

## QUANTIFYING THE BLACK ECONOMY: 'MEASUREMENT WITHOUT THEORY' YET AGAIN?

*Jim Thomas*

In a review article criticising Arthur Burns, Wesley Mitchell (Burns and Mitchell, 1946) and the methodology of the National Bureau of Economic Research (NBER) for excessive empiricism, Tjalling Koopmans (1947) coined the phrase 'measurement without theory' to characterise an approach in which

The various choices as to what to 'look for', what economic phenomena to observe, and what measures to define and compute, are made with a minimum of assistance from theoretical conceptions or hypotheses regarding the nature of the economic processes by which the variables studied are generated. (p. 161)

I shall argue that 'measurement without theory' is a fair description of the published empirical work aimed at guestimating the size of the 'hidden' or 'black economy'.<sup>1</sup> I shall also argue that a mere guestimate of the overall size of the black economy is of limited value for the policy maker; it is also important to know who is doing what, where, how and why. Then we can see what should and/or can be done about legislating for or against the black economy.

In assessing the various attempts to measure the size of the black economy, one should also be aware of a political dimension to some of this work. Perhaps a large and growing black economy is an indication that the economy is over-taxed and over-regulated and a neo-liberal adjustment is needed to free it up? If a large part of the black economy is social security fraud, then maybe unemployment is not really as bad as it looks? Clearly such political conclusions depended on having good theoretical as well as sound quantitative foundations and both these components were generally missing.

### **1. Does the Absolute Size of the Black Economy Matter?**

A large number of economists have sought to estimate the size of the black economy, but often without giving any explicit reasons for why this exercise is worth undertaking. It seems that a large black economy is 'a bad thing', as it may undermine people's willingness to pay taxes and a government's ignorance of the size of the black economy may lead to the imposition of incorrect

<sup>1</sup> There is no agreement over what to call the phenomenon under discussion and adjectives range through 'black', 'hidden', 'subterranean', 'underground' and many more (see Thomas, 1992, Chapter 6). For reasons that should become clear as this article progresses, I have chosen the term 'black economy'.

macroeconomic policies. However, how large is large? What is important, the absolute level of the black economy, its relative size or its rate of change over time? Suppose that a committee of wise and learned economists, after much thought and consultation, informs the government that in their collective judgement the size of the black economy in the United Kingdom in 1998 corresponds to 12.56% of GNP? What should the government do? Should it behave differently if the estimate were 22.56%? Without a theoretical framework, we have no way to answer these questions.<sup>2</sup>

## 2. Heroic Assumptions and Magic Numbers

There have been a number of approaches to the estimation of the size of the black economy that are not based on any economic theory, but which rely on heroic assumptions to justify the manipulation of certain numbers.

### 2.1. *Differences between National Income and National Expenditure*

On the assumption that while those working in the black economy may be able to hide their incomes from the taxperson, it is not possible for them to hide their expenditures, it has been suggested that the difference between estimates of National Expenditure and National Income should be used as a estimate of the size of the black economy.

Unfortunately, there are a number of problems with this approach. First, the assumption that the estimates of National Expenditure and National Income are constructed so that they are statistically independent is not generally true and the totals are a compromise with the same components being included in both. Second, while it is true that National Expenditure estimates are often larger than those of National Income, this is not always the case. In Switzerland National Income tended to be larger than National Expenditure, implying a *negative* black economy. Clearly Calvin's influence lives on!

### 2.2. *The Cash-Deposit Ratio*

While Cagan (1958) is generally credited with this idea, recent work on the black economy can be traced back to Gutmann (1977). The computations are based on three heroic assumptions. First, a year (or quarter, depending on the available data!) must be identified in which the black economy did not exist. Secondly, transactions in the black economy are carried out exclusively using cash. Finally, the velocity of circulation of cash is the same in both the non-black and black economies.

