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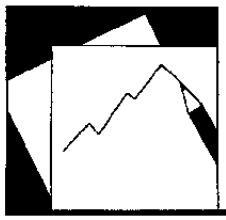

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Shadow Economies Around the World: Size, Causes, and Consequences

Friedrich Schneider and Dominik Enste

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Shadow Economies Around the World: Size, Causes, and Consequences

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Abstract

This paper presents estimates of the size of the shadow economy in 76 developing, transition, and OECD countries, which are derived by combining figures from different estimation methods. We describe and discuss the strengths and weaknesses of the different estimation methods. We find that the growth of the shadow economy—which is now remarkably large in the 76 countries—is strongly related to increasing burdens of taxation and social security contributions, as well as to the extent of state regulatory activities. Rising corruption also has a clearly positive impact on the growth of the shadow economy.

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I. INTRODUCTION

Crime and shadow economic activities are a fact of life around the world, and almost all societies engage in trying to control these activities through education, punishment, or prosecution. Gathering statistics about who is active in the shadow economy activities, the frequency with which underground activities occur and the magnitude of these activities, is crucial for making effective and efficient decisions regarding allocating resources in this area. Obviously it is difficult to get accurate information about underground or shadow economy activities because individuals engaged in these activities wish to remain unidentified. Hence, estimation of shadow economy activities can be considered as a scientific passion for knowing the unknowable.

Although quite a large literature[2] on certain aspects of hidden economies exists, a comprehensive survey is missing. Moreover, the subject is still quite controversial[3] and there are disagreements about the definition of shadow economy activities, the estimation procedures and the use of estimates in economic analysis and policy making.[4] Nevertheless, around the world, there are strong indications for an overall increase of the shadow economy. The size, the causes, and the consequences are different for different types of countries, but there are some comparisons that can be made and that might be interesting for social scientist, and helpful for politicians who need to deal with this phenomenon.

These attempts at measurement are obviously problematic, since shadow economy activities are performed in such a way as to avoid any official detection. Moreover, if you ask an academic, a public sector specialist, a policy or economic analyst, or a politician, what is going on in the shadow economy, and even just how big it is, you will get a wide range of answers. In spite of this, there is growing concern over the phenomenon of the shadow economy, and there are several important reasons why politicians and public sector workers should be especially worried about the rise and growth of the shadow economy.

Among the most important of these are:

- If an increase of the shadow economy is caused mainly by a rise in the overall tax and social security burden, this may lead to an erosion of the tax and social security bases and finally to

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[2] The literature about the "shadow," "underground," "informal," "second" or "parallel," economy is dramatically increasing. Various topics, on how to measure it, its causes, its effect on the official economy are analyzed (see e.g., the first publications by Tanzi (1982); Frey and Pommerehne (1984); and Feige (1989); the latest (survey type) publications by Thomas (1992); Loayza (1996); Pozo (1996); Lippert and Walker (1997); Schneider (1994a, 1994b, 1997, 1998a); Johnson, Kaufmann, and Shleifer (1997); and Johnson, Kaufmann and Zoido-Lobatón (1998a); although an overall survey of the global evidence of its size and of its impact is missing.

[3] Compare with the feature "Controversy: On the Hidden Economy," in the *Economic Journal*, Vol. 109, No. 456, June 1999.

[4] Compare the different opinions of Tanzi (1999); Thomas (1999); and Giles (1999).

a decrease in tax receipts, and thus to a further increase in the budget deficit or to a further increase of tax rates with the consequence of an additional increase in the shadow economy, and so on. Therefore, a growing shadow economy can be seen as a reaction by individuals who feel overburdened by state activities.

- With a growing shadow economy, (economic) policy is based on erroneous "official" indicators (like unemployment, official labor force, income, consumption), or at least indicators that are inaccurate in magnitude. In such a situation, a prospering shadow economy may cause politicians severe difficulties because it provides unreliable official indicators, and the direction of intended policy measures may therefore be questionable.

- On the one hand, a growing shadow economy may provide strong incentives to attract (domestic and foreign) workers away from the official economy. On the other hand, at least two-thirds of the income earned in the shadow economy is immediately spent in the official economy[5] resulting in a considerable (positive) stimulating effect on the official economy.

