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Income Tax Evasion, Inequality and Poverty

Panos Pashardes[a] * and Alexandros Polycarpou[b]

[a] *Department of Economics and Economics Research Centre, University of Cyprus, and*

[b] *Economics Research Centre, University of Cyprus*

Abstract

This paper uses a consumer demand based method to estimate the extent to which households in Cyprus under-report their income from self-employment, capital income and income from agriculture. On the basis of these estimates, the size of black economy appears to be around 7–8% of GDP. We find that income under-reporting biases measures of inequality and poverty downwards, suggesting that egalitarian and antipoverty policies need to become more generous, but also more carefully targeted to avoid false entitlement to social benefits. The high tax free income undoubtedly helps reduce the size of the tax evasion problem in Cyprus.

Keywords: income under-reporting, black economy, tax free income, Cyprus.

1. Introduction

Tax evasion refers to the case when a person, through commission of fraud, pays less tax than the law mandates. This paper investigates the extent of income tax evasion in Cyprus and examines how this biases the measures of inequality and poverty.

Estimates of the size of black (or underground) economy in Cyprus, where tax non-compliance arises from, do not suggest that income tax evasion in Cyprus is, on average, higher than that estimated for other countries (Georgiou and Syrichas 1994, Schneider and Enste 2000 and Fethi et al. 2006). Nevertheless, as we discuss later in this paper, empirical findings about the size of the black economy should be interpreted with caution, given the wide margins of error often associated with them. Furthermore, it is not only the size but also the sources and distribution of tax evasion that matter. For example, tax evasion can result in higher income inequality when concentrated among high-income individuals. Furthermore, tax non-compliancy renders means-tested social policies

* Corresponding author. Address: Economics Research Centre, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus. E-mail: p.pashardes@ucy.ac.cy

ineffective, because high income individuals can falsely take-up benefits to which they are not entitled. Economic efficiency can also be affected when tax evasion distorts relative returns to inputs (capital and/or labour) resulting in sub-optimal allocation of resources in the economy.

Measuring income under-reporting is difficult, since the whole motivation behind this non-compliance act is to prevent the true income from being shown in data available to others. Researchers estimating the size of the black economy have tried to side-step this problem by drawing on information available in national accounts, tax audit data, tax amnesty data and survey data. The resulting empirical findings are often based on national accounts data, with the size of black economy reflecting the difference between the recorded GDP and an estimate obtained from monetary indicators, such as the ratio of currency to demand deposits (Gutmann, 1977), the volume of cheque and currency transactions (Feige, 1979), and the currency ratio (Tanzi 1983).[1] Lackó (1996, 1998 and 1999) proposes an alternative approach to estimating the size of the black economy, the so called 'physical input method', based on the assumption that the per capita household electricity consumption in each country depends linearly on the per capita real consumption of the households.

This paper approaches the measurement of tax evasion from a micro-economic perspective, based on the idea that hidden economic activity can be inferred from comparing the reported income with an expenditure-based estimate. This idea was first applied by Pissarides and Weber (1989), who use food expenditure to estimate income under-reporting among the self-employed in the UK. Lyssiotou, Pashardes and Stengos (2004) extend the Pissarides-Weber method to the whole spectrum of consumer expenditure, not just food. They claim that this has the advantage of yielding more accurate estimates of tax evasion than the single commodity method and can provide separate estimates of the under-reporting for each source of income (self-employment, investment, second job etc).

In section 2 we use the Lyssiotou-Pashardes-Stengos method to estimate income tax evasion in Cyprus. Section 3 considers the impact of this tax evasion on measured inequality and poverty, while section 4 discusses the results and compares them with results reported elsewhere in the literature. Section 5 presents the main findings and conclusions of the paper.

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[1] Monetary methods for estimating the size of the black economy have been criticized for not being based on theory, for using questionable assumptions and for employing rather flawed econometric techniques (Thomas, 1999).

2. Income tax evasion

For the estimation of the under–reporting of income in Cyprus we use the Family Expenditure Surveys (FES)[2] to draw information about the income, the expenditure on various goods and services and the demographic and other characteristics of individuals and households. The main advantage of this dataset is that it has detailed information about the households' expenditures on non-durable goods and services which allow us to use a demand system analysis for estimating the income under-reporting in Cyprus. The disadvantage is that the income reported in the survey is probably not as under-reported as the income reported to the Inland Revenue Department (IRD) for tax purposes and thus the estimated under-reporting coefficients and tax evasion may be biased downwards. We shall return to this point in the discussion of the results in the last section of the paper.

