

could not prevent any country from appearing over- or under-populated to a foreign visitor with preferences and values¹¹ different from those of its own inhabitants.

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¹¹ Preferences and values are reflected not only in α and β , but also in the origin of $u(\cdot)$, for this, as we saw in footnote 5, determines the minimal level of consumption for which life is judged to be worth living.

ESTIMATING THE SHADOW ECONOMY: A 'NAIVE' APPROACH*

By BRUNO S. FREY and HANNELORE WECK

I. How to measure a shadow

WHENEVER one speaks of estimating the size of the shadow, underground or hidden economy, the immediate reaction is that this activity is by its very nature nonmeasurable. This feeling has certainly some truth in it as we shall see. However, the economic profession's ingenuity has found ways nevertheless to estimate the shadow economy's size. Currently, four approaches may be distinguished:

(1) By way of well designed *interviews* an effort is made to overcome the incentive to deny working in the underground economy (being unlawful to work there as neither taxes nor social security contributions are paid). The questions are put in such a way that the persons interviewed should not realize the purpose of the questioning. This approach has for example been successfully used by the Italian Statistical Office (see Pettenati 1979, L. Frey 1978).

The other three approaches endeavour to measure the shadow economy *indirectly*, i.e. by looking at "traces" which the hidden sector leaves elsewhere in the economy. The difficulty is, of course, to find a reliable and exact relationship between the traces observed and the size of the underground activity.

(2) The shadow sector results in an (officially measured) *participation rate* which is lower than it would otherwise be. Many housewives, students, pensioners and unemployed do not officially belong to the working population but are in fact earning money in the labour market. The official participation rate in Italy in 1975 was for example only 35%, but in the U.S. and in the U.K. it was 45% and in Japan 49%. Moreover, the Italian participation rate has been continually falling. The difference of the participation rates between countries and over time allows an estimation of the amount of "black" labour and the extent of the shadow economy (see in particular L. Frey 1978, Fuà 1976, Contini 1981a, 1981b).

(3) The underground economy also leaves traces in the sphere of *incomes* and *expenditures*. The most obvious variant of this approach is to deduce the

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size of the hidden economy from the estimated amount of *tax fraud*. The U.S. Internal Revenue Service (1979) has, for example, calculated that in 1976 between 5.9% and 7.9% of income has not been reported to the tax authority, and the Swedish Riksskatteverk (tax office) estimates that during the 70s between 8% and 15% of income was not declared (Hansson 1980). The size of the shadow economy may also be deduced from the difference between the GNP as estimated from the *income side*—which is mainly based on tax reports—and the *expenditure side*—which is independently calculated by undertaking household and industrial surveys on the value of goods and services purchased (see Macafee 1980).

(4) Yet another indirect approach is to consider the traces left by the hidden economy in the realm of *money*. This method is the most popular one. It basically assumes that individuals try to conceal shadow market activities by making the related payments in cash. In one case, the increasing ratio of currency to demand deposits observed in the U.S. since 1937–41 is attributed to the rise in the hidden economy, leading to an estimate of a little over 10% of official GNP for 1976 and 1979 (Gutmann 1977, 1979a). This method has been refined by estimating a currency demand equation. Use of currency depends on several variables, including the level of income taxes. By measuring the sensitivity of currency demand to taxes, it is possible to derive an estimate of the percentage of currency which can be attributed to tax-avoiding activities. By making assumptions about the velocity of circulation of money in the open and hidden sectors, the share of the underground economy in GNP due to the existence of income taxes can be derived. For the U.S., a share of between 3½% and 5% for the increase from 1929 to 1976, and between 8% and 13% for the 1976 level, is estimated (Tanzi 1980a). The corresponding figure for Norway is 9% of GDP, and for Sweden 13% of GDP in 1978 (Klovland 1980) but the author strongly stresses that these are only very approximate figures and that the “true” figures may lie in a very wide range.

Another variant of this approach assumes that the large and increasing amount of cash held by persons indicates a flourishing underground economy (see Ross 1978 for the U.S., and Macafee 1980 for the U.K.). Yet another variant considers the relationship of money circulation MV (where M = money, V = velocity of circulation) to national income. The observed increase in this ratio indicates the existence of unmeasured GNP. Using this method one author (Feige 1979) measures the U.S. shadow economy as lying between 13% and 22% of GNP in 1976, and between 26% and 33% of official GNP in 1978.

This brief survey of the approaches currently used to estimate the size of the shadow economy clearly shows how diverse the avenues are and how much the estimates (for the same country and year) differ from each other. One of the main shortcomings of all these approaches is that they do not concentrate on the *causes* and *circumstances* in which a shadow economy arises and exists.

II. Causes for a shadow economy

1. Taxes and Regulations

The existing literature¹ on the shadow economy is virtually unanimous with respect to why people take up clandestine employment. In the words of Tanzi (1980b, p. 34):

“The two main factors that create an underground economy are taxes and restrictions, and either is sufficient alone to bring about an underground economy”.

In the light of such a clear consensus about the causes for the existence of a shadow sector, one can advance

Proposition 1: The higher the taxes and the tighter the restrictions (regulations), the larger is the shadow economy.

This proposition can be used either to estimate the development of the shadow economy over time, or to compare its size between countries. This paper is devoted to a cross section analysis of 17 OECD countries.

The burden of total taxation can be measured by the share of taxes (including social security contributions) in GNP, taking account of the fact that it is not only income taxes which drive people into the shadow economy, but also indirect taxes on goods and services (where the incentive for tax evasion may be even stronger because both buyers and sellers have a monetary interest in doing so).² The burdening of the population by regulations can—at least up to now—only be measured indirectly. One approximate measure may be the share of public administrators in the total working force.