These growing concerns, and the scientific fascination of the underground economy, has inspired the authors to undertake the challenging task of collecting all available data (including own calculations) on the shadow economy, so that the development and size of the shadow economy over an extended period of time, and for as many countries as possible, can be shown. In Section 2 an attempt is made to define shadow economy activities. Section 3 presents the empirical results of the size of the shadow economy over 76 countries spanning all the regions of the globe. In Section 4 we examine the main causes of the shadow economy and in Section 5 we analyze the interactions of the official and unofficial economies. Section 6 provides a preliminary analysis of the link between corruption and the shadow economy and in Section 7 the various methods to estimate the size of the shadow economy are presented. In Section 8 more detailed empirical findings for OECD countries are shown and finally, in Section 9, a summary is given and some conclusions are drawn.

II. What is the Shadow Economy?

Studies trying to measure the shadow economy first face the difficulty of defining it. For instance, one commonly used definition is the shadow economy includes all currently economic activities which contribute to the officially calculated (or observed) Gross National Product.[6] However, Smith (1994, p. 18) defines it as "market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP." As these

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[5] This figure has been derived from polls of the German and Austrian population about the (effects of) the shadow economy. For further information, see Schneider (1998b). These polls also show that two-thirds of the value added produced in the shadow economy would not be produced in the official economy if the shadow economy did not exist.

[6] This definition is used, e.g., by Feige (1989, 1994); Schneider (1994a); Frey and Pommerehne (1984); and Lubell (1991).

definitions leave open a lot of questions, Table 1 may be helpful for developing a better feeling for what could be a reasonable consensus definition of the legal and illegal underground or shadow economy.

Table 1: A Taxonomy of Types of Underground Economic Activities[1]

Type of Activity	**Monetary Transactions**		**Nonmonetary Transactions**	
ILLEGAL ACTIVITIES	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling, and fraud		Barter: drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	**Tax Avoidance**	**Tax Evasion**	**Tax Avoidance**
LEGAL ACTIVITIES	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

[1] Structure of the table taken from Lippert and Walker (1997, p. 5), with additional remarks.

From Table 1 it becomes clear that the shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions—hence, all economic activities which would generally be taxable were they reported to the tax authorities. In general, a precise definition seems quite difficult, if not impossible, as "the shadow economy develops all the time according to the 'principle of running water': it adjusts to changes in taxes, to sanctions from the tax authorities and to general moral attitudes, etc." (Mogensen, et al. 1995 p. 5).[7] Our survey does not focus on tax evasion or tax compliance. It rather serves as a supplement to the recent survey of Andreoni, Erard, and Feinstein (1998, p.819), who excluded the shadow economy: "Unfortunately, there are many important issues that we do not have room to discuss, most notably the vast literature on the underground economy which exists in part as a means of evading taxes."[8]

[7] For a detailed discussion, see Frey and Pommerehne (1984); Feige (1989); Thomas (1992); and Schneider (1986, 1994a, and 1998a).

[8] Compare also Feinstein (1999), who tries to close the gap between tax evasion and shadow economy research.

III. How large is the Shadow Economy? Findings for 76 Countries

For single countries and sometimes for a group of countries (like the OECD or transition countries), research has been undertaken to estimate the size of the shadow economy[9]. Until now, there has not been a consistent comparison of estimates of the size of the shadow economies of various countries, for a fixed period, generated using similar methods, which will be discussed in Chapter 7.[10] In Tables 2 to 4, such an attempt is made by reporting the results for the shadow economy for 76 countries for the periods 1989–90 and 1990–93 using the physical input (electricity) method, the currency demand approach, and the model (MIMIC) approach. At this point, however, at least two methods have not been applied to all 76 countries, so that a comparison of the size of the shadow economy between countries remains crude where different methods were not used.[11]

A. Developing Countries

The physical input (electricity) method, the currency demand and the model approach were applied for selected developing countries. The results are shown in Table 2. The physical input, the currency demand, and MIMIC methods have been used for Central and South America. In Africa, the results from eight countries are reported. Nigeria and Egypt have the largest shadow economies with 76 percent and 68 percent of GDP, the smallest is Mauritius with 20 percent. Applying the currency demand approach, Tanzania had a shadow economy of 31 percent (of GDP) in 1989–90 and South Africa, a western-type industrial country, had a shadow economy of 9 percent in 1989–90.[12]

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[9] Recently, Pozo (1996); Loayza (1996); Lippert and Walker (1997); Schneider (1998a) and Lacko (1999).

