹

The underground economy is a concept that is not only hard to define but by its very nature escapes measurement. Several techniques have been developed for approximating its size. Even though these numbers differ between studies, we may compare the importance of the underground economy across countries (Schneider and Enste, 2000). In contrast to other industrialised economies, the size of the Italian underground economy has reached dramatic proportions. About one quarter of all economic activity takes place in the underground economy. Except for a few emerging economies, this ratio is higher than for any other industrialised OECD country (Table 1).

Tab. 1 Some estimates of the underground economy

country	Friedman <i>et al.</i> (2000)	country	Friedman <i>et al.</i> (2000)
	1997		1997
Korea	38.0	Romania	16.0
Hungary	30.7	Australia	15.3
Latvia	24.3	Germany	15.2
Lithuania	26.0	Austria	15.0
Italy	24.0	Slovakia	14.2
Estonia	23.9	France	13.8
Spain	23.9	Japan	13.7
Belgium	22.0	UK	13.6
Greece	21.2	Canada	13.5
Ireland	20.7	Netherlands	13.5
Poland	20.3	Czech Rep.	13.4
Denmark	17.8	Finland	13.3
Sweden	17.0	USA	10.5
Portugal	16.8		

Notes: shadow economy (in % of total GDP), Friedman *et al.* (2000) use the cash method for OECD countries.

A large underground economy creates several problems for public authorities, not least in terms of covering government spending with sufficient tax revenues. In Italy, unsurprisingly, the sustainability of public debt and the

¹ Maurizio Bovi acknowledges the able assistance of Mrs. Debora Stenti. The views expressed do not necessarily reflect those of the ISAE.

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consequences of the black economy on tax receipts are considered as the two “*national emergencies*”.² It raises questions as to which public policies can effectively address both phenomena. Budget cuts or tax hikes are necessary to keep the deficit under control. At the drafting of every annual budget, measures for combating tax evasion and regularising hidden activities are announced as a ‘miracle solution’ to cutting deficits. Ingenuous measures to detect tax fraud and closing legal loopholes are presented as a means of avoiding a further rise in the burden on ‘fair’ taxpayers or reductions in social spending.

The interaction between the underground economy and government policies is rather complex. Seminal studies argued that higher taxes give incentives to relocate activities in the underground sector.³ This linear effect of taxation does not hold in more detailed general equilibrium macroeconomic models. In these dynamic models, the labour market is the main mechanism driving the division between regular and underground activities. In basic two-sector RBC models, the distortionary effects of taxation on labour income and firm profits stimulate tax evasion through working in the underground sector (Busato *et al.*, 2004; Conesa *et al.*, 2001). The underground sector safeguards the economy of the negative effects of distortionary taxation; and consequently may overturn the usual effects of taxation in DSGE models (Busato *et al.*, 2005a). Calibration of these models gives reasonable approximations on the size of underground activity (Busato *et al.*, 2005b). A second class of models incorporates labour market frictions via search and matching mechanisms. This creates a dual labour market in which workers are sorted into the regular or underground sector.⁴ The interaction between tax variables and labour market regulations gives a much richer picture of the employment dynamics and the evolution of the underground economy (Fugazza and Jacques, 2003; Boeri and Garibaldi, 2006). These models simplify the trade-off between taxes and spending as they usually assume a period-by-period budget balance.

Another strand of research argues that high taxation only partially accounts for underground activity (Shleifer *et al.*, 1999; Friedman *et al.*, 2000). Spending arguably has an impact on the underground economy too. There are items under the direct control of the government that affect the equilibrium

² In the words of the Prime Minister Romano Prodi (speech delivered at the opening of the ‘Fiera del Levante’, Bari, 8th September 2007). A few other recent examples: “*Italy changes rules of tax-evasion game*” International Herald Tribune (13/06/2007) “*The battle against evasion*” La Repubblica (20/06/2007), “*Tax evasion down in five years time*” Corriere della Sera (15/10/2006).

³ Given some probability of detection and the level of penalties (Allingham and Sandmo, 1972).

⁴ The unregulated informal sector is the sector in which low-productivity workers participate (Albrecht *et al.*, 2006).

share of the underground economy (Friedman *et al.*, 2000). Assume the government was to consume just goods. Companies and individuals may appropriate part of this spending through privileged contacts or corruption (state capture). But government spending is also ‘*useful*’ in providing sound institutions. Spending on the judiciary, police or public administration has effects on the level of corruption and the rule of law. Finally, the government also provides social transfers that have a direct impact on the trade-off of individuals between underground and regular activity.

The joint effect of taxes and spending gives rise to several steady state equilibria: economies can get locked in ‘bad equilibria’ where insufficient tax revenues do not allow creating the public services to combat the underground economy.⁵ An insufficient police force, a failing judiciary, a faulty implementation of legislation create the conditions for setting up hidden activities and cultivate a sense of impunity (Shleifer *et al.*, 1999; La Porta *et al.*, 1999). In bad equilibria, taxes would need to be increased to finance useful government spending but this makes even more people ‘quit’ to the underground sector.

High public debt exacerbates the problem of fighting tax evasion. Further tax increases could undermine tax bases in the regular economy and set off adverse debt dynamics. A strong reaction of the irregular sector can become a challenge in meeting the budget constraint as a ‘mass escape’ from the regular sector dramatically reduces government revenues and worsens the budgetary situation (Porzecanski, 2002). The shift from the ‘bad’ equilibrium to a ‘good’ steady state requires a dramatic shift in policies. Lower tax rates may lessen the incentive to evade. But if spending is not kept under control, dodgers may decide to quit now anticipating future tax increases. Fiscal consolidation is necessary. Moreover, the composition of the budget cut may strengthen the return to the regular sector. Specific spending items may have a direct impact on the underground sector.

Empirical evidence is supportive of the ambiguous effects of taxation and the negative consequences of a bad institutional setting (corruption, lawlessness, etc.).⁶ Unfortunately, these studies are limited to a cross section comparison. These give little insight in the dynamic behaviour of underground

⁵ Friedman *et al.* (2000) argue that only two stable equilibria are possible. Bovi and Dell’Anno (2007) suggest that developed economies may be locked in several stable equilibria instead. Busato *et al.* (2004) show how the introduction of an underground sector can lead to indeterminacy in a DSGE model.

⁶ Andreoni *et al.* (1998) give an excellent overview of the various empirical studies that look into the effects of taxation. Dreher and Schneider (2006) provide an overview of the empirical literature on corruption, whereas Johnson *et al.* (1998) look into the effect of institutions, regulations and political stability on the underground economy.

activity. Our paper takes advantage of a unique dataset from the Italian National Institute of Statistics (Istat) that tracks the size of the non-observed economy since 1980. We estimate a small macroeconomic model to look into the dynamic effects of policymakers' behaviour on the hidden economy.⁷ In this simple dynamic model, the underground economy reacts to both taxes and government spending. We control for overall taxation in examining the impact of different expenditure items on underground activity. We close the model by specifying fiscal rules in which the budgetary variables respond to public debt.

As expected, taxation impinges on the size of underground activities. Higher taxes shift regular activity into the underground sector. The government cannot choose to lower taxes at the cost of higher deficits, however. Budget control is necessary to keep both public debt and the underground economy in check. The only option is a reduction of government spending: consolidation can even strengthen the positive effect of tax cuts if particular expenditure items are targeted. A reduction in public employment or social transfers may actually reduce underground activities. Cuts in public consumption, investment or subsidies are less effective. Various robustness checks confirm these baseline results.

The remainder of this paper is organised as follows. In section 2, we describe the construction of the dataset of Istat for the unofficial economy. We present the baseline model and some methodological issues in section 3. Results for the Italian underground economy are discussed in section 4. We also consider various robustness checks. We then run in section 5 some counterfactual simulations of different fiscal policies. A discussion of some policy implications for tackling the two Italian national emergencies in section 6 closes the paper.

2 TIME SERIES DATA ON THE UNDERGROUND ECONOMY: ITALY 1980-2004

The economic literature typically refers to shadow activities by using interchangeable terms as underground and informal (Fugazza and Jacques, 2004; Schneider and Enste, 2000). Since 1993, the System of National Accounts (SNA93) has established an internationally accepted definition that

⁷ We may safely assume differences in institutions over time are relatively small, and hence we do not need to control for their effect.

separates these contiguous phenomena (UN *et al.*, 1993). The underground sector is part of the so-called 'non-observed economy', which includes also illegal and informal activities.⁸ The underground sector represents the area of legal production activities that are not directly observed for economic reasons, i.e., activities carried out with the intention to avoid taxes and social contributions.⁹ It is the object of this paper.