Those two kinds of burdens imposed by government are of quite different dimensions and should therefore not simply be aggregated. The cardinal measures are therefore transformed into an ordinal scale, the countries with the highest tax share and the highest share of public administrators, respectively, being ranked 17, the countries with the lowest burdens being ranked 1. This gives the ranking for 1975 shown in Table 1 (the underlying figures for the tax share and the ratio of administrators as well as of the other influences considered afterwards are given in the appendix):

The rankings according to tax and regulatory burdens are not the same at all, the Spearman rank correlation coefficient being only 0.08. In particular the

¹ Besides the publications already mentioned see e.g. Feige (1980, 1982), Gutmann (1979b), Schmolders (1980), Thurn (1980), Gretschmann and Ulrich (1980), B. S. Frey (1981).

² The decision whether to switch to the shadow economy depends on the marginal tax rate faced by each individual. (For a formal analysis see Isachsen and Strøm 1980). It should be noted, however, that the marginal tax rate is not necessarily highest for high income recipients but may approach one hundred percent for welfare recipients: in many countries and for many kinds of welfare payments, when income from work exceeds a certain limit, one loses the welfare payment completely.

TABLE I
*The ranking of OECD countries relative to the burdens
of taxation and of regulation*

| <i>Rank</i> | <i>Tax</i> | <i>Burden by burden</i> | |
|-------------|--------------------------------|-----------------------------|-----|
| 17 | Sweden | S | UK |
| 16 | Norway | N | F |
| 15 | Netherlands | NL | CA |
| 14 | Denmark | DK | NL |
| 13 | Belgium | B | USA |
| 12 | Austria | A | FRG |
| 11 | Federal Republic of Germany | FRG | DK |
| 10 | Finland | SF | B |
| 9 | France | F | A |
| 8 | United Kingdom | UK | I |
| 7 | Ireland | IRL | SP |
| 6 | Canada | CA | S |
| 5 | Italy | I | JAP |
| 4 | Switzerland | CH | N |
| 3 | United States | USA | IRL |
| 2 | Japan | JAP | SF |
| 1 | Spain | SP | CH |

Scandinavian countries Sweden, Norway, and Finland have—compared to the other OECD countries—a high tax share and few regulations, while France, the United Kingdom, Canada, the United States and Spain are relatively little burdened by taxes, but are highly regulated. In the case of these countries, it is thus impossible to derive any conclusions as to whether a large or small shadow economy relative to the other OECD countries must be expected. The Netherlands, Denmark, Belgium, Austria and the Federal Republic of Germany on the other hand, rank high in both dimensions of burdens. According to the literature one would therefore have to expect a large underground economy in these countries. According to the same reasoning, in Japan, Switzerland and (somewhat less clearly) in Italy and Ireland a small shadow economy would have to be expected.

With the procedure used so far, an equal weighting of the two dimensions is implicitly assumed. In order to ascertain whether a change in weights has any great influence on the combined ranking of the two types of burdens (sensitivity analysis), three weighting systems are used in our analysis: weighting system I proceeds on the assumption that if nothing is known, one should give equal probability to each influence (La Place rule, see Luce and Raiffa, 1957, p. 298) assigning a weight of 50% to both the taxation and regulation factors. Weighting system II emphasizes more the influence of taxation and assigns 60% of the total weight to the ranking with respect to taxation and 40% to regulation thus assuming that people's decision to

become active in the shadow economy is somewhat more motivated by the taxes they can evade than by the restrictions imposed on them in the official economy. Weighting system III stresses even more the influence of taxation (70%) compared to regulation (30%). The greater weight accorded to taxation than to regulation corresponds to the greater importance given to taxation as a causal factor in the literature on the existing shadow economy. The total ranking of the 17 countries with respect to taxation and administrative burdening under the three weighting system is shown in Table 2.

TABLE 2
The size of the shadow economy: Rankings when the burden of taxation and regulation matter.

| Rank | Weighting systems | | |
|------|-------------------|------------------|-------------------|
| | I (50%, 50%) | II (60%, 40%) | III (70%, 30%) |
| 17 | NL | NL | NL |
| 16 | DK | DK | S |
| 15 | F | S | DK |
| 14 | UK | B | N |
| 13 | S | F | B |
| 12 | B | UK | FRG |
| 11 | FRG | FRG | A |
| 10 | A | N | F |
| 9 | CA | A | UK |
| 8 | N | CA | CA |
| 7 | USA | USA | SF |
| 6 | I | SF | USA |
| 5 | SF | I | I |
| 4 | IRL | IRL | IRL |
| 3 | SP | SP | CH |
| 2 | JAP | JAP | JAP |
| 1 | CH | CH | SP |

The first percentage figure in parentheses shows the weight accorded to a country's ranking with respect to taxation, the second with respect to regulation.

The following countries are under all three sets of weights among the one-third (six countries) most highly ranked, and are therefore expected to have a *large* shadow economy:

Netherlands
Denmark
Sweden
Belgium

The following countries are according to the same criterion expected to have

a *small* shadow economy:

Italy
Ireland
Spain
Switzerland
Japan

These two listings are intuitively not very convincing, because according to some journalistic notions,³ as well as case studies,⁴ one would certainly not expect Italy to be among those countries with a small shadow economy compared to other countries. On the other hand, in view of the traditionally high tax morality and obedience to the state, one does perhaps not expect to find the two Scandinavian countries Sweden and Denmark among those with the largest shadow sector. This suggests that some important *further causes* for the development of a shadow economy have so far been neglected.