[10] The physical input (electricity) and the currency demand methods are comparable because both assume an excessive use of a source (electricity and cash, respectively) for shadow economy activities, and in both potential GDP is calculated. These two methods are also used in a comparable way by Lackó (1996, 1997a, 1997b); Portes (1996); and Johnson, Kaufmann, and Zoido-Lobatón (1998a, 1998b), who even calculate one shadow economy series of these two methods for a cross-section country sample.

[11] One should be aware that such country comparisons give only a very rough picture of the ranking of the size of the shadow economy over the countries, because each method has shortcomings. See, e.g., Thomas (1992, 1999); and Tanzi (1999). A least in this comparison the same time periods (either 1989–90 or 1990–93) are used for all countries. If possible, the values were calculated as averages over the period 1989–90 or 1990–93, respectively.

[12] The ranking of the size of the shadow economy for the African countries is supported by similar findings and anecdotal evidence from Lubbel (1991); Chickering and Salahdine (1991); and Pozo (1996).

Table 2: The Size of the Shadow Economy in Developing Countries

	Size of the Shadow Economy (In percent of GDP)			
	Physical Input (Electricity) Method Average 1989–90	Currency Demand Approach Average 1989–90	MIMIC Approach Average 1990–93	
Africa				
Botswana	27.0		-	
Egypt	68.0	-	-	
Mauritius	20.0	-	-	
Morocco	39.0	-	-	
Nigeria	76.0	-	-	
South Africa	-	9.0[1]	-	
Tanzania	-	31.0[2]	-	
Tunisia	45.0	-	-	
Central and South America				
Argentina	-	-	21.8	
Bolivia	-	-	65.6	
Brazil	29.0	-	37.8	
Chile	37.0	-	18.2	
Colombia	25.0	-	35.1	
Costa Rica	34.0	-	23.2	
Ecuador	-	-	31.2	
Guatemala	61.0	-	50.4	
Honduras	-	-	46.7	
Mexico	49.0	33.0[3]	27.1	(35.1)[3]
Panama	40.0	-	62.1	
Paraguay	27.0	-	-	
Peru	44.0	-	57.4	
Uruguay	35.2	-	-	
Venezuela	30.0	-	30.8	
Asia				
Cyprus	21.0	-	-	
Hong Kong	13.0	-	-	
India	-	22.4[4]	-	
Israel	29.0	-	-	
Malaysia	39.0	-	-	
Philippines	50.0	-	-	
Singapore	13.0	-	-	
South Korea	38.0	-	20.3[5]	
Sri Lanka	40.0	-	-	
Taiwan	-	14.9	16.5[5]	
Thailand	71.0	-	-	

Sources: Own values for developing countries in Africa and Asia from Lackó (1996, Table 18). For Central and South America from Loayza (1996). A slash means that there exists no value for this period for this country.

[1] Source: For South Africa: Van der Berg (1990) and Hartzenburg and Leimann (1992), used the currency demand approach.

[2] Source: For Tanzania Bagachwa, and Naho (1995, p. 1394), used the currency demand approach.

[3] For Mexico Pozo (1996) estimates the size of the shadow economy (in percent of GDP): 33 percent(1989–90) and 35.1 percent (1990–93) using the currency demand approach.

[4] Own calculations using the absolute figures of Bhattagharyya (1999).

[5] For Taiwan the income discrepancy method is used also for South Korea for 1990–93. Source Yoo and Hyun (1998).