Given these assumptions, the method works as follows:

<sup>2</sup> At the microeconomic level, there has been a good deal of theoretical analysis of tax evasion (see Cowell (1990) and Pyle (1989)), but this is rarely utilised in empirical analysis of the black economy.

1. Let  $M$  denote the quantity of money, composed of cash,  $C$ , and deposits,  $D$ , so that  $M = C + D$ . A year is chosen in which it is assumed the black economy did not exist and all currency was demanded for legitimate transactions. Call this year 0, calculate  $(C/D)_0$  and denote this ratio as  $\lambda$ .
2. It is assumed that in the absence of the black economy, the cash-to-deposit ratio would continue to be  $\lambda$ , so the amount of cash demanded in the non-black economy in some other year  $t$ ,  $C_{NBt}$ , may be calculated as  $C_{NBt} = \lambda D_t$ .
3. If  $C_t$  is the total amount of cash in year  $t$ , the amount of cash being used in the black economy,  $C_{Bt}$ , is derived as the excess of total cash over the amount demanded in the non-black economy, i.e.  $C_{Bt} = C_t - C_{NBt}$ .
4. National income,  $Y$ , is used to measure income in the non-black economy and, given the quantity of money used in the non-black economy is  $M_{NB} = C_{NBt} + D$ , the velocity of money with respect to non-black economy income in year  $t$  is  $V_t = Y/(C_{NBt} + D)$ .
5. Finally, assuming the velocity of cash in the black economy is the same as the velocity of money in the non-black economy, an estimate of the size of the black economy is obtained as  $Y_{Bt} = V_t C_{Bt}$ .

Of the three heroic assumptions, the most questionable is the first. Was there ever a year in any society when hidden economic activities were not being undertaken? Perhaps in the Garden of Eden, but even there we do not know what else the Serpent got up to!

One must also question the logical implications of the cash-only assumption. Given they have to hide their activities, can those working in the black economy launder money into savings in conventional interest bearing financial assets without attracting attention? If not, then some of their stock of money will constitute their savings and should not be included in the multiplier calculations to guesstimate the size of the black economy. This would lower the actual size of the black economy. However, there is evidence against the assumption that only cash is used in the black economy (see Windebank and Williams, 1997).<sup>3</sup>

### 3. Regression to the Mean(ingful?)

Some progress in methodology was achieved with the introduction of regression analysis into the search for the size of the black economy. This meant that more explicit models could be specified and at least some assumptions tested. However, the application has not been noticeable for the rigorous use of

<sup>3</sup> Feige (1979, 1980, 1981 and 1989) developed an alternative monetary guesstimate of the size of the black economy based on money transactions, but otherwise used the same heroic assumptions as Gutmann. Feige's method produced much larger guesstimates than that of Gutmann. However, Boeschoten and Fase (1984) suggested that in the case of the Netherlands a possible explanation lay in the fact that Feige included in his measure of transactions a number of transfers, such as contributions to social security and pension funds, that were clearly not part of the black economy.

economic theory in developing the models used and the same heroic assumptions need to be made.

Following on from the work of Cagan (1958), Tanzi (1983) proposed the following regression equation to estimate the size of the black economy in the United States on the assumption that people worked there to avoid paying taxes:

$$\ln(C/M2)_t = \beta_0 + \beta_1 \ln(1 + TW)_t + \beta_2 \ln(WS/Y)_t + \beta_3 \ln R_t \\ + \beta_4 \ln(Y/N)_t + u_t,$$

where  $\ln$  denotes natural logarithms,  $C/M2$  is the ratio of cash holdings to Current and Deposit Accounts,  $TW$  is a weighted average tax rate (to proxy changes in the size of the black economy),  $WS/Y$  is the proportion of wages and salaries in national income (to capture changing payment and money holding patterns),  $R$  is the interest paid on time and savings deposits (to capture the opportunity cost of holding cash) and  $Y/N$  is *per capita* income.

Well, maybe, but where is the underlying economic theory? What other variables may have been excluded? What has this really got to do with the black economy?