The Istat method to estimate underground activity is based on labour survey methods, and has been internationally recognized as a very robust approach (Calzaroni, 2000; OECD, 2002). Istat looks for exhaustive estimates on the volume of work by comparing information from both firms and households.¹⁰ The underlying assumption is that firms provide a measure of regular jobs, while households give a measure of both regular and irregular jobs. The assumption is that individuals likely have fewer reasons than companies to conceal the nature of their labour. The discrepancy between household and firm data is the number of irregular jobs. Istat converts these into full time equivalent (FTE) units. Once shadow employment is estimated, Istat attributes to irregular employees the same gross compensation (net of social contributions) of corresponding (same industry, same firm size, etc.) regular ones. This gives a measure of irregular value added related to the hidden labour input (the "labour gap"). Finally, Istat corrects this number for the underreporting of revenues by enterprises (the "underreporting gap").¹¹

Istat has released a relatively long time series for FTE shadow units (1980-2004). The ratio of total underground GDP to total (regular plus irregular) GDP, instead, is available only for the period 1992-2003. Over this period, both shadow employment and underreporting contribute in equal measure to total tax evasion. Their shares have remained rather constant (each 50%), as there is a linear relation between the two phenomena. The reason is that dodgers hide

⁸ The illegal sector is defined as productive activities forbidden by law or productive activities which are usually legal but carried out by unauthorized producers. Due to the difficulties of estimation, illegal production is not included in the Italian national accounts. The informal sector is broadly characterized as consisting of production units with the primary objective of generating utility for the persons concerned. It is part of household unincorporated enterprises, and are not included in output measures.

⁹ A minor part of underground activities is due to problems in statistics collection. Some legal production activities are not registered due to, for example, the failure to fill out the administrative or statistical forms, or to the difficulty in collecting data for small-scale production units.

¹⁰ According to Istat, there is no undeclared work in the public sector. Other segments of the labour market, e.g. non-resident illegal foreigners, are captured with ad hoc statistical surveys.

¹¹ Istat uses the Franz-method (Franz, 1985).

both the costs and revenues stemming from the use of shadow employment, in order not to pay income taxes on undeclared labour costs.¹²

Several studies argue this ratio was similar in the eighties (Bovi, 1999; Zizza, 2002; Dell’Anno, 2003). In turn, we may assume this percentage was about 50% over the eighties. This allows building a unique time series on the underground economy since 1980.¹³ Figure 1 plots the evolution of the share of the underground economy. There is a steady rise in the underground economy over time from about 12% to 18% in 1998. Since 2001, the underground economy share shrunk by about 3%. Among the main reasons for this decline there is the legalization of many illegal immigrants.

Fig. 1 Public debt ratio and underground economy (in % of GDP), Italy, 1980-2004

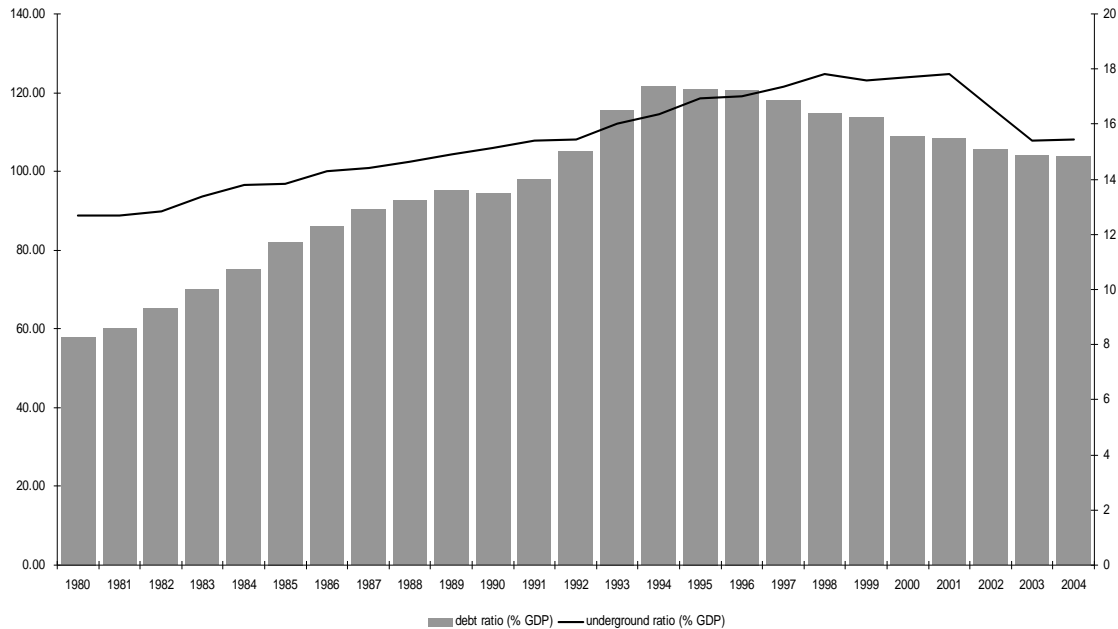


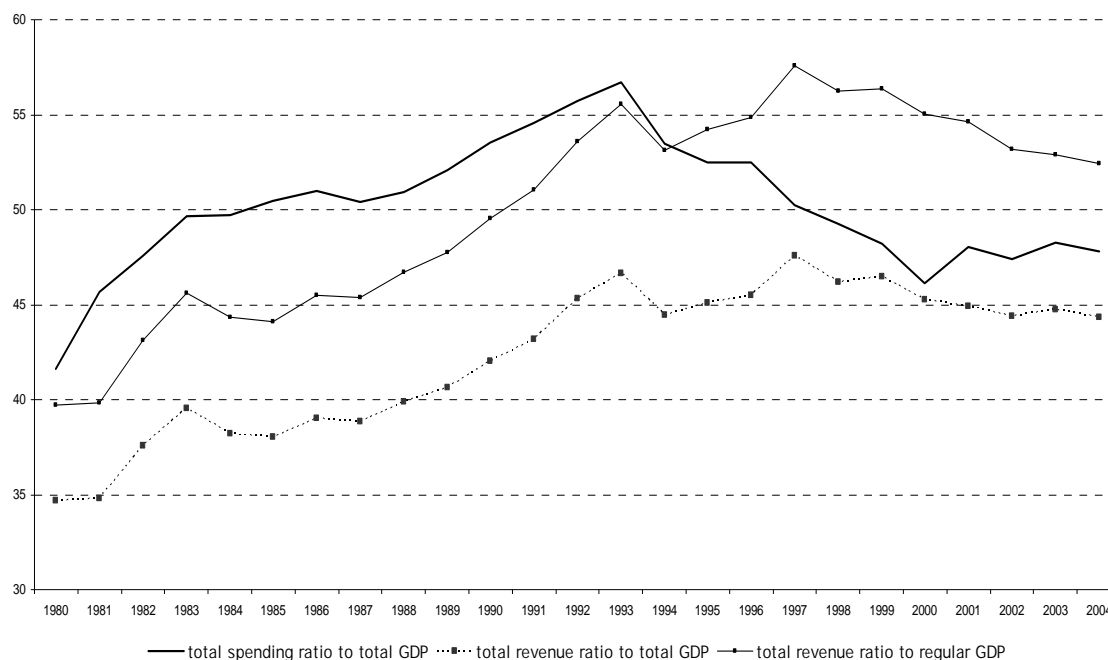
Figure 1 also reports the other “*Italian emergency*”: the public debt ratio boomed over the eighties. Spending gradually outgrew tax revenues, and deficits started to accumulate. Debt has not fallen below 100% since 1993. The consolidation of public debt was only gradually implemented via a reduction of

¹² Istat data show that this ratio (%) was: 1992=51; 1995=50; 1998=51; 2000=50; 2001=49; 2002=51; 2003=46. The fall in 2003 is due to the big legalization of immigration in 2002, when 274000 FTE units switched their status from irregular to regular employees (Istat, 2005). The bill was approved at the end of 2002, so the legalization increased the firms’ tax burden since 2003. Firms looked for other routes to evade, thus leading to the fall in the ratio. Previously there were other (much smaller) legalizations (1990, 1995 and 1998).