Table 1 presents the under-reported income estimated from applying the Lyssiotou, Pashardes and Stengos (2004) method described in the Appendix. Income from employment is used as reference, i.e. the benchmark from which the under-reporting of income from other sources is assessed. Furthermore, the estimates in Table 1 are obtained from three models, each corresponding to a different breakdown of total income. This is motivated by the fact that theory (consumer) based estimates of the black economy are characterised by a trade-off between accuracy in estimation and disaggregation of income by source: we perform estimation with aggregated income to obtain a general but accurate estimate of the black economy; and estimation with disaggregated income to obtain results that may not be particularly accurate, nevertheless show which sources of income are more responsible for tax evasion. The sources of income used here are those available in the FES data.

- In model 1 we break down the disposable income of individuals into income from self-employment (including income from agriculture), income from employment and benefits and income from capital. Estimates based on this model show that households under-report their

[2] The FES is conducted by the Statistical Service of Cyprus during the years 2002/03 on a sample of 2990 households. Only households with two-adults between the age of 21 and 60 and with two children are used in the empirical analysis to avoid preference heterogeneity interfering with the estimation of black economy parameters. Households with only one employee as well as households with no information about their income or with income from lottery, writing rights, loans, gratuity, sell of business were also excluded. The above exclusions reduced the sample size to 278 households.

self employment income by 44.8% That is, for every 1 euro they receive from self-employment activities, they only report 55 cents for taxation. The capital income reported by households is under-reported by about 40.3%.

- In model 2, income from agriculture is separated from self-employment income. The under reporting percentage of self-employment income (excluding income from agriculture) is now decreased to 38.3%, while income from agriculture is found to be under-reported by 59.9%. In this model the under reporting of capital income is estimated to be 35.5% (which is not statistically different from the estimate in model 1).
- In model 3, the self employment income is divided further to self employment income for households with head in white collar occupation and self employment income for households with head in blue collar occupation. Based on this model, blue collar households' under-report their self employment income more than white collar households (39% vs. 35.7%), however, this difference is not statistically significant.

On the basis of the under-reporting parameters in Table 1, income under-reporting activities in Cyprus range from around 8.1% (model 1) to 6.7% (model 3) of GDP and the tax revenue from households are reduced on average between 34,7% (model 1) and 27,4% (model 3).[3]

TABLE 1

Estimated under-reporting of income

Income source	Model 1	Model 2	Model 3
Self-employment income	44.8%	38.3%	
Head in white collar occupation			35.7%
Head in blue collar occupation			39.0%
Income from agriculture		59.9%	59.4%
Capital income	40.3%	35.5%	35.2%
Income under-reporting (as % of GDP)	8.1%	7.0%	6.7%

[3] These estimates are based on the tax-benefit model of the Economics Research Centre for the year 2002 (Andreou et al., 2007).

3. Inequality and poverty

In this section we study the effect of income under-reporting on measures of inequality and poverty. More specifically, we compute and compare various poverty and inequality measures using the income reported in the data and the income corrected for under-reporting using the estimated percentages reported in Table 1.

In Table 2 we present three measures of income inequality calculated with the reported and corrected income: the shares of aggregate household income by income group, the percentile ratios and the Gini index. All these measures show that inequality increases after we correct for income under-reporting. Overall, using the corrected in place of the reported income, decreases the income shares of the lower and increases the income shares of the higher income groups. This suggests that individuals in the higher income groups under-report their income more than individuals in the lower income groups.