Others followed down the regression route with fancier equations, but with no more economic theory to justify their equations (see, for example, Matthews (1983), Matthews and Rastogi (1985)<sup>4</sup> and Schneider (1997)<sup>5</sup>).

Moreover, the level of the econometric analysis in these studies was rather basic and further statistical analysis and the results of diagnostic tests cast some doubt over the validity of the original results.<sup>6</sup>

#### 4. The Darker Side of Diagnostics

Most economists would interpret Ramsey's RESET Test as a diagnostic test of the functional form of a regression equation. In order to see whether the equation

$$y = \mathbf{X}\beta + u \tag{i}$$

represents an adequate specification, against an alternative hypothesis that higher powers of the variables in  $\mathbf{X}$  need to be included, Ramsey (1969)

<sup>4</sup> The article by Matthews and Rastogi is an interesting example of the political dimension of the hunt for the black economy. Having guesstimated the size of the black economy for the United Kingdom, they then make the heroic assumption that only those who are officially unemployed are working *full-time* in the black economy. The result of their calculation is that 1,290,000 (41.6%) of the reported unemployed were made to disappear 'at a stroke' of a computer key or by horsing around with a mouse.

<sup>5</sup> This study is of interest as it attempts to analyse changes in the size of the 'hidden economy' through four specific effects: the burden of direct taxes, the burden of indirect taxes, the complexity of the tax system and the intensity of state regulation.

<sup>6</sup> For example, Thomas (1986) in re-estimating Tanzi's model for the period 1930–1980 found evidence of a structural break in 1945 and that the tax variables were statistically *insignificant* between 1946 and 1980. Smith (1986, pp. 102–6) presented evidence to suggest that the model of Matthews and Rastogi was mis-specified.

proposed a portmanteau test. Equation (i) is estimated and, denoting the vector of fitted values as  $\hat{y}$ , a matrix of new variables  $\mathbf{Z} = [\hat{y}^2 \ \hat{y}^3 \ \dots \ \hat{y}^m]$  is generated. An auxiliary regression equation

$$y = \mathbf{X}\boldsymbol{\beta} + \mathbf{Z}\boldsymbol{\gamma} + v \quad (\text{ii})$$

is estimated and the hypothesis  $H_0: \boldsymbol{\gamma} = \mathbf{0}$  is tested. If the hypothesis is rejected, this is taken as evidence against the functional form, but the variables in  $\mathbf{z}$  are not interpreted as having any significant economic meaning; they merely indicate the presence of mis-specification, the cause of which needs to be sought elsewhere.

However, Bhattacharyya (1990) suggested there was a darker side to diagnostic testing: by effectively relating  $\mathbf{z}$  to the black economy. Under the heroic assumption that there was no functional mis-specification in his specification of the demand for currency in the recorded (i.e. non-black economy), he argued that the mis-specification was due to the exclusion of the black economy and that a modified form of Ramsey's Reset Test could be interpreted as an estimate of the size of the black economy.

This is ingenious, but what economic theory underlies the model used in the estimation? In Bhattacharyya's notation, the total demand for currency,  $M_t$ , is

$$M_t = M_{Rt} + M_{URt}, \quad (1)$$

where  $R$  and  $UR$  denote the recorded and unrecorded sectors of the economy. The demand for currency in the recorded sector is a conventional constant-elasticity equation with a multiplicative error term

$$M_{Rt} = \alpha_1 Y_{Rt}^{\beta_1} R_t^{\beta_2} P_t^{\beta_3} e^{F(L)ut}, \quad (2)$$

where  $Y_{Rt}$  is a recorded income variable,  $R_t$  is a short-term interest rate,  $P_t$  is the retail price index and the polynomial in the lag operator,  $F(L)$ , allows for autocorrelation in the error process.