For Central and South American countries, we have two estimates—one using the physical input method (Lackó, 1996) and one from the MIMIC approach (Loayza, 1996). For some countries, the estimates of the size of the shadow economy are quite similar, such as Venezuela, Brazil, and Guatemala. For others, there are great differences, for example, Panama, Peru, and Mexico. Using the MIMIC approach for a ranking of the South American countries, the biggest shadow economies can be found in Bolivia with 65.6 percent of GDP, Panama with 62.1 percent of GDP, Peru with 57.4 percent of GDP, and Guatemala with 50.4 percent of GDP. The lowest can be found in Costa Rica with 23.2 percent of GDP, Argentina with 21.8 percent of GDP, and Chile with 18.2 percent of GDP (all over the period 1990–93).[13] In Asia, Thailand ranks number one with 71 percent of GDP, followed by the Philippines with 50 percent of GDP, and Sri Lanka with 40 percent of GDP. Hong Kong and Singapore rank lowest, with a shadow economy of 13 percent GDP.[14] In general, the size of the shadow economies of some developing countries is quite large and one may ask what has really been measured. It is possible that these estimates represent a "parallel" or second economy, which has not been adequately captured by official statistics.

B. Transition Countries

The physical input (electricity) method has been applied to the transition countries in Central and Eastern Europe, and to states of the former Soviet Union. The results are shown in Table 3; they cover the periods 1989–90, 1990–93 and 1994–95.[15] Considering the physical input method by Johnson et al. (the Lacko values) and the countries of the former Soviet Union over the period 1990–93,[16] Georgia has the largest shadow economy with 43.6 (50.8) percent of the GDP, followed by Azerbaijan with 33.8 (41) percent of GDP and Moldova 29.1 percent of GDP. Russia can be found in middle, with a shadow economy of 27 (36.9) percent of GDP. According to the Johnson et al. figures Belarus with 14 percent of GDP and Uzbekistan with 10.3 percent of GDP have the smallest values. Except Uzbekistan (only for the Johnson figures), all other former Soviet Union countries experienced a strong increase in their shadow economies, from an average of 25.7 percent of GDP (Lacko value: 34.9) for 1990–93 to 35.3 percent of GDP (Lacko value: 43.6) for 1994–95, calculated over all 12 countries of the former Soviet Union. Turning to the transition countries of Central and Eastern Europe, and considering the period 1990–93 and

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[13] The ranking of the size of the shadow economies of Central and South America is supported by similar findings in Pozo (1996); Lippert and Walker (1997); and Lubbel (1991). For Mexico, the results from all three methods are shown. Whereas the MIMIC approach and the currency demand method are in a similar range (27.1 percent of GDP, 35.1 percent of GDP, respectively); the physical impact measure provides a size of 49.1 percent of GDP, far above the other two.

[14] Chickering and Salahdine (1991); and Lubbel (1991) reach a similar conclusion.

[15] For the first period, 1989-90, the results can only be seen as very crude ones, because the collapse of the communist regimes took place in the years 1989 and 1990.

[16] The period 1989-90 is not discussed here, because in this period the former Soviet Union was breaking up.

the Johnson et al. estimates, Hungary has the largest shadow economy, with 30.7 percent of the GDP followed by Bulgaria with 26.3 percent of GDP. The smallest two are the Czech Republic with 13.4 percent of GDP and Slovakia with 14.2 percent of GDP. Considering the Lackó figures Macedonia has the largest shadow economy with 40.4 percent of GDP, followed by Croatia with 39 percent of GDP. According to Lackó the lowest two are Slovenia, with 28.5 percent of GDP and the Czech Republic with 28.7 percent of GDP. Whereas for the former Soviet Union countries a strong increase over the two periods 1990–93 and 1994–95 has been observed, the average size of the shadow economy of Central and Eastern European states was almost stable over these two periods. The Johnson et al. figures show an average shadow economy of the Central and Eastern European states of 20.6 percent of GDP (Lacko 32.4) over 1990–93; over the period 1994–95, Johnson et al. show an average size of the shadow economy of the Central and Eastern European states of 20.9 percent of GDP (Lacko 31.6).[17]

C. OECD Countries

For the 21 OECD western-type countries, either the currency demand method or the physical input method were used. For the currency demand method, two series of figures are shown—one from Schneider and one obtained from Johnson, Kaufmann, and Zoido-Lobatón (1998a, 1998b).[18]