TABLE 2

Income inequality measures

Income percentile	Reported Income		Corrected income	
	Mean (Euro)	Share	Mean (Euro)	Share
Lowest 10%	4483	3.2%	4569	3.0%
11% - 20%	6410	4.6%	6603	4.3%
21% - 30%	7999	5.8%	8448	5.6%
31% - 40%	9616	7.0%	10463	6.8%
41% - 50%	11194	8.1%	12257	8.1%
51% - 60%	12921	9.3%	14300	9.4%
61% - 70%	14930	10.7%	16570	10.8%
71% - 80%	17430	12.5%	19363	12.7%
81% - 90%	21357	15.2%	23541	15.3%
Highest 10%	33291	23.6%	37504	24.2%
Percentile Ratios	p90/p10	p90/p50	p10/p50	p75/p25
Reported Income	4.275	2.005	0.469	2.157
Corrected income	4.656	2.023	0.434	2.281
Gini Index	0.31356		0.32584	

The ratio of the 90th to 10th percentile increases, indicating that the income gap between the poorest and the richest widens. Similarly, the ratio of the 90th percentile to the median income increases, albeit by a small margin; while the ratio of the 10th percentile to the median decreases. Finally, the ratio of the upper middle percentile (75th) to the lower middle percentile (25th) increases, again, indicating an increase in income gap. The Gini Index, which summarises the dispersion of income shares and ranges between 0 (perfect equality) to 1 (all income is received by one household) also shows increased inequality when incomes are corrected for under-reporting.

To assess the effect of income under-reporting on the measurement of poverty we adopt the European Union threshold, i.e. we consider households to be below the poverty line when their equivalent income[4] is less that 60% of the median. Using the reported income, the poverty line in Cyprus is 7137EUR and the poverty rate (the percentage of households below the poverty line) is 20%; whereas using the corrected (for under-reporting) income the poverty line increases to 7906EUR and the poverty rate to 22%. This suggests that the under-reporting of income causes an under-estimation of the poverty rate in Cyprus by about 2 percentage points.

Table 3 presents the mean income and the poverty rate calculated with the reported and corrected income for various groups of households classified by the occupation of head. The most pronounced difference in the poverty rate when incomes are corrected for under-reporting, is found among households with head in agriculture or fishery. The mean income of these households increases by nearly 58% when corrected for under-reporting, resulting in a dramatic drop in their poverty rate from 12% to 1%, and raises questions about the generally held view that agricultural workers are among the poorest people in Cyprus. Other notable changes arising from correcting incomes for under-reporting is the increase in the poverty rate among households with non-worker heads or with heads in elementary occupations. Thus, households in these categories suffer from more severe poverty than that estimated from statistics based on reported income.

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[4] Equivalent income is the income of the household when the family size and composition is taken into consideration.

TABLE 3

Mean income and poverty rate by occupation

	Mean Income (Euro per annum)			Poverty Rate		
Occupation	Reported	Corrected	Change	Reported	Corrected	Change
Clerks	16347	17106	4.6%	7%	8%	1%
Agricultural workers	12900	20364	57.9%	12%	1%	-11%
Legislators, Managers	23544	26088	10.8%	0%	0%	0%
Professionals, Technicians	21149	22876	8.2%	3%	4%	1%
Sale persons	14943	17057	14.1%	11%	9%	-2%
Personal services workers	13907	15271	9.8%	11%	11%	0%
Crafts, machine operators	12920	14649	13.4%	7%	8%	1%
Elementary occupations	12018	12769	6.2%	16%	19%	3%
Non workers	9849	10425	5.8%	47%	53%	6%
All	13969	15365	10.0%	20%	22%	2%

4. Discussion

Attempts to estimate the size of the black or underground economy found in the literature are based on widely varied approaches resulting in very different empirical findings. This is illustrated by the figures reported in Table 4, showing estimates of the underground economy using four different methods; two macroeconomic and two microeconomic approaches[5]. The currency demand method compares actual currency in circulation with one implied by reported income, while the electricity demand uses the evident relationship between per capita income and electricity consumption.

Comparing the results obtained from the two macroeconomic methods, the one based on the physical input suggests that the black economy in Cyprus is 21%, the third highest among the countries included in the table; while the corresponding estimate obtained from the currency demand method is only 6.5%, the second lowest among the countries included in the table. The currency demand method also gives substantially higher estimates of the black economy than the physical input method in other countries (e.g.

[5] As noted by Schneider et al. (2000) a "huge range of estimates of the shadow economy for a country in a given time span are achievable using different calculation methods. Hence one should be very careful when interpreting the size of the shadow economy in a country using only one method."