2. *The approach used*

The next sections will cumulatively consider additional factors which are theoretically expected to contribute to the formation of a shadow economy. As with taxation and regulation, the various countries are only ranked in relation to each other, but various sets of weights for the causal influences will be used. The procedure used may be compared with a multiple regression in which the dependent variable X_D is related to the various factors X_1, X_2, \dots, X_n which the researcher expects to have a causal influence:

$$X_D = g_1X_1 + g_2X_2 + \dots g_nX_n.$$

In regression analysis, the variables, $X_D, X_1, X_2 \dots X_n$ are known, so that the parameters or "weights" $g_1, g_2 \dots g_n$ can be estimated. In our case, the dependent variable is the size of the shadow economy, for which there are (at least up to now) no reliable measures available (see part III of our paper). Our procedure thus takes the opposite route: the weights $g_1, g_2 \dots g_n$ are inferred on the basis of the knowledge gained from the literature dealing with the shadow economy quoted above, and the size of the dependent variable X_D is then deduced on the basis of these weights and the values of the explanatory variables $X_1, X_2 \dots X_n$. None of the authors quoted deals with all the determinants which will be considered here, or attempts to assess the relative importance of the factors discussed in quantitative terms. The weighting systems used have therefore to be deduced on the basis of the importance attached to the various determinants in the writings on the subject, assuming that the specialists in the area are reasonably accurate as to the causes leading to the formation of a shadow economy. For each determinant, various weights are used in order to determine whether a variation in the weights has any large effect on the countries' rankings

³ See e.g. Business Week (1978), Economist (1979a, 1979b), Wirtschaftswoche (1980).

⁴ E.g. Alessandrini (1978), Contini (1979), Fuà (1977), Martino (1980), Zanoni (1980).

according to the size of the shadow economy (*sensitivity analysis*). Those countries for which the shadow economy ranking turns out to be strongly sensitive to the particular weights chosen will not be included in the final ranking (given in Table 5). As above, the "principle of insufficient reason" or La Place rule (i.e. assigning equal weights to each determinant) will also be used in order to minimize possible biases introduced by the subjective views of the authors. While the procedure used here may seem unfamiliar and naive to economists, it is considered scientifically acceptable in psychology.⁵

In order to lessen the problems involved with the measurement and comparability of the various dimensions (determinants), the study derives only the *ranking* of the various countries with respect to each determinant, and with respect to the size of the shadow economy. Thus, no figure of the shadow economy's size is given; rather it is derived whether it is to be expected that a particular country has a larger or smaller shadow sector compared to the other OECD-countries. For that reason, no exact definition of the shadow economy is required in our study, because the determinants here identified may be relevant for various definitions of the shadow economy, and the relative rankings between countries may be unaffected by the specific definition of the shadow economy considered.⁶ It is sufficient to note here that one set of determinants considered refers to conditions in the labour market (see Section II.3), i.e. the shadow economy is considered primarily in terms of productive contributions (value added) by labour rather than simply as a set of financial transactions in the "black" market. To measure the shadow economy in terms of GNP corresponds to what seems to become a growing consensus among the workers in the field (see Macafee 1980, Tanzi 1980b).

The "determinants" which will be identified beyond the burden of taxation and regulation are assumed to *cause* the formation of a shadow economy. In principle, however, each of these factors may in turn be influenced by the shadow economy, i.e. there may be a mutually interrelated system of variables. For example, an increase of the tax rate may not only lead to an increase in the shadow sector, but a rising shadow sector may induce the public decision-makers to raise the tax rate in order to finance a given level of government expenditures (including transfers). In that case, the size of the shadow economy is a determinant of the tax rate. It is, however, to be expected that this "reverse causation" is of rather small magnitude compared to the influence in the other direction, and that it may therefore at this stage of research be neglected. (Some suggestions for the construction of an interdependent system are given in Section IV.)

The various causal influences on the formation of a shadow economy will

⁵ For a discussion of this procedure and a comparison with standard regression methods see Dawes and Corrigan (1974), Einhorn and Hogarth (1975) and Wainer (1976).

⁶ On the other hand, those approaches coming up with a precise figure for the size of the shadow economy (e.g. in percent of GNP) require a precise definition of what the shadow economy is. Most studies, however, do *not* provide such a definition, see e.g. Gutmann 1977, Feige 1979.

be introduced stepwise, in order to better show the separate influences of the various factors and to enable us to assess the sensitivity of the outcome to the particular weighting system chosen. The rankings of the combined influence of the burdens of taxation and of regulation will be termed *CAUSES A*.

3. *Tax morality and the perception of the tax burden*

The size of the shadow economy depends to a considerable extent on the *willingness* of people to evade taxes. It is extremely difficult to compare tax morality across countries. An effort has been made to study empirically the willingness to cheat on taxes in a comparative way for various countries. By way of extensive survey research individuals in various countries have been asked the same questions (translated into the national language) about their feelings of duty to pay taxes and the extent of moral punishment of tax cheaters (see Strümpel (1966), Beichelt *et al.* (1969) and Tretter (1974)). For various reasons (into which we cannot go for reasons of space), the answers are not fully comparable, such that the results of these studies can only be considered as preliminary. The following hierarchy of tax immorality may be constructed on that basis:

| | <u>Rank</u> |
|---|-------------|
| Italy | 17 |
| France | 14 |
| Spain Belgium | 12 |
| Federal Republic of Germany Austria Netherlands | 9 |
| USA Canada Japan Ireland | 6 |
| Norway Sweden Denmark Finland United Kingdom | 4 |
| Switzerland | 1 |

Next to the hierarchal order, in which Italy is shown to have the highest, and Switzerland the lowest tax immorality, the corresponding ranks⁷ are shown. Thus, e.g. Spain and Belgium are ranked equally with rank 12.