Considering the period 1990–93 and using the series by Johnson et al., where estimates of the shadow economy for most OECD countries are available (20 out of the 21 investigated countries), the southern European countries have the largest shadow economies: Greece (27.2 percent of GDP), Italy (20.4 percent of GDP), Spain (16.1 percent of GDP), and Portugal (15.6 percent of GDP). A similar result can be found by using figures of Schneider, and, to a lesser extent, the ones achieved by the physical input (electricity) method by Lackó (1997b). At the lower end, Johnson et al. rank Switzerland (6.9 percent of GDP), Norway (5.9 percent of GDP), and Austria (5.8 percent of GDP); whereas Schneider finds the United States (8.2 percent of GDP), Switzerland (6.9 percent of GDP), and Austria (6.1 percent of GDP). In general, this ranking of the size of the shadow economies of the OECD countries calculated by Schneider is

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[17] If one compares the results of Johnson et al. with those of Lacko, one realizes that Lacko gets, on average, a much higher value of the shadow economy for former Soviet Union countries and Central and Eastern European countries. One reason for this may be that Lacko uses an econometric estimation of household electricity consumption whereas Johnson et al. calculate their figures from a macro (overall electricity-consumption) approach.

[18] The main difference between the two series is that Johnson, Kaufmann, and Zoido-Lobatón (1998a, 1998b) use average values of the size of the shadow economy of a country coming from different sources, if a monetary approach was applied, whereas in Schneider the currency-demand approach is used for these countries and only one value for that year (or an average over a time period) is used. The problem with using averages from various sources is (a) that the time period is greater (1985–95), and (b) the specification of the monetary approaches from different authors may be quite different.

supported by other studies.[19] Due to the different calculation approaches for the two monetary series, considerable differences between the size of the shadow economy for some countries show up. But for other countries, the differences are quite small.

Table 3: The Size of the Shadow Economy in Transition Countries
(In percent of GDP)

	Physical Input (Electricity) Method using values from Johnson et al. (1997) and values in "( )" from Lacko (1999)					
	Average 1989–90		Average 1990–93		Average 1994–95	
Former Soviet Union[1]						
Azerbaijan	21.9	(-)	33.8	(41.0)	59.3	(49.1)
Belarus	15.4	(-)	14.0	(31.7)	19.1	(45.4)
Estonia	19.9	(19.5)	23.9	(35.9)	18.5	(37.0)
Georgia	24.9	(-)	43.6	(50.8)	63.0	(62.1)
Kazakhstan	17.0	(13.0)	22.2	(29.8)	34.2	(38.2)
Kyrgyzstan	-	(13.9)	-	(27.1)	-	(35.7)
Latvia	12.8	(18.4)	24.3	(32.2)	34.8	(43.4)
Lithuania	11.3	(19.0)	26.0	(38.1)	25.2	(47.0)
Moldavia	18.1	(-)	29.1	(-)	37.7	(-)
Russia	14.7	(-)	27.0	(36.9)	41.0	(39.2)
Ukraine	16.3	(-)	28.4	(37.5)	47.3	(53.7)
Uzbekistan	11.4	(13.9)	10.3	(23.3)	8.0	(29.5)
Average	16.7	(16.2)	25.7	(34.9)	35.3	(43.6)
Central and Eastern Europe						
Bulgaria	24.0	(26.1)	26.3	(32.7)	32.7	(35.0)
Croatia	22.8[2]	(-)	23.5[2]	(39.0)	28.5[2]	(38.2)
Czech Republic	6.4	(23.0)	13.4	(28.7)	14.5	(23.2)
Hungary	27.5	(25.1)	30.7	(30.9)	28.4	(30.5)
Macedonia	-	(-)	-	(40.4)	-	(46.5)
Poland	17.7	(27.2)	20.3	(31.8)	13.9	(25.9)
Romania	18.0	(20.9)	16.0	(29.0)	18.3	(31.3)
Slovakia	6.9	(23.0)	14.2	(30.6)	10.2	(30.2)
Slovenia	-	(26.8)	-	(28.5)	-	(24.0)
Average	17.6	(17.6)	20.6	(32.4)	20.9	(31.6)

Sources: Own calculations, using values of Johnson, Kaufmann, and Shleifer (1997, Table 1, p. 182–83); Johnson, Kaufmann, and Zoida-Lobatón (1998a, p. 351) and for the values in ( ) Lacko (1999, Table 8).
[1] For the former Soviet Union in the column 1989–90, only data for 1990 was available using the source from Johnson et al. (1997).
[2] For Croatia, see Madzarevic and Milkulic (1997, Table 9, page 17), who used the discrepancy method.

