

Response to Referee Reports on:

Hidden Economies and the Socially Optimal Fiscal-Tax to Liquidity-Tax Ratio.

By Marco Ercolani

Firstly, my thanks go to the referees for their constructive comments. I have responded to both referees in one document in order to avoid any overlaps and undertake consistent responses. I hope this is satisfactory, all responses are open-access so this violates no issues of confidentiality. I will re-state the referees' concerns by identifying them as *Referee Canavese* and *Anonymous Referee*.

As both referees point out, the revisions are substantial. Although I can carry out these revisions, I don't believe I can complete these by the assigned associate editor's own deadline of May 4th, 2007. I have therefore first outlined herein all the corrections I will undertake and hope these will help the associate editor with the decision making process. I am now undertaking those corrections on the actual paper and could incorporate any further responses to this document as they emerge.

General Comments.

Comments on the exogeneity of the hidden economy and first/second/best outcomes.

Referee Canavese: "i) The closed economy model assumes the relative size of the shadow economy as exogenously given ... taxes. So, at least a part of the data used in the empirical test of the paper assumes exogenous what is endogenous in theory and vice versa. This point should be addressed by the author."

Anonymous Referee: "1. Considering the theoretical approach, I have one big problem: Does the author assume his model is in a "first best" world ... The author should really solve this problem and model government behaviour in a second best or third best world."

Response: The anonymous Referee points out that the current model is in a "third best" world because the hidden economy share is taken as entirely exogenous and referee Canavese points out that under even modest assumptions the hidden economy is not exogenous of the fiscal tax nor the liquidity tax hence leading to a "second best" world.

I need to be clearer about the fact that the model has been initially set up assuming a "third best" world and should at least justify this on the basis of constraints facing the Government as "benevolent dictator". These costs include the inability to gather information on the activities of all its citizens (i.e. the tax evaders) and the issue of some activities (such as religion or charities) being beyond the reach of the tax authorities.

I also need to add a section with extension that directly adds at least some degree of endogeneity for the hidden economy share h , thus extending this to a "second best". To allow for cancellation effects I have actually used a different definition of h to that of referee Canavese, I should make this clearer in my paper. Using the notation of referee Canavese, he defines the hidden economy share h as the ratio of hidden output Y_H to registered output Y_R :

$$h^* = \frac{Y_H}{Y_R}$$

In my paper the hidden economy share is defined as the ratio of hidden output to total output Y_T :

$$h = \frac{Y_H}{Y_T} \tag{1}$$

The consequence of this is that, assuming the various elasticities in the two sectors are the same,

many of the terms cancel out, including the liquidity tax rate i . However, as referee Canavese points out, the fiscal tax rate τ does not cancel out. Assume the following currency demand (C_T, C_H, C_R) equations hold:

$$C_T = C_H + C_R \quad (2)$$

$$C_T = A(1 + \tau)^\alpha Y_R^\beta e^{-\delta i} \quad (3)$$

$$C_R = AY_R^\beta e^{-\delta i} \quad (4)$$

where i is the liquidity tax rate and A, α, β and δ are parameters and assume the following identity holds in each sector:

$$Y_{T,H,R} = v C_{T,H,R} \quad (5)$$

where v is the velocity of circulation. Substituting equations (2) and (5) into equation (1) gives:

$$h = \frac{vC_H}{vC_T} = \frac{v(C_T - C_R)}{vC_T} = 1 - \frac{C_R}{C_T} \quad (6)$$

Substituting equations (3) and (4) into (6)

$$h = 1 - \frac{AY_R^\beta e^{-\delta i}}{A(1 + \tau)^\alpha Y_R^\beta e^{-\delta i}} = 1 - \frac{1}{(1 + \tau)^\alpha} \quad (7)$$