In order for a shadow sector to emerge it is not only necessary that people are prepared to cheat on the tax authorities but they must also be *aware* of the burden of taxation. It may be argued that to a certain extent people get used to a given level of taxation. Having adapted to that tax burden, they no longer feel it so heavy. An *increase* in the tax level, however, is realized better, because one has to adjust to it (e.g. one has to get used to calculate a new turnover tax when one buys and sells a commodity or service) and because tax increases are often publicized by the media. Given tax morality,

⁷ The ranks are chosen such that the differences between them are of a similar size. The exact differences are $2\frac{3}{4}$ points each, such that by rounding we get the ranks shown in the table above.

it is thus argued that an increase in taxation (in percentage points of GDP) leads to an increased awareness of tax burdens and induces people more strongly to switch to the underground economy.⁸ We thus have

Proposition 2: The lower the tax morality and the higher the increase in taxes in recent years, the larger is the shadow economy.

The increase in the average tax shares over the period 1956–1975 for the various countries is shown in the appendix. The increase has been highest for Sweden, Denmark, the Netherlands and Norway, followed by Belgium, Switzerland, Ireland, Canada and Austria. In descending order follow Spain, the U.K., Finland, Italy, the F.R.G. and France. The increase was lowest in Japan and the United States.

The rank order reached by considering the burden of taxation and regulation (CAUSES A) may now be adjusted by the influence of the rank order of tax morality and of tax perception (increase in tax share), taking into account three different weighting systems. The equal weighting system I gives 50% of the weight to CAUSES A (25% each to taxation and to regulation), and 25% of the weight each to tax morality and tax awareness. Weighting system II gives the same weight to CAUSES A (50%), but emphasizes tax morality more (40%) relative to tax awareness (10%). This assumes that it is an essential requirement for people to become active in the shadow sector that they are not impeded by moral considerations. Compared to these moral factors, the importance of tax perception via tax share increases is taken to be considerably less important. Weighting system III gives more weight to the burden of taxation and regulation (CAUSES A is weighted 60%), and the relative weight of tax morality (25%) compared to tax awareness (15%) is reduced compared to the previous weighting. This weighting stresses that a low tax morality and (objectively) high burdens of taxation and regulation are not solely responsible in inducing a movement to the shadow economy but that it is also important to be aware of how heavy this burden is.

The combined rating scale under the three weighting schemes is given in Table 3. Taking again the countries which under *all* three weighting schemes are among the one-third most highly ranked,

Netherlands
Belgium
France

must be expected to have a larger shadow economy than the other OECD countries. Compared to CAUSES A, the two Scandinavian countries Denmark and Sweden (with high tax morality) have been substituted by France. The following countries belong to that one-third with the lowest ranking.

⁸ An empirical study finds indeed that the public's discontent is the larger, the more the total tax pressure in percent of GNP has risen. See Hibbs and Madsen (1981).

TABLE 3
The size of the shadow economy: Rankings when both the burden of taxation and regulation and tax immorality and perception matter.

| Rank | Weighting systems | | |
|------|-------------------|-----------------|----------------|
| | I | II | III |
| | (50%; 25%; 25%) | (50%; 40%; 10%) | (60%; 2%; 15%) |
| 17 | NL | NL | NL |
| 16 | B | B | B |
| 15 | DK | F | A |
| 14 | S | I | DK |
| 13 | F | A | F |
| 12 | A | FRG | N |
| 11 | N | DK | A |
| 10 | FRG | S | FRG |
| 9 | CA | N | I |
| 8 | UK | CA | UK |
| 7 | I | UK | CA |
| 6 | SP | SP | IRL |
| 5 | IRL | IRL | SF |
| 4 | USA | USA | SP |
| 3 | SF | SF | USA |
| 2 | CH | JAP | CH |
| 1 | JAP | CH | JAP |

The first percentage figure in parentheses shows the weight accorded to a country's ranking with respect to CAUSES A, the second with respect to tax immorality and the third with respect to tax perception (increase of tax share).

irrespective of the weighting scheme:

Spain
Ireland
United States
Finland
Switzerland
Japan.

Compared to CAUSES A, Italy—with a traditionally low tax morality—has been substituted by Finland and the United States.

The rankings combining the level of the tax and administrative burden (CAUSES A), as well as the tax morality and tax awareness, will be called CAUSES B.

4. Labour market influences

The size of the shadow economy depends not only on the incentive to leave the taxed and regulated economy and on the psychological willingness and awareness to follow these incentives, but also on the possibility to take up employment in the shadow economy. When a large share of the popula-

tion is working in the official economy, when there is little unemployment, and when working hours are long, people have little opportunity to work in the shadow sector. On the other hand, a low (official) participation rate indicates that people have possibly found work in the hidden economy. As is well known⁹ a great many people officially unemployed do in fact work. Much of black labour is undertaken after official hours (moonlighting). We thus have

Proposition 3: The lower the (official) participation rate, the higher the (official) rate of unemployment, and the shorter (official) working hours, the larger is the shadow economy.

The data on participation rates, unemployment and working hours are again given in the appendix. It is sufficient to indicate here that Italy, the Netherlands, Ireland, Spain and Austria have a low participation rate (high rank), while the United Kingdom, Switzerland, Finland, Japan, Denmark and Sweden have a (relatively) high one. Unemployment over the period 1966–1975¹⁰ was high in Ireland, Canada, the United States and Italy (high rank), while it was relatively low in the Federal Republic of Germany, Norway, Japan and Switzerland. Working time is short in the Scandinavian countries, Austria and Belgium (high rank) while it is long in Ireland, Italy, France, Spain and Switzerland.