¹³ To our knowledge, Italy is the only country for which (official) time series on the underground sector consistent with national accounts are available.

public spending. Total revenues have levelled off and have not been a major instrument to reduce the public deficit after 1997 (Figure 2). The steady rise over the eighties and nineties and the recent decline in underground activity, somewhat mirrors the evolution of public debt. The correlation between the share of the underground economy and the public debt ratio is high (0.92). This is suggestive of some interaction between both emergencies. Yet, there is no similar link between adjustments in spending or taxes and the underground economy. We turn to an explicit macroeconomic model to test these *prima facie* relationships.

Fig. 2 **Public debt ratio and underground economy**
(in % of GDP)



3 THE UNDERGROUND ECONOMY AND FISCAL POLICY

3.1 A baseline model

As a baseline model, we simply transpose the usual cross-sectional regression for explaining the underground economy into the time dimension. We relate the variation in the share in the underground economy u_t to total average taxation t_t (both expressed as a share to total GDP). We would expect to find a similar effect as in cross-section studies for developed countries, i.e. higher taxation leads to more underground activity.

Similarly, we may test the effect of spending g_t on the underground economy. The predicted outcome is less clear cut. Several possibilities abound as government spending covers various categories. Assume the government was to consume just goods. In this case, companies and individuals may appropriate part of this spending through privileged contacts or corruption. Budget items that can be targeted to specific groups are particularly prone to this state capture. Public consumption, investment or subsidies can be channelled to groups of interest. However, this is too Leviathan a view. The government also provides some useful public services: a more effective police and judiciary force that implements the rule of law reduces the possibility to hide economic activities.

The government affects individual incentives to go underground by some other channels too. Social transfers change the trade-off between labour and leisure, and the return on legal or underground activities. On the one hand, there is a positive substitution effect if more social provisions free up time to engage in underground activity. On the other hand, higher transfers induce an income effect that negatively affects incentives to start risky underground labour. Finally, the public service is a large employer and directly affects conditions on the labour market. The government can absorb the pool of unemployed and thus shield them from moving into the underground economy. But there is also a substitution effect at play if public workers start underground activities too.¹⁴

¹⁴ Some papers look into even more detailed budget items. Loayza (1996) provides a model that links the size of the underground economy to growth via the accumulation of public capital. Busato *et al.* (2005b) look at the effect of capital subsidies.

We can thus write a specification for the underground sector and fiscal variables as follows:

$$u_t = \psi_0 + \psi_1 u_{t-1} + \psi_2 g_t + \psi_3 t_t + \varepsilon_t^u . \quad [1a]$$

We allow for a lag to model persistence in the underground series. While the coefficient ψ_2 is *a priori* unclear, the effect of taxes ψ_3 should be positive. An alternative specification is to restrict in [1a] that only the total surplus s_t is the relevant variable in [1b].

$$u_t = \psi_0 + \psi_1 u_{t-1} + \psi_4 s_t + \varepsilon_t^u . \quad [1b]$$

3.2 The dynamic model

This baseline model is not complete without a full description of the evolution of fiscal policy. A relation like [1a] or [1b] allows testing the impact of spending or taxes, but is insufficient to capture the dynamics of debt. If the expectations of future adjustments in spending or taxes overwhelm the direct impact of each variable, then [1a] or [1b] are incomplete specifications. We could test in [1a] whether the current deficit is sufficient to examine government impact on the underground economy by testing the restriction on [1b] that spending and revenues have opposite effects on the underground economy ($\psi_2 = -\psi_3$). But this is not possible without a dynamic path for public debt. A shortcut way to relate the dynamic evolution of fiscal variables to the sustainability of public finances is by means of a fiscal rule. In contrast to the popularity of fiscal rules in practical policy making, the idea that fiscal policy can be described by fiscal rules has been gaining ground only recently. Bohn (1998) proves that a positive reaction of the surplus s_t to an increase in past public debt b_{t-1} is a sufficient condition for the government to satisfy its intertemporal budget constraint. In this way, we close the model with a fiscal rule [2a]:

$$s_t = \alpha_0 + \alpha_1 b_{t-1} + \varepsilon_t^s \quad [2a]$$

A fiscal rule like [2a] can be used for examining sustainability of fiscal policies in the long term, but is not a realistic description of variations in the budget in the short term. We therefore incorporate a reaction of the budget to the business cycle, as measured by the output gap y_t . These cyclical

responses come from two different sources. First, automatic stabilisers built-in the budget system make some spending categories (e.g. unemployment benefits) respond to changes in output. Similarly, for a given tax rate, a cyclical variation in the tax base implies fluctuations in total tax revenues. Second, the government may wish to implement discretionary responses to economic booms or crises. We do not model explicitly other determinants of fiscal policy setting, such as the effect of political variables (e.g. coalitions, left-right, etc.). Lengthy parliamentary processes, sunk decisions and implementation/information lags make all budget variables rather persistent. Hence, we argue that the government adjusts its fiscal instrument s_t only gradually and we include a lag of the surplus s_t in the baseline fiscal rule:

$$s_t = \alpha_0 + \alpha_1 b_{t-1} + \alpha_2 y_t + \alpha_3 s_{t-1} + \varepsilon_t^s \quad [2b]$$

The specification of this fiscal rule can easily be extended to look at different components of the budget. We can specify a rule for government spending g_t [3a], as well as for tax revenues t_t in [3b].

$$g_t = \beta_0 + \beta_1 b_{t-1} + \beta_2 y_t + \beta_3 g_{t-1} + \varepsilon_t^g \quad [3a]$$

$$t_t = \gamma_0 + \gamma_1 b_{t-1} + \gamma_2 y_t + \gamma_3 t_{t-1} + \varepsilon_t^t \quad [3b]$$

Moreover, and following our earlier arguments, different spending items may have different effects on the underground economy. We thus decompose public spending in several subcategories and examine the impact of each budget item g_t^j on the underground economy with the fiscal rule [3a], as in Lane (2003).¹⁵ Likewise, we could also insert different types of taxation in [3b] (personal income tax, VAT, etc.). This is less interesting for our purposes. First, we prefer to focus on the composition of public spending, and control for the overall level of taxation. The control of public outlays is crucial for a government facing both high debt and a high level of underground activity. Second, a control for the aggregate tax level avoids some contentious choices on taxes that are beyond the scope of this paper. It is not clear which tax variable to use. Is it the maximum, average or marginal tax rate which determines the quit option? Moreover, we cannot disentangle tax rates from tax bases for different tax categories (OECD, 2000).

¹⁵ Adding all budget items to the baseline model [1a] would lead to problems of multicollinearity.

3.3 Methodology

We estimate the specification of the dynamic model in a system. The economic arguments for a system approach are obvious. Shocks to both equations are likely to be contemporaneously correlated. This not only follows from the specification of the output response in both (1), (2) or (3). In addition, the level of taxation – and several spending items – affects the decision to go underground. Conversely, the underground economy has consequences for tax revenues and specific spending categories. Policy makers control the tax rate, but the tax-to-GDP ratio is endogenous due to the dodgers' reaction. Because of the effects on the budget deficit, the underground economy determines future government decisions on taxation and the allocation of spending. Moreover, if fiscal variables indeed have real economic effects, as a recent literature suggests, then fiscal policy contributes to fluctuations in output. For these reasons, we cannot ignore the endogeneity of the underground economy and the fiscal variables.

Applying SUR to the system would lead to biased and inconsistent estimates. In order to account for both endogeneity problems, the model is estimated by 3SLS. We include some instrumental variables that have been used to derive estimates of the underground economy, such as the ratio of cash money to a broad money supply indicator (Tanzi, 1999). We also consider some supply side variables, such as the NAIRU, unit labour costs, and total labour productivity. Several external variables model either international economic developments (commodity price index) or the dependency on economic conditions in Europe. Hence, we include the German inflation and output gap, as well as the Lira-Mark exchange rate, the short term interest rates of the Bundesbank and the German government bond yield.