This represents a second-best solution with h endogenized, note that the i cancels out but the fiscal tax rate τ does not cancel out. The comparative static suggests that an increase in the fiscal tax rate is associated with an increase in the hidden economy share:

$$\frac{\partial h}{\partial \tau} = \frac{\alpha}{(1 + \tau)^{\alpha+1}} > 0$$

Equation (1) also holds further implications for the empirical section. I need to re-check the definition of the hidden economy share h in the various sources. If h is defined as in equation (1), then the data are fine. However, if the data sources define the alternative

$$h^* = \frac{Y_H}{Y_R} \quad (*)$$

then, the equation (1) definition has to be retrieved using:

$$h = h^*/(1+h^*)$$

Corrections to the empirical section:

Referee Canavese: “ii) Part of the data used in the empirical test is inaccurate. Data for the size of the Argentine shadow economy comes from Ahumada, Canavese and Alvaredo (2001). The main purpose of that paper is not to measure the size of the Argentine shadow economy but to point out that, in many cases, the use of the monetary method is not accurately applied and to suggest a way to correct wrong estimates. Estimations are correct only when the transactions elasticity of the demand for cash is one. ... This problem may be present for other countries and incorrect estimations should be corrected to use the data in the test.”

Response: Obviously, I need to check the validity of the data sources and verify, or rectify, those cases where the transaction elasticity of the demand for cash is not one.

Anonymous Referee: “2. Empirical analysis: From the econometric standpoint the empirical analysis is well done. However I have several problems interpreting the empirical regressions in tables 2-5. First, what is really missing is that the author writes down the test equation and derives the signs of the independent variables in his test equation. Third, what is much more problematic in the test

equation is that in all test equations the only “valid” independent variable is the size of the shadow economy. To this the author adds a transition dummy variable and a time trend which are all artificial variables. Why did the author not include other independent variables like wage pressure, like GDP per capita or growth rate of GDP or the export/import ratio or the openness of a country? There are number of variables which should play a role in explaining either the liquidity-tax to fiscal-tax ratio or the tax to inflation ratio. I think the author really heavily violates the ceteris paribus conditions just including only the shadow economy as the only “valid” independent variable. The author should explain this and should at least show some results, if other important variable are included here, too.”

Response: The trend and the dummies are obviously unsatisfactory in capturing regional differences. Rather than use trends and dummies, I should source other economic measures. These may include:

- Wage pressure as measured by GDP/Population or GDP/Workforce.
- GDP growth rates.
- Measures of openness such as Exports/Imports or Exports/GDP.

The likely data source will be the World Bank’s World Development Indicators. The main issue being to gather whichever indicators cover all countries for which the hidden economy share is available. The appendix in the paper does contain Tables 7-10, where regressions that include measures of Corruption¹ and Development² are included. Belarus, Croatia and Slovenia are excluded from these regressions because these data do not extend to these countries. Perhaps Tables 7-10 should be brought into the main text along with any additional regressions resulting from the Anonymous Referee’s comments.

Anonymous Referee: “3. Time trend variable: The time trend variable is always highly statistically significant and has a sizeable positive coefficient. Why did the author not use lagged endogenous variables avoiding the problem that he regresses on the dependant variables (a ratio) a time trend, which does not make so much sense. The authors should here try the lagged dependent variable or a more advanced autoregressive structure.”

Response: Tables 3 and 5 do contain dynamic econometric specifications with AR(1) residuals. These AR(1) residuals $u_t = \rho u_{t-1} + \varepsilon_t$ can be interpreted as a lag of the structural equation: $u_{t-1} = y_{t-1} - \hat{\beta}X_{t-1}$ hence the AR(1) can be interpreted as:

$$y_t = \hat{\beta}X_t + \rho (y_{t-1} - \hat{\beta}X_{t-1}) + \varepsilon_t$$

These allow for dynamics without overcomplicating the structural equation, they also give an indication of the magnitude of the autoregressive parameter. It is true that the time trends are still significant in these dynamic equations but these may become less important once the *Anonymous Referee*’s comment 2 is implemented.

Anonymous Referee: “4. Missing interpretation of the regression results: What is totally missing is a good interpretation of the regression results, especially how quantitatively important the size and development of the shadow economy is.”