The three causal influences of the labour market mentioned are in scheme I weighted again as much as the previous four influences (contained in CAUSES B, i.e. CAUSES B are weighted 4/7 (or 58%), and the ranking of the participation rate, unemployment and working hours by 1/7 (or 14%) each. In weighting system II CAUSES B are stressed more (the weight is 65%), and the participation rate is given more weight (15%) compared to the other two labour market factors (10% each). This weighting assumes that today even those fully employed have a chance to find a second job in the hidden economy such that the labour market conditions are not so important.

In weighting scheme III the weight of CAUSES B is somewhat reduced (60%) in favour of giving even more weight to the participation rate (20%), while keeping the weights of unemployment and working hours constant (10% each).¹¹ This assumes that the shadow economy must be expected to

⁹ See e.g. de Grazia 1980.

¹⁰ As the rate of unemployment of a particular year, say 1975, is strongly influenced by business cycle influences, the longer term unemployment rate here relevant is measured by a ten-year average.

¹¹ The weight of every single determinant in the overall ranking is:

| weighting system | CAUSES A | | CAUSES B | | participation rate | unemployment | working time |
|------------------|-----------|-------------------|----------------|---------------|--------------------|--------------|--------------|
| | tax share | administr. burden | tax immorality | tax awareness | | | |
| I | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 |
| II | 0.2 | 0.13 | 0.26 | 0.06 | 0.15 | 0.1 | 0.1 |
| III | 0.25 | 0.1 | 0.15 | 0.1 | 0.20 | 0.1 | 0.1 |

TABLE 4
The size of the shadow economy: Rankings when all seven factors matter.

| Rank | Weighting systems | | |
|------|---------------------------|----------------------------|-----------------------------|
| | I (58%; 14%, 14%, 14%) | II (65%; 15%, 10%, 10%) | III (60%; 20%, 10%, 10%) |
| 17 | B | B | NL |
| 16 | NL | NL | B |
| 15 | A } | I | A |
| 14 | CA } | F | I |
| 13 | I } | A | N |
| 12 | S } | CA } | F |
| 11 | DK | SP } | S |
| 10 | N } | N | DK |
| 9 | F } | FRG } | IRL |
| 8 | IRL | S } | CA |
| 7 | UK | DK | FRG |
| 6 | FRG | IRL | UK |
| 5 | SP | UK | SP |
| 4 | USA | USA | SF |
| 3 | SF | SF | USA |
| 2 | JAP | JAP | JAP |
| 1 | CH | CH | CH |

The first percentage figure in parentheses shows the weight accorded to a country's ranking with respect to CAUSES B, the second with respect to the participation rate, the third with respect to the rate of unemployment and the fourth with respect to working hours.

be particularly large, if people drop out of the official economy (low participation rate) and work fully in the shadow economy. It should be remembered that the "Italian" approach to estimating the shadow economy relies *exclusively* on the relative size of the participation rate.

The combined rating scale under the three weighting schemes is given in Table 4.

Two countries are always on the top irrespective of what weighting scheme is used:

Netherlands
 Belgium.

One would therefore expect that the Netherlands and Belgium have a *considerably larger* shadow sector than any other OECD country. If the group is expanded to those countries which are consistently in the top half of the ranking, we have to include

Austria
 Italy
 France.

According to the hypothesis advanced, these three countries can be taken to have a *larger* shadow sector than the remaining OECD countries.

Four countries are consistently at the bottom of the ranking, irrespective of the weighting system:

United States
Finland
Japan
Switzerland.

These countries can safely be assumed to have a *very small* shadow economy.

According to each weighting scheme the United Kingdom consistently belongs to that half of the countries ranked lowest, it may therefore be conjectured that it has a *small* shadow economy compared to other OECD countries.

Ten countries have now been classified which can be expected to either have a very large, large, very small or small shadow economy. Seven countries could not be classified because their ranking is very sensitive to the particular weighting of the seven factors influencing the rise and existence of an underground economy. They are

Canada
Sweden
Denmark
Norway
Ireland
Federal Republic of Germany
Spain.

Canada must be expected to have a large shadow economy, if regulation and unemployment are decisive factors, but only a small one if the burden of taxation has a dominant influence on people's decisions. The three Scandinavian countries Sweden, Denmark and Norway, as is well known, have a very high and strongly rising tax burden and owing to the comparatively short working hours there is much opportunity to work in the shadow economy. These factors favouring a large underground sector are, however, countervailed by the high tax morality. If a low (official) rate of participation and a high rate of unemployment are important factors contributing to a shadow sector, one will expect Ireland to have a large underground economy despite its low burden of taxation and regulation. The situation is quite similar for Spain. The Federal Republic of Germany is not ranked very high according to any particular factor, but neither is it ranked anywhere very low. Thus, a large shadow economy must according to our approach be due to the simultaneous working of all (or most) of the seven determinants here identified.

III. Is the 'naive' approach so naive after all?

The method used here to evaluate the (relative) size of the shadow economy is open to many criticisms. It can in particular be argued that the determining factors considered,¹² their ranking and the choice of weights is not based on any explicit theoretical reasoning, but on the reading of reports on the shadow economy. It has been stressed, however, that the choice of weights is not important *per se*. Rather it has been analyzed, whether and to what extent the ranking of the size of the shadow economies of the various countries depends on the choice of weights. This *sensitivity analysis* has allowed us to allocate the countries into two groups: one group whose relative size of the shadow sector compared to other countries is insensitive, and another group of countries for which the relative ranking is sensitive to the weights chosen. This procedure makes it possible to identify those causal factors which are crucial for a country's relative position, thus giving a clue in which direction future research should be directed.