In the absence of a complete dynamic model of the underground economy and fiscal policy, the results are uninformative of policy issues that involve deep parameters or that require a structural interpretation (Lucas, 1976). The approach is subject to the usual criticism on some *ad hoc* identifying restrictions. Many of the applications of the model depend on its interpretation as a whole system. We see the contribution of this paper to extend the estimation of the effects of government revenues and spending on underground activity to include a small model of fiscal sustainability that is key to the dynamic behaviour of these variables. Single equation IV estimation of parts of the model does not provide efficient estimators as the instruments insufficiently capture the remaining part of the model (Henry and Pagan, 2004).

We perform several diagnostic tests on the system 3SLS estimates. First, we impose as few overidentifying restrictions as possible in order to avoid

potential estimation bias in small samples when a smoothing term is included in the specification. We test the validity of the overidentifying restrictions through the J-test. As this test does not consider a specific alternative, it is likely to have low power. In addition, the moment conditions may not only be satisfied for the true coefficient parameters. This weak identification often causes IV estimates to break down.¹⁶ Second, we search endogenously for a structural break in the coefficients. We estimate the breakdate by least squares and test its significance with the supremum Quandt LR test on the central 70% of the sample. As it is rather peculiar to locate a unique break, we modify the test to account for subsample variability. Stock and Watson (2003) suggest conditioning the break test on a potential change in the residual variance before and after the initial breakdate in the coefficients. Accordingly, the modified test scales down periods of greater turbulence and magnifies relatively small policy shifts in less turbulent periods. Finally, full information procedures often find the true parameters, even when the model is severely misspecified and the measurement error is not normally distributed. We run alternative FIML estimates of the model. These did not indicate strong differences with the main results reported below.

4 RESULTS

4.1 Data

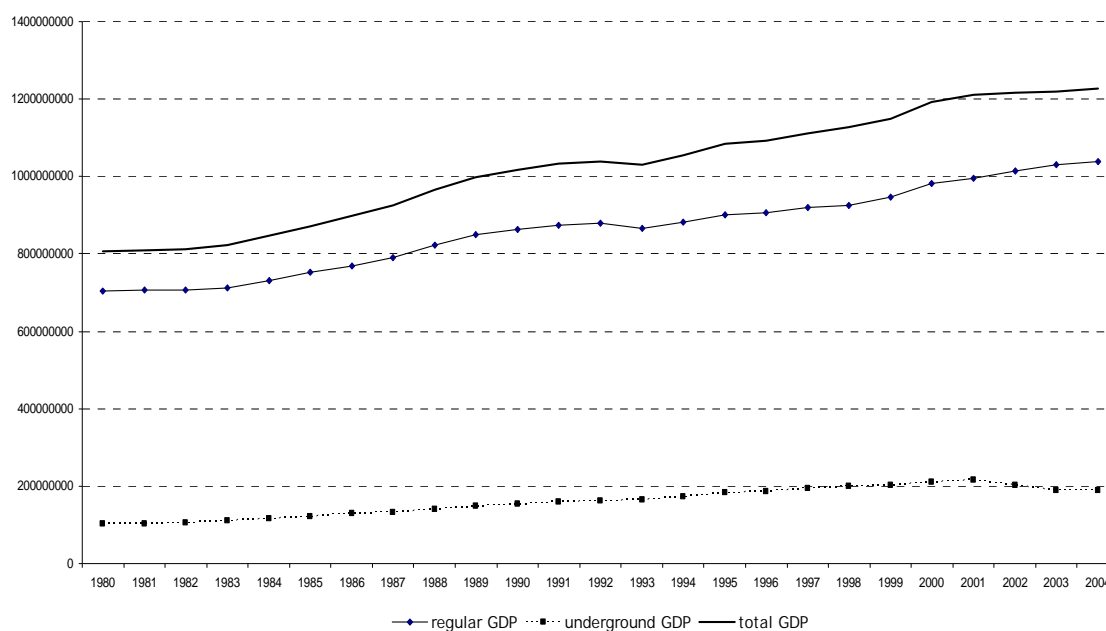
The sample size is determined by data availability for the irregular economy, and is thus limited to the period 1980-2004. We use annual macroeconomic and budget variables data for Italy from the OECD databases. All budget variables are expressed as ratios to total GDP. The construction of the regular and underground output variables requires some explanation instead. OECD and Istat data on GDP are consistent, as both compute total GDP (y) as the sum of regular (y_r) and underground GDP. We transform the

¹⁶ Formal tests are based on the concentration parameter that measures the correlation between variables and instruments. Staiger and Stock (1997) propose the F-statistic on the relevance of the instruments in the first stage regression. A value smaller than 10 is seen as an indication of weak instruments. We therefore compute in addition an F-test on the first stage regression for each of the endogenous right hand side variables F_{\bullet}^1 . For reasons of space, we did not report all test statistics as the test did not indicate problems with any of the instrumental variables.

share of both in the following way. We first compute regular potential GDP (y_r^*) by applying a Hodrick-Prescott filter to the regular series.¹⁷ We can then derive an output gap for the regular economy, and compare this to the ‘official’ output gap of the OECD. We then calculate an ‘underground’ output gap as the difference between the official and the regular output gaps, weighted by their share in total GDP.

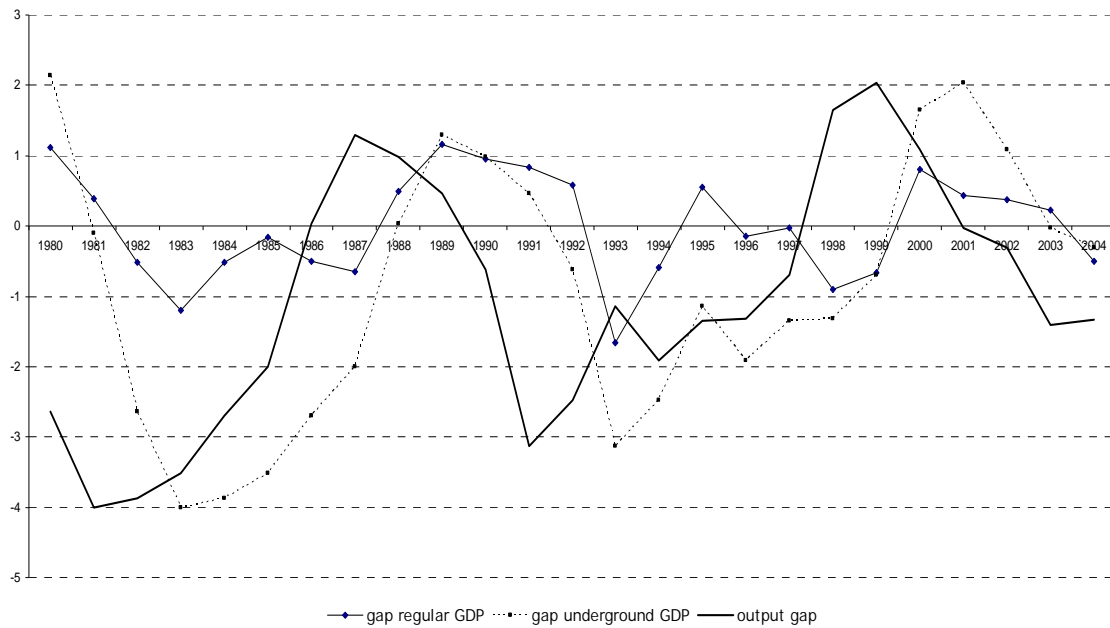
Figure 3 plots the three GDP series that underlie the analysis. The resulting output gaps for regular and underground activity are in Figure 4. The fluctuations in underground GDP are much larger than those in regular GDP. The above mentioned methodology exacerbates the variation in the underground sector. It is a common finding in the literature, however, that hidden economic activity is more susceptible to economic fluctuations. By its very nature, underground activities take place in very flexible (labour) markets (Bovi, 2007). Entry and exit choices follow the peaks and troughs in more stable regular activities (Busato *et al.*, 2004).

Fig. 3 Official OECD GDP, regular GDP and underground GDP, Italy: 1980-2004



¹⁷ HP filter, smoothing parameter on annual data $\lambda = 6.25$ (Ravn and Uhlig, 2002).