Response: Though comments were kept to a minimum, in order to keep the paper as short as possible, it is true that some more interpretation is needed. A short discussion on the magnitude of

¹ Taken from the International Country Risk Guide produced by Political Risk Services

² Annual real income in thousands of 1995 US Dollars per capita. Source: World Bank, World Development Indicators.

the hidden economy and whether it is increasing/decreasing should be added toward the start in section 2.2. Interpretation of the results has been restricted to the implied elasticity of the inflation to fiscal tax ratios to changes in the hidden economy share. Some more interpretation should be given to the importance on the ρ parameter on the autoregressive errors and the diagnostic statistics.

The problem of Currency-Substitution.

Referee Canavese: “iii) Conclusions should be judicious. The author says “... estimates based on a diverse sample of 36 countries suggests that the elasticity of the tax ratio with respect to the hidden economy share is close to minus one. The data also suggests that this issue on formulating the optimal tax mix is particularly relevant for developing and transition economies given their relative large hidden economy shares” (page 20). The whole theoretical analysis is performed within a closed economy model and so the currency substitution phenomenon is ignored. Many hidden transactions in developing and transition economies are financed with foreign currencies (mainly US dollars). Any rise in the liquidity-tax may only induce a substitution of domestic cash for dollar bills without any increase in the collection of seignorage. The author should try to modify the theoretical model to open it to be able to include transactions made in a foreign currency. This point is important to evaluate if the paper is relevant at all. 4-Conclusion. The paper is not ready for publication and I doubt whether the subject is relevant at all if the currency substitution phenomenon is not duly addressed. ”

Response: This is by far the most challenging of the referees’ requests. It is true that during the period under analysis, currency substitution with the US dollar was an important issue in Soviet-Block and Latin-American countries. However, in a comprehensive model, the net effect of currency substitution on the tax-mix may be ambiguous. If we extend the theoretical model to include currency substitution we should also extend the theoretical model to the possibility that hidden economic activity may be more cash-constrained because it may have poorer access to legitimate banking services. So, currency substitution will make the inflation tax a less effective policy instrument while the cash-constraints will make the inflation tax a more effective policy instrument. The net effect will depend on the relative importance of these two effects in each country. If the answer is an empirical one, we then need access to measures of currency-substitution and relative cash-constraints in the registered and hidden sectors but these data are not readily, if at all, available. The currency-effect issue is therefore an issue that needs, not just this paper, but an entire research programme for it to be addressed satisfactorily. I therefore humbly ask if the referee would be satisfied with the addition of a subsection discussing the issues surrounding currency-substitution, the related bibliography and recommended directions for future research.

Specific Comments from Referee Canavese.

i) The very first equation of the paper (equation (1)) is wrong. ...

Response: The referee is right, equation (1) needs to be corrected with the re-introduction of D^* , as presented in Phelps (1973, eq. 10).

ii) Definitions should be consistent. In equation (11) wealth does not include the capital stock but in equation (16) it does include the capital stock.

Response: Equations (11) and (16) are specified correctly but the descriptions are incorrect.

Equations (11) and (16) correspond exactly to equations (21) and (26) in Phelps (1973). W in equation (16) is “real net spendable [i.e. disposable] wealth (real marketable net worth)” Phelps (1973, p73). Δ in equation (11) is the real value of accumulated Government Debt:

$$\Delta = \frac{D}{p} = \frac{D^* + M}{p}$$

where D^* is the public debt held by the private sector and M is money in circulation. The descriptions of equations (11) and (16) must therefore be corrected and clarified.

i) Notation should be consistent. In the model π denotes inflation while p is inflation in the empirical test and it denoted the price level in the model.

Response: The notation in the empirical section needs to be corrected.

ii) The paper should be written with care. In page 2 it reads “This survey is therefore proceeds along.....” In page 12 it reads “...the inflation rate is rate is only 0.009...” In page 17 it reads “... redundant because perfectly collinear...” In page 19 it reads “...the statistical significance of does drop in most cases.”

Response: All these grammatical errors must be corrected.