Compared to the other approaches sketched in the introduction to this paper, the method here used does not fare badly, considering (a) the theoretical basis, (b) the interest for policy makers, and (c) the empirical results derived.

(a) The *theoretical* advantage of our approach is that an effort is made to identify the *causes* leading to a shadow sector and that *all factors* which can reasonably be assumed to have an influence are taken into account.¹³ The other approaches either do not use any information on the determinants of the shadow sector at all (e.g. Gutman 1979a, Feige 1979), or restrict it to the influence of taxation (e.g. Klovland 1980, Tanzi 1980a), i.e. to a factor which we have found to lead to a rather unconvincing ranking of countries (see Section II.1). The methods used by the other researchers require some rather strong assumptions. To name just one of the approaches: the monetary method¹⁴ used by Gutmann, Tanzi and Klovland has to make the quite dubious assumptions that underground activities exclusively use currency for transactions, i.e. the use of both cheques and barter¹⁵ is neglected, and that the velocity of circulation is the same in the official and the shadow sectors or has to be fixed *ad hoc* in each. Moreover, the estimates depend crucially on the base year chosen. If e.g. 1963 instead of 1974 is chosen in the case of the United Kingdom, the Gutmann method would reveal a negative black economy (O'Higgins 1982); the same vagueness applies to Feige's (1979) method (Tanzi 1980a, p. 37).

(b) The advantage of our approach from the point of view of *economic*

¹² Not to mention the data problems involved.

¹³ A further determinant which can be introduced as soon as internationally comparable data are available is the effectiveness of prosecution and the size of punishment of shadow market activities.

¹⁴ For critical evaluations see e.g. Garcia (1978), Feige (1982), and O'Higgins (1982).

¹⁵ According to some reports, barter increases strongly in some countries, especially the United States, because people want to evade taxation. See e.g. Intersocial 1980, p. 14.

policy making stems directly from the theoretical advantage. Only if the *causes* leading to the formation of a shadow economy are known it is reasonable to think about what should be done about it. The other studies are in this respect not very useful; they serve mainly to attract the attention of the public and politicians by showing that the shadow economy is of considerable size as compared to measured GNP. They do not, however, give any indication of how its size can be influenced by economic policy instruments.

(c) The empirical estimates derived on the basis of *other* methods have a very large range and should therefore not be taken at face value, as can be seen e.g. for the case of the United States, Sweden and Italy. For the *United States* the following estimates of the shadow economy (as percent of measured GNP) for the years indicated are available:

| | | |
|--|--------------|------------|
| Gutmann (1979) | 1976 | 10–14% |
| | 1978/79 | 10–14% |
| Internal Revenue Service (1979) | 1976 | 5.9–7.9% |
| | Feige (1979) | 1976 |
| | 1978 | 25.5–33.1% |
| Feige (1982) | 1979 | 27% |
| Tanzi (1980) increase since 1929 level | 1976 | 3.4–5.1% |
| | 1976 | 8.1–11.7% |

For 1976, the estimates range from 3.4% (Tanzi) to 21.7% (Feige) of GNP, a percentage point difference of over 18%. For 1978, the range is 10% (Gutmann) to 33% (Feige), i.e. a 23 percentage points difference.

For *Sweden*, the estimates of the size of the shadow sector as percent of official GNP presently available are:¹⁶

| | | |
|-------------------------|----------|----------------------------|
| Rikspolisstyrelsen | 1977 | 1.6–6.4% |
| Statistika Centralbyrån | 1978 | 4.6% |
| Riksskatteverk | late 70s | 8–15% (of declared income) |
| Sifo-Survey | 1979 | 0.5% |
| Hansson (1980) | late 70s | 5–9% |
| Klovland (1980) | 1978 | 6.9–17.2% |

The overall range is from 0.5% (Sifo), to 17.2% (Klovland) a percentage point difference of almost 17%.

For *Italy*, the following estimates of the shadow sector's share in GNP have been advanced:

| | | |
|---|------------|-------------|
| Central Statistical Office (see Martino 1980) | 1975–79 | Minimum 10% |
| De Grazia (1980) | late 1970s | 10–25% |
| Martino (1980) | late 70s | 25–33% |
| Contini (1981) | 1977 | 14–20% |

¹⁶ The first four estimates are reported by Hansson 1980, p. 579–599.

The estimates range from 10% (De Grazia) to 33% (Martino), with a percentage point difference of 23%.

Even if one compares the estimates using the *same* method only, the results differ widely. Taking as an example the most 'sophisticated' one, the currency-demand deposit ratio method, we find for the United States and the year 1978 estimates ranging from 3.4% (Tanzi 1980a) to 28% (Feige 1980) and for Sweden from 5% (Hansson 1980) to 17.2% (Klovland 1980).