Fig. 4 Output gaps: OECD, regular and underground, Italy: 1980-2004



4.2 The effects of taxation

Referring to Italy, the transpose of the usual cross section tests for the effects of taxation on the underground economy to a time series model leads to a similar finding: an increase in the tax burden raises the size of the underground economy (Table 2). The effect is rather large: a 1% raise in average taxation implies an increase in hidden activity of 0.77%. The substitution of the regular for the underground economy implies a marginal fall in government revenues. At an average effective tax rate of 50% and with an underground economy of about 15% (sample averages for Italy), the public budget foregoes about 0.44% of additional tax revenues of a 1% tax hike due to the shift to hidden activities. The corollary is that the tax burden on honest taxpayers becomes less and less bearable to achieve an effective 1% increase in tax revenues.¹⁸ At the current level of underground activity, there is no danger of unstable revenue dynamics however. The exit to the underground economy is less than proportional.

¹⁸ This is not the entire loss of tax revenues, however. In our static model, we can just examine the substitution from regular to hidden activity on the shift in tax burden. In a complete dynamic model, we need to calculate the effects of tax increases on regular activity too.

In this simple model, taxes are the only relevant variable under control of the government that determines underground activity. The effect of taxation remains if we control in [1a] for spending. Aggregate government outlays have no significant effects on the underground economy. As a consequence, the restriction that spending and revenues have opposite effects on the underground economy is rejected, albeit only marginally. A lower deficit (or a higher surplus) has positive effects on the size of the underground economy because of the implied increase of taxes relative to spending. The size of the deficit does not matter as such.

Tab. 2 Single equation, dependent variable = underground economy, 2SLS estimates

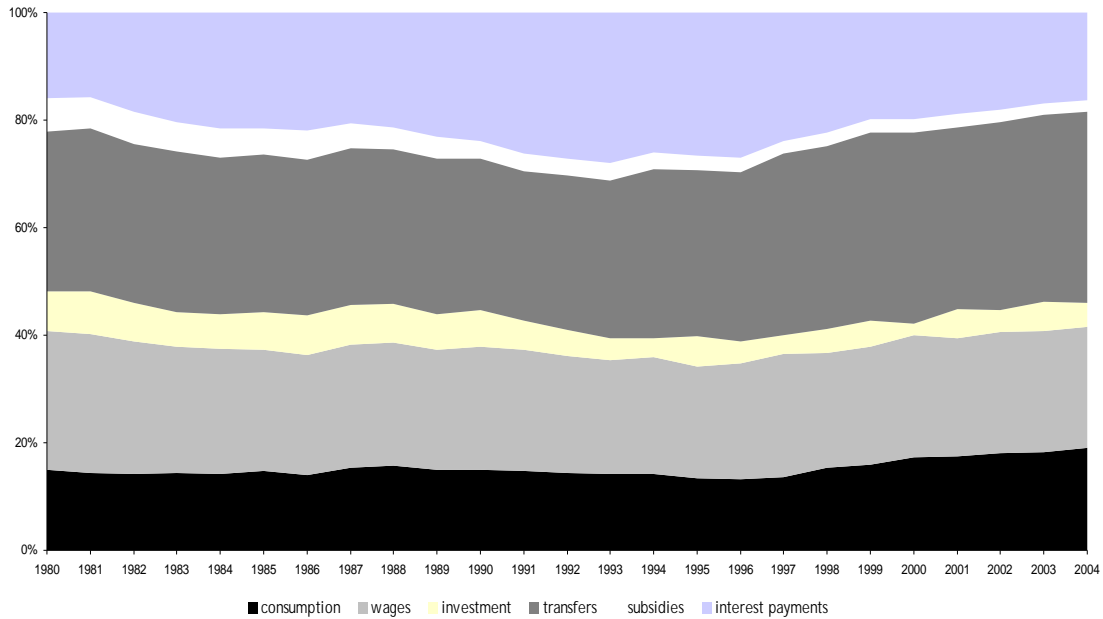
	ψ_1	ψ_2	ψ_3	ψ_4	\bar{R}^2	J	dh	LM	AP
[1a]	0.69***	-	0.77**	-	0.70	0.16	0.00	0.00	1985 (0.18)
[1a]	0.66***	-0.34	0.83**	-	0.69	0.15	0.00	0.00	1987 (0.18)
[1b]	0.67***	-	-	0.63**	0.70	0.15	0.00	0.00	1985 (0.18)

Notes: coefficients are reported with */**/** indicating significance at 1/5/10%; a constant is not reported; J test is a test for overidentifying restrictions (Hansen, 1982); dh is the corrected Durbin Watson test statistic; AP is the Andrews Ploberger test for a structural break in all coefficients (with p value in brackets); LM is the Breusch Godfrey test.

A specification like [1b] downplays the role of government spending too much. More insight may be gained by examining different spending items. While controlling for total revenues, we split up total expenses into wage spending, consumption, investment, subsidies and interest payments in the baseline model. Figure 5 decomposes public spending in these various categories. Total spending hides major adjustments in the composition of the budget. Surprisingly, public consumption takes up a rather small percentage of total outlays. Government investment and subsidies are only minor fractions of total spending. Both categories have been in decline over the sample period. Instead, wages of public employees as well as transfers to households add up to 20 respectively 30% of total outlays. Another major budget item is interest payments on outstanding debt. Increasing indebtedment has led to a crowding out of all other budget items. The rising fraction of interest payments on public debt has mainly affected investment and subsidies. The policy myopia in Italy has been particularly strong felt in investment, as long-run returns have been foregone for a politically less costly budget cut. The consolidation of Italian

public finances that has taken place since 1993 has reduced this pressure, and led to a recomposition of government spending towards public consumption and a moderate rise in public investment.

Fig. 5 **Composition of public spending**
(% of total spending)



What impact do different budget items have on the underground economy? If we test each budget category separately in [1b], we find that government consumption, investment or subsidies do not have an impact on the underground economy (Table 3). This confirms evidence in Bovi and Dell’Anno (2007) that – at least at the aggregate macroeconomic level – state capture of specific budget categories is not an important phenomenon in a developed country like Italy.

The results for the other budget categories are more interesting. We find that higher public wage spending has a depressing effect on the underground economy. The effect is not sizeable: a 1% rise in total wage spending results only in a 0.16% decrease in hidden activities. Several studies suggest that public employment absorbs unemployment and thereby function as a substitute for underground activities (Boeri and Garibaldi, 2006). Public employment is indeed determined by political factors rather than by the need of public services in several Italian regions (mainly in the Mezzogiorno). The government is an employer of last resort. There is also another potential channel linking wage spending and hidden activities. Higher public wages increases the threshold of public employees of being corrupted. Empirical studies report a negative

correlation between the number of public officials involved in corruption and the level of public wages (Tanzi, 1998). Despite the level of aggregation in the present analysis, we are tempted to speculate that the reaction can be associated with 'hidden' unemployment in the public sector (Eatwell, 1995; Bovi and Castellucci, 1999). We come back to this point in section 4.4, where we decompose total wage spending in both wages and total number of employees. Social transfers do not have a similar impact as public wages on underground activity. The (positive) substitution effect may cancel the (negative) income effect, and explain the final zero impact.

Tab. 3 Single equation, dependent variable = underground economy, 2SLS estimates

wage consumption interest investment subsidies transfers								\bar{R}^2	J	dh	LM	AP
ψ_1	ψ_2	ψ_2	ψ_2	ψ_2	ψ_2	ψ_2	ψ_3					
0.12	-0.16*						0.10	0.94	0.33	0.50	0.39	1987 (0.33)
0.13		0.09					0.58***	0.94	0.27	0.25	0.03	1992 (0.37)
0.10			-0.31				0.63***	0.95	0.25	0.65	0.43	1987 (0.13)
0.12				0.00			0.23	0.93	0.36	0.36	0.30	1992 (0.29)
0.12					-0.01		0.05	0.93	0.42	0.45	0.36	1987 (0.47)
0.11						0.00	-0.14	0.94	0.35	0.64	0.53	1987 (0.65)

The final major spending item is interest payments on outstanding debt. We do not expect to find direct effects of government bonds on the underground economy. Table 3 confirms this intuition. However, Figure 5 attests to the crowding out effect of interest payments on other budget items. There could be an indirect impact if current deficits imply higher taxes or spending cuts in the future to repay debt. From a regression as [1b], it is hard to determine whether deficit and debt dynamics have a significant impact on the underground economy.