In contrast, the demand for currency in the unrecorded sector has no intercept term and an additive error term that is free from autocorrelation. Thus

$$M_{URt} = Y_{ht}^{\beta_4} + w_t, \quad (3)$$

where  $Y_{ht}$  denotes a measure of black (hidden) economy generated within the unrecorded sector. This equation is not derived from any economic theory and the only justification provided for it is a reference to one of the maintained hypotheses that 'the unrecorded economy almost totally uses currency for transactions' (p. 704) and a footnote that '(a)ccording to our maintained hypothesis, for each pound sterling transaction in the unrecorded sector of the economy a pound sterling will be added to the unrecorded economy. The simplest way to represent this property in the equation is the specification in (3).' (p. 705, note 4). No explanation is given as to why the error term should be additive in this equation and free from autocorrelation.

The rest is mathematics. Combining (2) and (3), taking logarithms and approximating by using the linear terms of a Taylor expansion produces

$$m_t = \ln \alpha_1 + \beta_1 y_{RT} + \beta_2 r_t + \beta_3 p_t + F(L) u_t + (Y_{ht}^{\beta_4} + w_t)/F(\cdot), \quad (4)$$

where  $F(\cdot) = \alpha_1 Y_{Rt}^{\beta_1} R_t^{\beta_2} P_t^{\beta_3} e^{F(L)u_t}$  and logarithms of all capital letters are denoted by small letters. The model is estimated by non-linear least squares and yields quarterly estimates that suggest that the size of the black economy trended upward from about 3.7% of GNP in 1960 to a plateau of over 10% of GNP between 1975 and 1980 and fell thereafter to 7.6% of GNP by the end of 1984.

Bhattacharyya points out that, unlike those in (2), the elasticities in (4) will be complex functions involving all the terms in  $F(\cdot)$  except  $e^{F(L)u}$ . However, the  $\beta_j$  are the relevant elasticities for (2) and their final estimates (as reported in Table 1, p. 709) seem odd, with the interest elasticity being positive (0.0598) and the price elasticity being negative (-0.5497).

Returning to the question of the underlying economic theory, the model consists of three equations: an identity (1) and two behavioural equations (2) and (3) explaining the two endogenous variables  $M_{Rt}$  and  $M_{URt}$ . All the other variables appearing in the equations are exogenous, including  $Y_{ht}$ , the black economy variable that the model is supposed to explain! This has the unfortunate consequence that the model cannot explain why the black economy has behaved as it has: why the long period on the plateau between 1975 and 1980.1 and why the decline since 1980? The failure to develop an explicit theoretical model of the black economy means that Bhattacharyya has nothing to offer policy makers in terms of links between the black economy and its economic causes.

## 5. Ask and Ye Shall be Answered

Some readers might wonder why economists do not follow the example of other social scientists and ask questions to investigate the black economy. In part the answer lies in the fact that economists are generally very poorly trained in the art of collecting data and, as a result, they tend to be hunter-gatherers of other people's data rather producing their own data. As Reuter (1982) noted:

Economists are unique among social scientists in that they are trained only to analyse, not to collect, data. While psychologists are taught experimental techniques, sociologists learn the vagaries of interviewing, and anthropologists devote much of their training to field work, economists are provided only with the tools for data analysis. One consequence is a lack of scepticism about the quality of data. (p. 137)

As an example, consider the data presented in Matthews and Stoney (1987). Despite the boast (p. 28) that their data were obtained through a 'questionnaire-based survey with interviewer/interviewee contact conducted personally throughout (i.e. without resort to either the post or the telephone)', the interviewers failed to detect the sex of 6.3% of respondents and, given that

69.3% of respondents were apparently unwilling to reveal their marital status to the interviewers, one must question the authors' confidence in the reliability of the information provided by respondents on the more sensitive subject of illegal earnings!

In reality, the situation is more complex than Reuter suggests. While it is true that some economists are uncritical in their acceptance of statistics based on surveys, others are deeply suspicious of *all* survey data:

Whenever statistics are derived from household surveys, caution is advisable. If there are incentives to give untruthful answers, statistics which depend on these are biased. Users of such statistics, unaware of the bias, risk fallacious analysis and wrong conclusions. (Gutmann, 1985, 13–4).