[19] See Frey and Pommerehne (1984); Frey and Weck-Hannemann (1984); Williams and Windebank (1995); Thomas (1992); and Lippert and Walker (1997); who reach quite similar rankings.

Table 4: The Size of the Shadow Economy in OECD Countries

	Size of the Shadow Economy (in percent of GDP) using:			
	Physical Input (Electricity) Method Year 1990	Currency Demand Method Schneider figures Average 1989/90	Currency Demand Method Schneider figures Average 1990/93	Currency Demand Method Johnson et al. Figures Average 1990/93
Australia	15.3	10.1	13.0	13.1
Austria	15.5	5.1	6.1	5.8
Belgium	19.8	19.3	20.8	15.3
Canada	11.7	12.8	13.5	10.0
Denmark	16.9	10.8	15.0	9.4
Finland	13.3	-	-	-
France	12.3	9.0	13.8	10.4
Germany	14.6	11.8	12.5	10.5
Great Britain	13.1	9.6	11.2	7.2
Greece	21.8	-	-	27.2
Ireland	20.6	11.0	14.2	7.8
Italy	19.6	22.8	24.0	20.4
Japan	13.2	-	-	8.5
Netherlands	13.4	11.9	12.7	11.8
New Zealand[1]	-	9.2	9.0	9.0
Norway	9.3	14.8	16.7	5.9
Portugal	16.8	-	-	15.6
Spain[2]	22.9	16.1	17.3	16.1
Sweden	11.0	15.8	17.0	10.6
Switzerland	10.2	6.7	6.9	6.9
United States	10.5	6.7	8.2	13.9
Average	15.1	11.9	13.5	11.3

Sources: Physical input method, Lackó (1996, 1997a, 1997b, 1999). Currency demand approach, Schneider (1994a, 1998a); Johnson, Kaufmann, and Zoida-Lobatón (1998a/b); and Williams and Windebank (1995).
1 The figures are calculated using the MIMIC method and currency demand approach. Source Giles (1999b).
2 The figures have been taken from Mauleon (1998).

Table 5: A Comparison of Johnson et al.'s and Schneider's Findings Using the Currency Demand Approach

Size of the Shadow Economy (in percent of GDP) (1989–90) Using the Currency Demand Approach			**Absolute Differences Between the Two Approaches**
Country	**Johnson et al. Figures**	**Schneider Figures**	
Ireland	7.8	14.2	6.4
Great Britain	7.2	11.2	4.0
Norway	9.9	16.7	6.8
Spain	16.1	17.3	1.2
The Netherlands	11.8	12.7	0.9
Germany	10.5	12.5	2.0

Source: own calculations.

Comparing the values obtained by the currency demand approach with those from the electricity approach, there are considerable differences with respect to the average shadow economy (cd 12.3 percent of GDP and el 15.4 percent of GDP) and with respect to size of the single countries:

Table 6: A Comparison of the Currency Demand and the Electricity Approach

Size of the Shadow Economy (in percent of GDP) 1989–90			Absolute Differences Between the Two Approaches
Country	Currency Demand Approach (Schneider figures)	Electricity Approach (Lacko (1999) figures)	
Austria	5.1	15.5	10.4
Ireland	11.0	20.6	9.6
Spain	16.1	22.9	6.8
United States	6.1	10.5	4.4

Source: our calculations

Which method is more reliable is an open question. But it seems that the electricity approach is problematic when applied to western OECD countries, because of the level of technical progress in the use of electricity.

In Table 7, the latest results are shown for OECD countries over the period 1994–95, and for the period 1996–97. In principle, the ranking of the sizes of the shadow economies of the results are similar to the ones in Table 4. However, the shadow economy has increased compared to the results of the period 1990–93 in all OECD countries; whereas the average size of the shadow economy of the investigated OECD countries was 13.5 percent of the GDP in 1990–93, this value increased to 16 percent of GDP in the years 1994–95. A further increase can be observed

for the investigated OECD countries to 16.9 percent of GDP for the period 1996–97. From these results, it is obvious that even in the late 1990s, the shadow economy is still growing in most OECD countries.