4.3 System estimates of the underground economy

We can only proof these claims if we control for the reaction of fiscal variables to the development of public debt. We first look into a simple extension. We complement the underground equation [1b] with a deficit rule. The coefficient estimates of the rule confirm several common findings in the

literature (Table 4). First, public finances in Italy are sustainable as there is a small but positive reaction of the surplus to public debt (Galí and Perotti, 2003). Second, Italian governments have not stabilised the economy: the surplus is anticyclical (Ballabriga and Martinez-Mongay, 2003). Fiscal policy in Italy over the nineties has been on a path of lower deficits. This has implied an increase in the share of the underground economy. We basically confirm the result of single equation estimates of the positive effect of the surplus on the black economy.

Tab. 4 System 3SLS estimates, fiscal surplus rule and underground economy

	α_3	α_2	α_1	\bar{R}^2	dw	Var.	Skew.	Kurt.	JB	LB(1)	LM (1)	AR(1)	ARCH
[2b]	0.87***	-0.20	0.06***	0.94	2.69	1.13	0.09	0.28	0.08	0.03	0.00	0.04	0.41
[1b]	ψ_1	ψ_4		0.77	0.57	24.93	0.86	0.82	0.95	0.00	0.00	0.00	0.03
				J test	$\rho_{s,u}$								
				0.99	-0.12								

Notes: reported coefficients with */**/** indicating significance at 1/5/10%; dw is Durbin Watson test statistic; J test for overidentifying restrictions (Hansen, 1982); JB is Jarque Bera test for non normality; LM is an LM test for first order autocorrelation; AR is test for first order autocorrelation; ARCH is an LM test for conditional heteroskedasticity.

The effect of the deficit could be due to either spending cuts or revenue increases. Figure 2 shows that since 1992 the tax burden was increasing, but spending has been cut to a similar extent. We extend the model to include both a spending and a tax rule. Results in Table 5 indeed suggest that reductions in government spending as well as rises in taxation have been used for reducing deficits. However, the increase of public spending in economic booms has largely offset the usage of automatic stabilisers through cyclical tax revenues. The procyclicality of expenditure is confirmed in other empirical studies too (Lane, 2003).

The results demonstrate the mechanism of debt creation and the rise in the underground economy. The paydown of debt with higher tax revenues creates a dynamic response of the underground economy. Tax rises imply large substitution effects into the underground economy: a 1% tax rise implies a more than proportional growth of the underground economy. This shift into the black economy implies a gradual erosion of tax bases. Only 20% of the planned additional revenues actually flow to the Treasury. The other 80% are foregone

due to tax evasion. The rise in statutory tax rates is undone by the contraction of the regular tax base. Figure 2 indicates this additional tax pressure on regular GDP (i.e., on honest taxpayers) due to evasion in the underground sector. While there is no evidence of Laffer effects on total tax revenues, higher and higher tax burdens may eventually imply unstable revenue dynamics.¹⁹ In contrast, aggregate government spending does not have significant direct effects on the underground economy. The implication for the government is that only tax cuts are an effective strategy to reduce the size of the underground economy.

Tab. 5 System 3SLS estimates, fiscal spending and tax rule, and underground economy

	β_3	β_2	β_1	\bar{R}^2	dw	Var.	Skew.	Kurt.	JB	LB(1)	LM (1)	AR(1)	ARCH
[3a]	0.94***	0.52***	-0.08***	0.89	2.12	1.46	0.22	0.09	0.06	0.69	0.00	0.72	0.80
	γ_3	γ_2	γ_1										
[3b]	0.37*	0.34**	0.07*	0.90	1.28	1.72	0.48	0.85	0.73	0.21	0.01	0.25	0.76
	ψ_1	ψ_2	ψ_3										
[1a]	0.59***	0.06	1.55***	0.72	0.62	31.25	0.66	0.39	0.54	0.00	0.00	0.00	0.04
				J test	$\rho_{g,t}$	$\rho_{g,u}$	$\rho_{u,t}$						
				0.99	0.58	-0.55	-0.81						

Notes: see Table 4.

4.4 An assessment of government spending

Tax cuts to combat underground activity would make debt even more an emergency. Tackling both problems also requires an adjustment in spending. Nonetheless, taxation is not the only tool left to the government for dealing with underground activity. Some budget items might have a direct impact: adjustments in specific spending items might then be complementary. We therefore examine a model with a tax rule and spending rules for different budget categories (Table 6).

¹⁹ Sanyal *et al.* (2000) derive such Laffer effects in a theoretical model of the underground economy.

Tab. 6 System 3SLS estimates, fiscal spending and tax rule, and underground economy. A decomposition

		current spending				subsidies				investment				social transfers										
		β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$		β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$		β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$
[3a]		0.95***	0.56***	-0.08***	0.89	1.51	0.71			0.43***	-78.52***	13.45***	0.96	1.90										
[3b]																								
[1a]																								
interest payments																								
[3a]		1.16***	0.35***	-0.06***	0.95	2.10	0.44			0.48***	35.02	-16.52***	0.90	2.12										
[3b]																								
[1a]																								
consumption																								
[3a]		0.69***	-0.00	0.00	0.74	1.15	-0.10			0.28**	73.50	27.40***	0.88	1.07										
[3b]																								
[1a]																								

Tab. 6 (continued) System 3SLS estimates, fiscal spending and tax rule, and underground economy. A decomposition

	wage spending				wage spending (gross wage per public employee)			
	β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$	0.99
[3a]	0.83***	-0.00	-0.00***	0.99	1.15	1.15	0.43	
	γ_3	γ_2	γ_1				$\rho_{g,u}$	
[3b]	0.33**	0.13	0.08***	0.91	1.27	1.27	-0.72	
	ψ_1	ψ_2	ψ_3				$\rho_{u,t}$	
[1a]	1.00***	0.56***	3.96***	0.25	0.54	0.54	-0.83	
	wage spending (number of employees, FTE)							
	β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$	0.99
[3a]	0.07	0.21***	-0.01	0.45	1.49	1.49	0.00	
	γ_3	γ_2	γ_1				$\rho_{g,u}$	
[3b]	0.39**	0.08	0.08**	0.92	1.41	1.41	-0.95	
	ψ_1	ψ_2	ψ_3				$\rho_{u,t}$	
[1a]	0.19*	15.88	1.54***	0.15	1.28	1.28	-0.26	
	wage spending (share in total employment, FTE units)							
	β_3	β_2	β_1	R^2	J-test	dw	$\rho_{g,t}$	0.99
	0.30	0.06*	0.03**	0.98	0.95	0.95	0.21	
	γ_3	γ_2	γ_1				$\rho_{g,u}$	
	0.63***	0.08	0.03	0.93	1.67	1.67	-0.57	
	ψ_1	ψ_2	ψ_3				$\rho_{u,t}$	
	0.61***	11.89***	-2.73***	0.83	1.31	1.31	0.12	

Disaggregating the budget into current spending and interest payments on outstanding debt does not affect the main insights. The difference between the fiscal rules for total and current spending is slight. It confirms the debt stabilising effect of both spending and taxes budget. We do not find a direct impact of current or interest spending on the underground economy. Taxation still has a sizeable positive impact: higher average taxation levels have strong positive substitution effects towards the underground sector. Hence, the debt stabilising impact of tax rises for paying interest on outstanding debt creates more underground activity.

This basic mechanism is confirmed for most budget categories too, with two major qualifications. First, despite the rise in debt, most spending items have continued to grow. Second, manoeuvres on some spending items can produce positive effects on the underground economy.

A complementary reduction in state capture by slashing public consumption, subsidies or investment would not produce large effects. Public consumption has continued to expand. The reaction of taxes has been sufficiently large to contain debt. But the consequence is a sizeable tax effect on the underground economy. Therefore, there is no trade-off as tax cuts cannot tackle both emergencies. A cut in government consumption would not reduce underground activity, however.

Similarly, government subsidies have not been cut with rising debt. The tax rule shows that, at the same time, revenues have not been raised sufficiently to pay off debt. It is less obvious to explain the direct negative impact of subsidies on underground GDP. The state capture hypothesis would predict a positive sign of increased subsidies. It is likely that subsidies, over the last decade, have become i) less tailor-made to specific interest groups and/or ii) more conditional to the regular status of the recipient. As the effect is economically small, we conclude that the state capture effect of fiscal policy on underground activity can be ignored.