Austria and Ireland). In contrast, Greece, Sweden and Canada are among countries where the physical input method gives rise to higher black economy estimates than the currency demand method. Comparison of the two micro (consumer expenditure) methods cannot give conclusive evidence about systematic differences in their findings because micro-based approaches to estimating the size of black economy are less popular and only a few studies report results based on these methods.

TABLE 4

Estimates of underground economy as a % of GDP using different methods

	Macro Methods		Micro Methods (Consumer Expenditure)	
Countries	Currency Demand[1]	Electricity Demand[2]	Single Equation[3]	Demand System[4]
Austria	5.1	15.5	–	–
Belgium	19.3	19.8	–	–
Canada	12.8	11.7	2.0	–
Cyprus	6.5	21.0	–	6.7
Denmark	10.8	16.9	–	–
Finland	–	13.3	2.3	–
France	9.0	12.3	–	–
Germany	11.8	14.6	–	–
Greece	27.2	21.8	–	–
Ireland	11.0	20.6	–	–
Italy	22.8	19.6	–	–
Netherlands	11.9	13.4	–	–
Portugal	15.6	16.8	–	–
Spain	16.1	22.9	–	–
Sweden	15.8	11.0	1.0	–
UK	9.6	13.1	5.5	10.6

Notes: [1] Schneider and Enste (2000) and Fethi et al. (2006) for 1980-90; Johnson et al. (1998) for Greece and Portugal for 1990-93.

[2] Physical input method, Schneider and Enste (2000).

[3] Mirus and Smith (1997) for Canada 1969-1992, Johansson (2000) for Finland 1994-1996, Apel (1994) for Sweden 1988, Pissarides and Weber (1989) for UK 1982.

[4] Lyssiotou et al. (2004) for UK 1993 and authors' own calculations for Cyprus 2002-2003.

One explanation behind the differences in the results obtained from using alternative methods to estimate the size of the black economy can, of course, be sampling errors, so that the possibility that these differences are statistically insignificant (i.e. arise from not precise estimates) cannot be excluded. This may be particularly the case with the currency demand

method, given that some of the empirical findings obtained from this method are counter-intuitive, e.g. the very low estimate of the black economy in Cyprus vis-a-vis the corresponding high estimate for Sweden.

Another possible explanation behind the differences in the resutls reported in Table 4 may be the fact that alternative methods employed for the estimation of the black economy do not measure the same thing: the micro-economic approaches focus on tax evasion whereas the macro-economic approaches focus on the black (underground) economy. Although these two concepts are sometimes used synonymously, black economy is wider in content, in the sense that it can include unrecorded transactions that do not incur tax losses for the government. Therefore, estimates of income tax evasion tend to account for a smaller percentage of GDP than estimates of the black economy. Furthermore, among the micro-based estimates those using a single consumer demand equation can understate the size of tax evasion because the share of food (the item of consumer expenditure most often used in this case) can differ between the self-employed and other individuals for reasons other than differences in income. As argued by Lyssiotou et al. (2004), such differences can result in a downward biased estimate of tax evasion and a complete demand system is needed to avoid this bias.

A further explanation for the differences in the results reported in Table 4 can be that the taxable income of the self-employed in the Family Expenditure Surveys may not be so much under-reported as the self-employed income recorded in the Inland Revenue accounts. Therefore micro-based estimates of the black economy drawing on data from the Family Expenditure Surveys can under-estimate the size of the tax evasion. For instance, the ratio of employee to employer/self-employed income in Cyprus is found to be, on average, 0.81 in the Family Expenditure Surveys and 1.47 in the Inland Revenue statistics in 2003. This suggests that tax evasion can be 181% higher than that estimated using the Family Expenditure Surveys data.

5. Conclusions

The size of the black economy in Cyprus, as in most other countries, varies with the method and data used for its estimation. Our analysis suggests that households under-report self employment income by 44.8% and capital income by 40.3%. The highest under-reporting (59.9%) is associated with agricultural income. These results suggest that between 27.4% and 34.7% of tax revenue from households is lost due to income under-reporting, implying that the size of black economy is around 6.7% to 8.1%

of GDP. Furthermore, these figures are likely to understate the true size of income tax non-compliance in Cyprus because the average income in the data used in our empirical analysis is below the average income in the tax revenue statistics by a factor of 1.8.