It may be concluded that our approach based on relative estimates of the shadow economy's size and empirically identifying as many causal factors as possible gives at least as much information as the estimates based on seemingly more 'sophisticated' methods. Though specific percentage shares are offered there, their range is so large that it is not even possible to compare the estimates brought forward e.g. for the United States, Sweden and Italy. With our 'causal' approach, the hierarchy of the relative size of the shadow economy of OECD countries for 1975 shown in Table 5 can be determined. As soon as more reliable estimates are available, it is possible to indicate what "very large", "large", "small", and "very small" means in terms of the size of the shadow economy in relation to officially measured GNP. On the other hand, our hierarchy allows us to check whether empirical estimates offered for individual countries make sense relative to

TABLE 5
*Estimate of the relative size of the shadow economy for 1975
based on seven determinants.*

| | |
|---|--|
| very large | Netherlands Belgium |
| large | Austria Italy France |
| small | United Kingdom |
| very small | United States Finland Japan Switzerland |
| inconclusive (depends strongly on weighting of the determining factors) | Canada Sweden Denmark Norway Ireland Federal Republic of Germany Spain |

those advanced for other countries. In view of the fact that we expect the United States to have a very small shadow economy compared to other OECD countries the very high estimates advanced by Feige (1979, 1982) of up to 33% of GNP seem to be quite implausible.¹⁷ According to our hierarchy, the United Kingdom's and the United States' shadow economy should be of a roughly similar size, and if at all, the United Kingdom is expected to have a larger underground economy. This ranking does not seem to be unlikely because "...economists in Britain agree that the subterranean economy is larger than it is in the US" (*Business Week* 1978, p. 74). The estimates for the United States based on the 'sophisticated' currency-demand deposit ratio and the transaction methods—namely 10% to 33% of GNP in 1978—compared to estimates for the United Kingdom based on equally 'sophisticated' methods—namely 3½% to 7½ of GNP—suggest exactly the opposite ranking.

IV. What theory is needed?

Considering the various methodologies (including our own) used to estimate the shadow economy, one is reminded of Georg Christoph Lichtenberg's saying:

"Wir irren allesamt, nur jeder irrt anders".

What all approaches have in common is that a sound theoretical basis is missing. It is not sufficient just to measure the "traces" the shadow sector leaves, or to collect the influences which may cause a shadow economy to exist. What is needed is a model which clearly specifies the relationship between the official private, the shadow and the government sectors in the economy. If taxation and regulations are indeed important causal influences, it is necessary to show explicitly why and how government imposes taxes and regulations on the private sector, what the incentives are for people to move to the shadow economy, and what effect this has on the tax receipts. Such a model allows us to take implicitly into account that the factors here identified not only determine the formation of the shadow economy but that the shadow economy in turn influences these factors. In particular, the tax burden is a major determinant of the shadow economy due to the incentives created to evade to an untaxed sector, but an increasing shadow economy is also likely to lead to increased tax rates in the official economy because the political decision-makers try to increase tax revenues necessary for financing government expenditures. (An attempt to construct such a model is made by Frey and Weck 1982). It is necessary to specify what rules still obtain in the shadow economy, and what rules (e.g. the payment of taxes and social security contributions, working hours, employment security) no longer hold. The analysis must, moreover, not be restricted to the role of

¹⁷ This view is shared by Tanzi (1980b, p. 37); he even considers Gutmann's (1977) 10% estimate to be too high.

the burden of taxation and regulation, but must incorporate into the model the determinants and the effects of tax immorality and of tax perception, as well as of labour market conditions. Only when the relationship between these factors is established on the basis of a consistent model of human behaviour and institutional characteristics will it be possible to derive sound estimates of the shadow economy.

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APPENDIX

Determinants of the shadow economy: the data.

| Rank | Burden of | | | Tax | | | Labour market variables | | | | | |
|------|-------------------|------|------------------|-------------------------|------|----------------|-------------------------|------|-------------------|-----|-----------------|---------|
| | Taxation | | Regulation | immorality ⁸ | | Tax perception | Participation rate | | Unemployment rate | | | |
| | 1975 ¹ | (%) | 1975 | (%) | 1956 | (%) | 1975 | (%) | 1966 | (%) | 1975 | (hours) |
| 17 | S | 47.0 | UK | 7.7 | I | 17 | S | 20.8 | IRL | 5.8 | S ¹¹ | 30.9 |
| 16 | N | 47.0 | F | 6.8 | F | 14 | DK | 18.0 | CA | 5.3 | N ¹³ | 32.4 |
| 15 | NL | 46.2 | CA | 6.7 | SP | 12 | NL | 17.2 | IRL ¹⁰ | 36 | USA | 33.1 |
| 14 | DK | 42.4 | NL | 6.3 | B | 12 | N | 17.0 | SP | 38 | I | 33.9 |
| 13 | B | 39.3 | USA | 6.2 | FRG | 9 | B | 14.8 | A ⁹ | 40 | SF | 34.8 |
| 12 | A | 38.7 | FRG | 5.4 | A | 9 | CH | 10.3 | B | 41 | F | 38.4 |
| 11 | FRG | 38.3 | DK | 5.3 | NL | 9 | IRL | 10.1 | N | 43 | SP | 38.6 |
| 10 | SF | 37.8 | B ⁴ | 4.9 | USA | 6 | CA | 9.7 | FRG | 43 | B | 38.8 |
| 9 | F | 37.2 | A ⁵ | 4.7 | CA | 6 | A | 8.4 | F ⁹ | 43 | UK | 39.4 |
| 8 | UK | 36.0 | I | 4.6 | JAP | 6 | SP | 7.8 | CA ⁹ | 44 | NL | 39.5 |
| 7 | IRL | 33.1 | SP ⁶ | — | IRL | 6 | UK | 7.4 | USA | 45 | S | 40.5 |
| 6 | CA | 32.5 | S | 3.7 | N | 4 | SF | 7.0 | UK | 45 | A | 41.2 |
| 5 | I | 31.8 | JAP | 3.7 | S | 4 | I | 6.9 | CH ⁹ | 46 | DK | 41.3 |
| 4 | CH | 29.2 | N | 3.6 | DK | 4 | FRG | 6.9 | SF | 48 | FRG | 41.5 |
| 3 | USA | 27.5 | IRL ⁵ | 3.5 | SF | 4 | F | 6.3 | JAP | 49 | JAP | 41.7 |
| 2 | JAP | 22.1 | SF ⁷ | 2.8 | UK | 4 | JAP | 4.1 | DK | 49 | N | 42.7 |
| 1 | SP | 20.7 | CH | 2.7 | CH | 1 | USA | 2.7 | S | 50 | CH | 43.2 |

Notes

¹ Three-year averages.