In contrast, cuts in government investment would not only contribute to the consolidation of debt, but can directly reduce the underground economy as well. The size of this state capture effect of investment is not large, however. If the economic benefits were large, lobbies would probably have fought stronger to maintain investment spending at a high level. The complementary substitution response to tax revenues doubles in this case.²⁰

A reduction in some major budget categories is a more effective tool. Social transfers have been increasing substantially and outpaced by far the evolution in debt. Increases in tax revenues did not compensate for this rise in

²⁰ An additional 1.76% of revenues are foregone after a 1% tax hike.

spending. Transfers are among the predominant causes of the debt problem in Italy. The best strategy for the government to combat underground activity is not a reduction in taxes, however. This would further worsen the debt problem. But there is an alternative option to tax hikes, as there is an additional direct effect of transfers on the underground economy. Less social transfers reduce the possibility of engaging in irregular activity. The substitution effect outweighs the income effect. The marginal effect is rather small, but given the size of public spending, a reduction would still be economically relevant.

The effects of spending on public employment are slightly different. Total wage spending has not reacted in an economically significant way to the increase in public debt. Tax revenues have risen sufficiently to keep debt on a stable path, however. As a consequence, taxation has the standard positive effect on the underground economy. The substitution effect is slightly larger than in other models, and implies the loss of about 2.00% in additional tax revenues. Tax reduction would be an option, especially if in addition public employment spending is cut. Moreover, the impact of a cut in wage spending is economically very relevant.

The government could consolidate wage spending either along the intensive margin (by reducing wages) or the extensive margin (by reducing staff). We find that a cut in the number of public employees (in FTE units) would be especially effective. A reduction in staff would complement the substitution effects of a tax cut, and tackle both the debt and underground emergency.²¹ This contradicts and better qualifies our previous result that the government is an employer of last resort. The absorption of potential underground workers into legal public employment does not seem to work once its implications on public debt are taken into account.

Cuts in the per capita wage would be much less effective in prompting a return to regular activity. Wage increases have been important in driving the rising wage costs for the Italian government. This burden on the budget could only be offset with tax hikes. Tax increases would stabilise the debt burden but not the underground economy. An accompanying reduction in public wages would have smaller effects than a reduction in FTE units.

²¹ This result continues to hold if we express public employment as a share in total employment.

4.5 Some robustness checks

The effect of unsustainable debt dynamics on the standard substitution effect of taxation and the direct impact of social transfers and wage spending are robust to different specifications of the econometric model.

Our results may overstate the substitution effect of taxes if we scale the budget series on total GDP. In practice, taxes are levied on regular GDP only.²² We find similar effects for taxation as well as spending in this specification (Table 7). The substitution effect of taxes are only slightly smaller than in Table 6.

Tab. 7 System 3SLS estimates, fiscal spending and tax rule, and underground economy. Variables are scaled to regular output

	β_3	β_2	β_1	\bar{R}^2	dw	Var.	Skew.	Kurt.	JB	LB(1)	LM (1)	AR(1)	ARCH	
[3a]	0.87***	1.00**	-0.05***	0.90	2.45	2.20	0.06	0.01	0.00	0.34	0.00	0.40	0.93	
	γ_3	γ_2	γ_1											
[3b]	0.58***	0.48	0.06	0.94	1.66	2.02	0.40	0.74	0.62	0.85	0.07	0.87	0.61	
	ψ_1	ψ_2	ψ_3											
[1a]	0.67***	0.18	0.99***	0.74	0.59	32.45	0.73	0.74	0.67	0.00	0.00	0.00	0.02	
	J test			$\rho_{g,t}$	$\rho_{g,u}$	$\rho_{u,t}$								
				0.99	0.59	-0.39	-0.61							

Notes: see Table 4.

We consider one particular extension to these results. Monetary developments have been of major importance for economic conditions in Italy. Over the sample period 1980-2004, the Banca d'Italia can be considered as an independent policy maker that is effectively split from the Treasury. Monetary policy can be characterised over this period by a gradual convergence to the rest of Europe. Even if its participation in the European Monetary System abruptly ended in the 1992 crisis, interest rates and inflation came down towards the start of the EMU in 1999. This may have imposed additional constraints on the government in combating the underground economy.

Cuts in spending or tax hikes can be avoided if the government instead pressures the central bank to loosen policy. This tackles both emergencies at once. First, low interest rates have a double impact on real interest payments

²² In fact, irregular incomes can not avoid paying indirect taxes and, in general, there are many feedbacks from underground to regular activity.

on public debt. First, newly issued bonds can be placed at lower rates and thus reduce the total deficit. Second, if low rates fuel inflation, the real value of outstanding debt erodes. These effects are even more pronounced if the government directly monetises debt. Loose monetary policy also has an effect on the underground economy. The ensuing increase in inflation acts as a direct tax on the underground economy (Ercolani, 2000; Caballe and Panades, 2004). As the underground sector mainly use cash balances, higher inflation leads to a more balanced taxation of both the regular and underground sector (Ercolani, 2000). In order to avoid adverse dynamics in debt and the underground economy, monetary policy should not be tight.

Micro founded DSGE models with optimizing agents and sticky prices, have mainly been used for the study of monetary policy. In order to close these dynamic models, it is necessary to specify some monetary rule that has the policy instrument of the central bank being set in response to inflation and output (Woodford, 2003). We check if our baseline results are robust to the inclusion of a monetary rule. We take a common specification: we estimate an interest rate rule by which the central bank looks to future inflation developments and the current economic outlook. In addition, there is some persistence in the interest rate. We thus have a rule like [4]:

$$i_t = \phi_0 + \phi_1 i_{t-1} + \phi_2 \pi_{t+1} + \phi_3 y_t + \varepsilon_t^m \quad [4]$$

This monetary rule performs remarkably well in tracking the evolution of Italian short term interest rates (Tables 8-9). Monetary policy did not satisfy the Taylor principle as the response to inflation is rather weak. The reaction to the

Tab. 8 System 3SLS estimates, fiscal surplus rule, monetary rule and underground economy

	ϕ_1	ϕ_2	ϕ_3	\bar{R}^2	dw	Var.	Skew.	Kurt.	JB	LB(1)	LM (1)	AR(1)	ARCH
[4]	1.07***	0.18	0.77***	0.97	2.25	1.14	0.09	0.26	0.08	0.03	0.00	0.04	0.04
	α_3	α_2	α_1										
[2b]	0.87***	-0.20	0.06***	0.95	2.69	1.14	0.09	0.26	0.08	0.03	0.00	0.04	0.04
	ψ_1	ψ_4											
[1b]	0.66***	0.80***		0.80	0.57	24.55	0.84	0.81	0.94	0.00	0.00	0.00	0.03
				J test	$\rho_{m,s}$	$\rho_{m,u}$	$\rho_{u,s}$						
				0.99	0.09	-0.15	-0.13						

Notes: see Table 4.

Tab. 9 System 3SLS estimates, fiscal spending and tax rule, monetary rule and underground economy

	ϕ_1	ϕ_2	ϕ_3	\bar{R}^2	dw	Var.	Skew.	Kurt.	JB	LB(1)	LM (1)	AR(1)	ARCH
[4]	0.98***	0.29***	0.65***	0.98	2.25	1.09	0.01	0.03	0.00	0.44	0.00	0.48	0.67
	β_3	β_2	β_1										
[3a]	0.95***	0.40***	-0.06***	0.92	2.45	1.09	0.84	0.52	0.74	0.20	0.00	0.24	0.87
	γ_3	γ_2	γ_1										
[3b]	0.67***	0.15	0.04	0.94	1.87	1.25	0.28	0.54	0.40	0.89	0.00	0.90	0.10
	ψ_1	ψ_2	ψ_3										
[1a]	0.70***	0.02	0.91***	0.82	0.69	25.02	0.57	0.42	0.53	0.00	0.00	0.00	0.17
	J test			$\rho_{m,g}$	$\rho_{m,t}$	$\rho_{m,u}$	$\rho_{g,t}$	$\rho_{g,u}$	$\rho_{t,u}$				
				0.99	-0.05	0.04	-0.10	0.52	-0.42	-0.54			

Notes: see Table 4.

output gap is much stronger instead. There are no major implications of monetary policy on the path of fiscal variables, and hence for the underground economy, in our model. We confirm the results of the analysis for the real development of the regular and underground economy. The (positive) tax substitution effect is more moderate: a 1% tax rise has a less than proportional impact on the underground economy.