While care is needed in extracting and interpreting information on sensitive issues from sample surveys, the task is not impossible and here economists have much to learn from sociologists and social anthropologists in this respect (see Thomas, 1992, chs. 8 and 9 and Lee, 1993).

## 6. Conclusions

The search for the magic number corresponding to the size of the black economy as a percentage of GNP without providing economic theories to explain the determinants and structure of the black economy has led economists into a blind alley in which the question of size has become an end in itself and more important issues are not addressed. No genuine policy conclusions emerge from the exercise, although some have been tacked on, varying according to the political persuasion of the author concerned.

This concentration on one number has led to an uncritical acceptance of any number, whether large or small, without due consideration of the corresponding *microeconomic* implications. This is what I have referred to elsewhere as '*The Fallacy of Non-Decomposition*, that is the tendency to accept large macroeconomic numbers without looking carefully at their microeconomic implications' (Thomas, 1988, p. 183).

For example, Feige (1981) presented estimates of the size of the black economy in the United Kingdom that grew from 0% of GDP in 1960 (his base year) to about 11% in 1966–9 before falling to about 8% in 1971. It then changed dramatically, growing to 22% in 1974, before falling to 14% in 1975 and fluctuating about this level from 1975 to 1979. He concludes that 'To the extent that these estimates correctly capture the time path of the unobserved sector, they suggest that the massive recession and soaring inflation recorded in the official statistics in the mid-1970s might be partially explicable in terms of a statistical illusion induced by the growth of the unobserved sector' (p. 211). He notes that 'Massive shifts between the observed and the unobserved sector which go unnoticed will give rise to governmental policies whose consequences might be different from their intent . . . Social welfare policies which do not take adequate account of the redistributive impact of a sizeable

unobserved income may well lead to less equitable rather than more equitable distribution' (p. 212).

Rather than accepting these magic numbers we should ask the obvious microeconomic questions: are we seriously expected to believe that the production of goods and services in the black economy could increase from 8% of GDP in 1971 to 22% in 1974 and then fall to 14% in 1975 *without being observed*? Where was this all happening? Who was doing it and how were they hiding their activities? What are the implications for policy makers – what should they do? Without an answer to such questions we should be sceptical and, in particular, resist the use of anecdotal evidence to support such claims.<sup>7</sup>

The earlier debate over the methodology of the NBER also stressed the importance of a policy focus, so it seems appropriate to let Koopmans (1947) have the last word in this critique of the empirical analysis of the black economy:

But the decision not to use theories of man's economic behavior, even hypothetically, limits the value to economic science and to the maker of policies of the results obtained or obtainable by the methods developed. (p. 172)<sup>8</sup>

*London School of Economics and Political Science*

## References

- Bhattacharyya, D. K. (1990), 'An econometric method of estimating the "hidden economy", United Kingdom (1960–1984): estimates and tests', *ECONOMIC JOURNAL*, vol. 100 (September), pp. 703–17.
- Boeschoten, W. C. and Fase, M. M. G. (1984), *The Volume of Payments and the Informal Economy in the Netherlands 1965–1982: an attempt at quantification*, Dordrecht: Marinus Nijhoff.
- Burns, A. F. and Mitchell, W. C. (1946), *Measuring Business Cycles*, New York: National Bureau of Economic Research, Studies in Business Cycles, No. 2.
- Cagan, P. (1958), 'The demand for currency relative to the total money supply', *Journal of Political Economy*, vol. 66(), pp. 303–28.
- Cowell, F. A. (1990), *Cheating the Government: The Economics of Evasion*, Cambridge, Mass: The MIT Press.
- Feige, E. L. (1979), 'How big is the irregular economy?', *Challenge*, vol. 12, pp. 5–13.
- Feige, E. L. (1980), 'A new perspective on macroeconomic phenomena – the theory and measurement of the unobserved sector of the US economy: causes, consequences and implications', paper presented at 93rd Annual Meeting of the American Economic Association.
- Feige, E. L. (1981), 'The UK's unobserved economy: a preliminary assessment', *Economic Affairs*, vol. 1, pp. 205–12.
- Feige, E. L. (1989), 'The meaning and measurement of the underground economy', in (E. L. Feige, ed.), *The Underground Economies: Tax Evasion and Information Distortion*, Cambridge: Cambridge University Press.