² Public administration excluding armed forces. The data have been taken from the published national sources and the basic series for each country are summarized in the Statistical Appendix of the *Economic Bulletin for Europe* 30/2, United Nations, New York 1979, pp. 71-78. There exist differences in the specification of the public administration sector between countries; e.g. the figures for Finland include regular armed forces, those for Ireland include Garda Síochána (civil guard). While these deviations from the basic definitions are footnoted in national statistical sources, it is likely that others have gone unnoticed: national sources do not always give unambiguous definitions of the statistical categories employed, explanatory footnotes often being conspicuous by their absence (see *Economic Bulletin*, p. 71). Many uncertainties remain in the data and therefore the *absolute* values of the variables cannot be compared between countries. In order to minimize these problems, the *relative* size (rank) of the share of public administrators to total labour force is used in this study.

³ 1974.

⁴ 1972.

⁵ 1971. Including civil guard.

⁶ There are no data available for the employment in public administration sector for Spain. The rank has been determined on the basis of the ratio of total public sector employment to total labour force; see John P. Martin (1982, p. 31).

⁷ Public administration, including armed forces.

⁸ For the exact formulations of the questions used in the survey research for the United Kingdom, France, Italy, Spain, the Federal Republic of Germany and Switzerland see Beichler *et al.* (1969) and Strümpel (1966), where the limitations of this approach are discussed in detail. On the basis of the existing literature Tretter (1974) constructs a hierarchy of tax immorality for various countries which is used in this study. No comparable figures are available for the USA, Canada, Japan and Ireland; in order to minimize the effect on the total rankings, they are given an intermediate rank with respect to tax immorality.

⁹ 1976.

¹⁰ 1974.

¹¹ Calculated from hours per month.

¹² Hours paid for.

¹³ Calculated as weighted average from the separate figures for men and women.

¹⁴ Calculated from hours per day.

Sources of the data

Tax burden, change in tax burden:

OECD, Public Expenditure Trends, Paris 1978, p. 42.

Regulation: Employment in public administration

United Nations, *Economic Bulletin for Europe*, 30/2, New York 1979.

except Japan: Statistical Handbook of Japan, 1978.

Canada: Canada Year Book 1978-79.

Regulation: Total labour force

OECD, Labour Force Statistics, 1978.

Tax immorality

Tretter, Bertram. *Die Steuermentalität. Ein internationaler Vergleich*. Bunker & Hünblot, Berlin 1974.

Participation rate

Statistisches Bundesamt, Statistisches Jahrbuch der Bundesrepublik Deutschland, 1977, p. 602.

Unemployment rate

OECD, Labour Force Statistics, 1978.

Working time

ILO, Yearbook of Labour Statistics, 1977.

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THE ROLE OF THE FIRM IN WAGE DETERMINATION: AN AFRICAN CASE STUDY

By J. B. KNIGHT and R. H. SABOT

1. Introduction

To what extent are wages in a developing country determined by the personal characteristics of employees and to what extent by the characteristics of their employers? Insofar as employers play a role in wage determination, what are the firm characteristics which influence wages? These are the questions which we attempt to answer in this paper. We do so by means of an earnings function analysis of a sample drawn from the manufacturing sector of Tanzania. The establishment-based survey, conducted by one of the authors in 1971, covers about 1,000 employees in some 47 firms in Dar es Salaam.¹ Information was gathered² on the characteristics of the 24 larger firms (those with 50 or more employees), accounting for a total of 660 sampled employees. This permits the simultaneous analysis of the influence on wages of both personal and firm characteristics.

Theories of wage determination focusing on individual productive characteristics and those focusing on group affiliation differ in their assumptions about the behaviour of the labour market. In a perfectly competitive labour market group affiliation does not influence wages. Irrespective of differences among groups of workers in goods produced, in the technology or organization used to produce them, in the ownership or profitability of such production, its scale or its location, competition in the labour market will ensure that all workers with the same personal economic characteristics receive the same rate of pay. Differences in pay arise only if employers discriminate among workers on the basis of personal non-economic characteristics or if the desirability of employment varies among different jobs. Implicit in theories of wage determination that emphasize group affiliation is the assumption of labour market imperfections. Non-market forces which, directly or by restricting labour mobility, cause wages to depart from the competitive level, must be sufficiently powerful to prevent competition in the market from eroding wage differentials among homogeneous workers.

In Section 2 we sketch out various arguments, relating to the characteristics of firms, which could explain why group affiliation of this type matters.

¹ A sample of 44 manufacturing firms was randomly selected from a comprehensive Central Bureau of Statistics list of firms in Dar es Salaam, stratified by three size categories, 1-10, 10-49, and 50-499 employees. In each firm a sample of one third of the labour force or 30 workers, whichever was smaller, was randomly selected from a complete list of the firm's employees. In addition, 60 employees were interviewed in 3 of the 6 manufacturing firms in Dar es Salaam which employed 500 or more workers. Detailed interviews were conducted with each of the sampled employees; in total 986 employees were interviewed.

² From the 1971 Industrial Census return of each sampled firm.