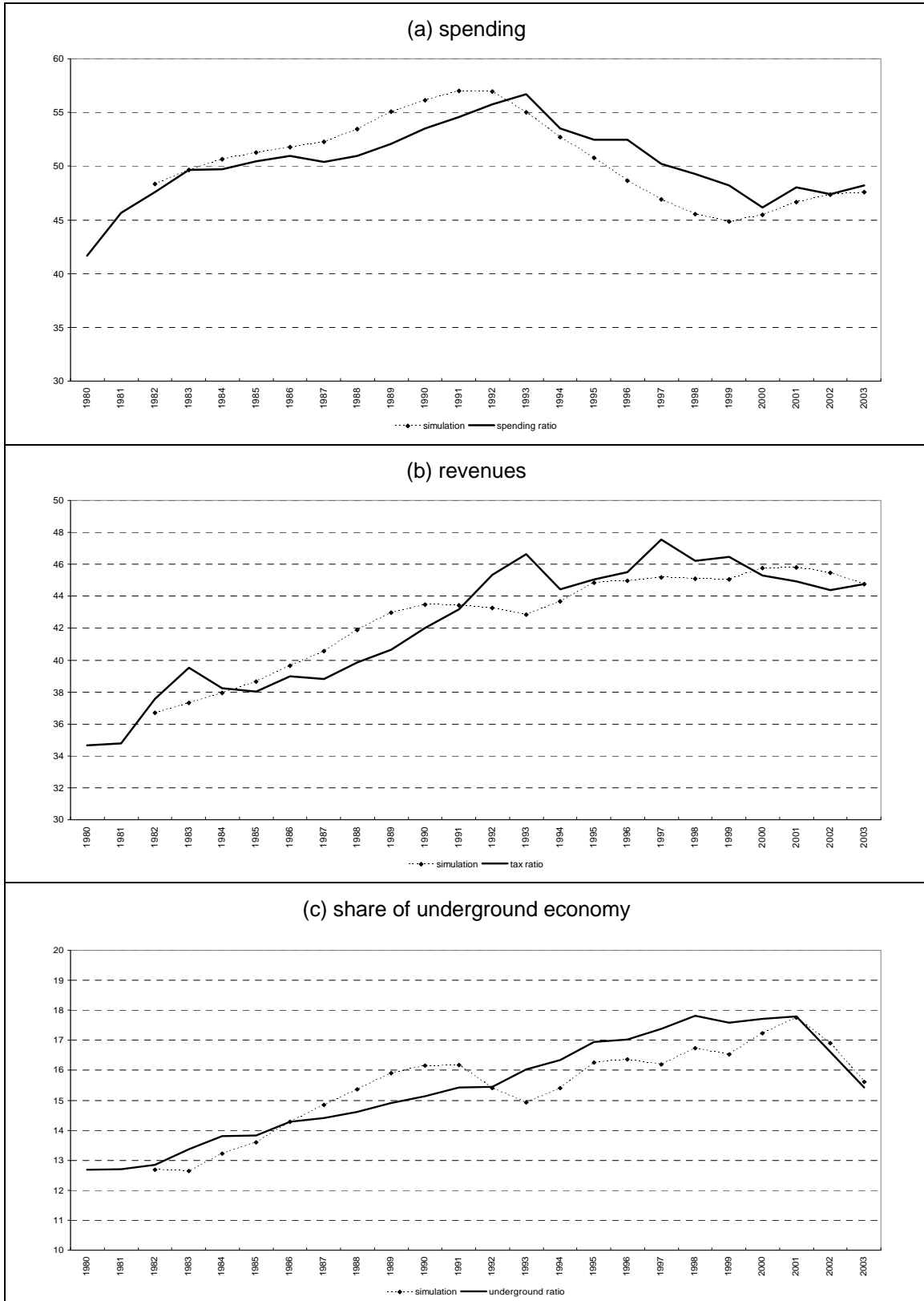
5 ITALY IN THE 80s AND 90s: SOME COUNTERFACTUALS

One way to perform experiments and have an idea of how policymakers behave and the relative response of the economic system is to dynamically simulate the econometric model of section 4. We consider a few counterfactual scenarios to see how the Italian economy, and in particular its irregular sector, would have behaved if the fiscal authorities do not deviate from their systematic behaviour.

The first step in the counterfactual simulation is to set up a base from which the effect of the counterfactual policy can be assessed. The baseline is the result of a simulation made consistent with history by adding back single-equation residuals, so that the actual values of the endogenous variables are replicated. The counterfactual scenario then derives from a dynamic simulation in which the policy shocks are set to zero. The comparison between actual and simulated series then provides for an assessment of the behaviour of the irregular sector.

Fig. 6

Counterfactual scenarios
 (series in % GDP) (full line = series; dashed line = simulation)



We simulate the model for an underground economy with both a spending and tax rule. The results are reported in Figure 6. Italian public finances have seen some strong shifts, especially on the expenditure side of the public budget. Actually, the deviations on the spending side of the budget are much determined by the size of public debt. Over the eighties, lower public debt would have left some more leeway to policymakers to adjust spending. However, overall tax revenues were not sufficient to cover expenditure. In contrast, after the explosion of public debt, consolidation has in first instance taken place on the spending side. There has been a reduction of about 7% of GDP since 1993. At the same time, tax revenues have been larger than predicted, especially at the (euro) tax hike of 1997. However, given the small size of tax increases, fiscal policy remains rather lax. Figure 6 also shows that in the aftermath of the adoption of the euro, the Italian fiscal policymakers reduced the gap with expected behaviour. The efforts to further consolidate seem to have tapered off on both the spending and revenue side in recent years.

What about the underground sector dynamics? Figure 6 displays the effect on the share of the underground economy in total GDP. Given the large significant impact of taxation, deviations in revenues are the main driver behind this result. Had tax revenues been sufficiently increased over the eighties, the underground economy would have been substantially larger in that period. In contrast, deviations from the systematic pattern of the tax burden induced a shift to the underground economy in the nineties. The consolidation of debt, and the consequent strong reduction of interest payments, has helped in reducing the tax pressure on the underground economy. In recent years, the Italian government has increased spending again, without paying attention to adequate tax measures to contain debt.

6 CONCLUDING REMARKS

The size of public debt and the underground sector are two major policy problems for Italian policymakers. The two phenomena are closely intertwined. The interaction between the underground economy and government actions is rather complex and inherently dynamic. Higher levels of taxation usually make tax payers quit to the underground sector. But a high debt requires fiscal adjustments. Tax increases undermine tax bases in the regular economy and set off adverse debt dynamics. Tax cuts are only possible if debt is consolidated. Cuts in specific spending items may complement the effect of tax cuts.

We analyse a dynamic system of both the underground sector and fiscal variables. Sustainability of public debt is examined through spending and tax rules. The main insight is that higher taxes lead to a shift to the underground sector. Tax hikes that boost the underground economy hollow out the tax base to pay off debt. This can potentially lead to adverse dynamics in funding the government budget. The government cannot choose lower taxes at the cost of higher deficits, however. Increased government spending requires future tax rises to keep the budget in balance and has therefore an indirect impact on the underground economy. Hence, budget control is necessary to keep both public debt and the underground economy in check. Tax cuts always require offsetting measures on the spending side of the budget. A reduction in spending is particularly adequate as it reduces both the underground economy and public debt. Spending variables have a limited direct impact on the underground sector. There is little evidence of state capture at the aggregate level. But the Italian government could use other tools to combat the underground sector and the debt problem. Cuts in social transfers and public employment could play an important role in fostering regular activity.

The empirical model discussed in this paper corresponds to a DSGE model of the underground economy and fiscal policy. The empirical verification of DSGE models has been limited to assessing the effects of monetary or fiscal policy on regular GDP. Our results suggest that these models would need an extension in three different ways to account for underground activity. First, two-sector models can be used to analyze determinacy of the economy and public finances. Second, this requires some intertemporal budget imbalance. Such a DSGE model further requires a specific transmission channel of fiscal variables, mainly on the labour market.

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