<sup>7</sup> For example, some years ago certain tabloid newspapers printed interviews with some professional beggars who claimed to have earned thousands of pounds per week by posing as poor homeless persons in Central London. These revelations were widely quoted, but nobody undertook the exercise of observing beggars in Central London to discover their average earnings per hour and how many hours per week the professionals would have had to worked to obtain their claimed earnings. Casual observation suggests beggars have more 10p pieces than £10 notes in their collecting tins, so the number of hours per week needed to earn these high incomes might well exceed 168.

<sup>8</sup> If this contribution to the debate seems overly negative, the reader should recall that, in the fairy story, the person who pointed out the Emperor's lack of apparel was not asked to suggest the name of a good tailor.

- Gutmann, P. (1977), 'The subterranean economy', *Financial Analysts Journal*, vol. 35, pp. 26–8.
- Gutmann, P. (1985), 'The subterranean economy, redux' in (W. Gaertner and A. Wenig, eds.), *The Economics of the Shadow Economy*, Berlin: Springer-Verlag.
- Koopmans, T. C. (1947), 'Measurement without theory', *Review of Economic Statistics*, vol. 29 (August), pp. 161–72.
- Lee, R. M. (1993), *Doing Research on Sensitive Topics*, London: Sage Publications.
- Matthews, K. (1983), 'National income and the black economy', *Economic Affairs*, 3, pp. 261–7.
- Matthews, K. and Rastogi, A. (1985), 'Little Mo and the moon lighters: another look at the black economy', Liverpool Research Group in Macroeconomics *Quarterly Economic Policy*, pp. 221–40.
- Matthews, K. and Stoney, P. (1987), 'The black economy: the evidence from Merseyside', Liverpool Research Group in Macroeconomics *Quarterly Economic Policy*, vol. 8(no. 2, June), pp. 26–36.
- Pyle, D. J. (1989), *Tax Evasion and the Black Economy*, London: Macmillan.
- Ramsey, J. B. (1969), 'Tests for specification errors in classical linear least-squares regression analysis', *Journal of the Royal Statistical Society Series B*, vol. 31(), pp. 350–71.
- Reuter, P. (1982), 'The irregular economy and the quality of macroeconomic statistics', in (V. Tanzi, ed.), *The Underground Economy in the United States and Abroad*, Lexington MA: Lexington Books, pp. 125–43.
- Smith, S. (1986), *Britain's Shadow Economy*, Oxford: Oxford University Press.
- Schneider, F. (1997), 'The shadow economies of Western Europe', *Economic Affairs*, (September), pp. 42–8.
- Tanzi, V. (1983), 'The underground economy in the United States: annual estimates, 1930–1980', *Staff Papers*, International Monetary Fund, vol. 30 (June), pp. 283–305.
- Thomas, J. J. (1986), 'The underground economy in the United States: a further comment on Tanzi', *Staff Papers*, International Monetary Fund, vol. 33 (December), pp. 782–9.
- Thomas, J. J. (1988), 'The politics of the black economy', *Work, Employment and Society*, vol. 2 (no. 2), pp. 169–90.
- Thomas, J. J. (1992), *Informal Economic Activity*, Hemel Hempstead: Harvester Wheatsheaf.
- Windebank, J. and Williams, C. C. (1997), 'What is to be done about the paid informal sector in the European Union? A review of some policy options', *International Planning Studies*, vol. 2 (no. 3), pp. 315–27.