In order to find how income under-reporting affects measures of inequality and poverty, we compute and compare various such measures before and after we correct income for under-reporting. The results show that using the corrected in place of the reported income, increases inequality and poverty because individuals with high income under-report their income more than those with low income. This suggests that egalitarian and antipoverty policies need to: (i) become more generous to compensate for the fact that measured inequality and poverty underestimate the true extent of these problems; and (ii) complement mean testing with indicators other than reported income to avoid false entitlement to social benefits by persons under-reporting their income.

Finally, in interpreting our results, one has to consider that we focus on measuring income tax evasion. Given the high tax free income in Cyprus (and the skewness of income distribution) the majority of workers are below the income tax threshold. Therefore, our empirical findings refer to economic activity at the top half of GDP and are lower than other estimates of the black economy, covering hidden activity at all levels of income. Indeed, a high tax free income can help not only reduce tax evasion directly, but also through limiting the potential tax evaders among higher earners, thereby making tax compliance measures less costly to implement.

Appendix

Here we describe in brief the method proposed by Lyssiotou, Pashardes and Stengos (2004) which is used in this paper for the estimation of the black economy in the case of Cyprus**.**

Assuming implicitly separable preference and Quadratic Logarithmic unit cost of nondurable goods, the expenditure shares can be written as a system of Engel curves,

$$\omega_{ih} = \alpha_i + \beta_i \left(\ln Y_h^*\right) + \lambda_i \left(\ln Y_h^*\right)^2 \qquad (1)$$

where α_i, β_i and λ_i depend on prices and Y_h^* is the *true* income of the hth household consisting of K components according to their source, e.g. income from employment, self-employment, investment, second job etc. Each component of true income is proportional to its observed counterpart

$$Y_{kh}^{*} = \theta_k Y_{kh}, \quad \text{K=1,…, k,} \tag{2}$$

where Y_{kh} is the observed level of the k[th] component of income and $\theta_k \geq 1$ shows the factor by which the observed income must be multiplied in order to become equal to the true income. Then budget shares can be written as

$$\omega_{ih} = \alpha_i + \beta_i \left(\ln Y_h + \ln\left(\sum_k \theta_k y_{kh}\right)\right) + \lambda_i \left(\ln Y_h + \ln\left(\sum_k \theta_k y_{kh}\right)\right)^2 \tag{3}$$

where $Y_h = \sum_k Y_{kh}$ and $y_h = {Y_{kh}}/{Y_h}$.

The intuition behind the above modelling of under-reporting is as follows. Suppose household *h* has a k[th] component of income such that $\theta_k > 1$. Then $\ln Y_h > \ln Y_h^{*}$ so that the household will behave as if earning a higher income, i.e. allocate more expenditure to luxuries and less expenditure to necessities than otherwise. The parameter θ_k shows the extent to which the observed k[th] component of income will have to increase to compensate for the understatement of the observed household income, i.e make the allocation of expenditure on nondurable luxuries and necessities as if $\ln Y_{kh} = \ln Y_{kh}^{*}$.

For the demand system estimation we apply Seemingly Unrelated Regression (SUR) on six categories of non-durable goods (food, health, utilities, clothing, transport/ communication and miscellaneous goods/other services). The sources of income are wages, self-employment income, income from benefits and income from capital. The estimated budget shares are

$$\begin{aligned} \omega_{ih} = {} & \alpha_i + \sum_j \alpha_{ij} z_{jh} + \beta_i \left[\ln Y_h + \ln\left(\theta_0 y_h^{\omega} + \theta_1 y_h^{s} + \theta_2 y_h^{b} + \theta_3 y_h^{c}\right)\right] \\ & + \lambda_i \left[\ln Y_h + \ln\left(\theta_0 y_h^{\omega} + \theta_1 y_h^{s} + \theta_2 y_h^{b} + \theta_3 y_h^{c}\right)\right]^2 + u_{ih}, \end{aligned} \tag{4}$$

where y_h^{ω}, y_h^{s} y_h^{b} and y_h^{c} are the wage, self-employment, benefit and capital proportions of household's income, z_{jh} the vector of household characteristics and u_{ih} an error term. Assuming that wage and benefit income is correctly reported then θ_0 and $\theta_2 = 1$. Therefore the parameters θ_1 and θ_3 are interpreted as the black economy coefficients.

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