Table 7: Size of the Shadow Economy of OECD Countries 1994–97

	Size of the Shadow Economy (in percent of GDP) using Currency Demand Approach	
	Average 1994–95	Average 1996–97
Australia	13.8	13.9
Austria	7.0	8.6
Belgium	21.5	22.2
Canada	14.8	14.9
Denmark	17.8	18.2
France	14.5	14.8
Germany	13.5	14.8
Great Britain	12.5	13.0
Greece	29.6	30.1
Ireland	15.4	16.0
Italy	26.0	27.2
Japan	10.6	11.3
Netherlands	13.7	13.8
New Zealand[1]	11.3	-
Norway	18.2	19.4
Portugal	22.1	22.8
Spain	22.4	23.0
Sweden	18.6	19.5
Switzerland	6.7	7.8
United States	9.2	8.8
Average	16.0	16.9

Sources: Own calculations, using the data by Schneider (1998a); and Schneider and Pöll (1998).
[1] Only 1994, source Giles (1999b).

Average size of the shadow economy in developing, transition, and OECD countries

If one finally compares the average sizes of the shadow economies for the three types of countries, one gets the following results:

Table 8: Average Size of the Shadow Economy for Developing, Transition, and OECD Countries

Countries (Estimation method)	Average Size of the Shadow Economy (in percent of GDP) 1989–93	
Developing countries		
(Electricity method)		
Africa[1]	43.9	(39.4)
Central and South America	38.9	
Asia	35.0	
Transition countries		
(Electricity method)		
Former Soviet Union[2]	25.7	34.9
Eastern Europe[2]	20.7	32.4
OECD countries		
(Electricity Method)	15.1	
Currency Demand Method	11.9	

Source: own calculations, using Tables 2–4.
[1] Including South Africa.
[2] Using the values from Lackó (1999) over 1990–93.

A comparison of the size of the shadow economy between the various countries and types of countries is very difficult. Only a "crude" comparison can be made, because in the collected studies (i) different independent variables (e.g., tax variables) and (ii) different specifications of the dependent variable and of estimation equations were used; (iii) different assumptions about the velocity of currency are made, and (iv) different additional influences on the electricity consumption were used. As can be seen from the Table 8, the developing countries have by far the largest average shadow economies, between 35 and 44 percent of GDP, followed by the transition countries, between 20.7 percent of GDP and 34.9 percent of GDP, and finally the OECD countries with an average shadow economy of 15.1 percent of GDP using the electricity approach and 11.9 percent of GDP using the currency demand approach. But it needs to be pointed out that this comparison can only give some general hints, since the methods, statistical approaches, and specifications are quite different in the various studies.

D. Some Remarks on a Shadow Economy Labor Force

Having extensively examined the size and rise of the shadow economy in terms of value added over time, the analysis in this last section focuses on the "shadow" labor market. Within the

official labor market, there is a particularly close contact among those people who are active in the shadow economy.[20] Moreover, every shadow economic activity involves the labor market to some extent: Hence, the "shadow labor market" includes all cases where the employees or the employers, or both, occupy a "shadow economy position ." This is true regardless of whether such employees or employers also have official (legal) position, as long as the production is for the market.

Why do people work in the shadow economy? In the official labor market, the costs that firms (and individuals) have to pay when "officially" hiring someone are tremendously increased by the burden of taxes and social security contributions, as well as the legal administrative regulation to control economic activity.[21] In various OECD countries, these costs are (sometimes) greater than the wage effectively earned by the worker—providing a strong incentive to work in the shadow economy.[22] The underground use of labor may consist of a second job after (or even during) regular working hours. A second form is shadow economy work by individuals who do not participate in the official labor market. A third component is the employment of people (e.g., clandestine or illegal immigrants), who are not allowed to work in the official economy.

Gathering info about the nature and size of the shadow economy labor force is as difficult as researching the shadow economy's value added. The few existing results are shown in Table 9 for western-type OECD countries.[23] The figures in Table 9 give a rough idea of the size of the shadow labor force, for example, the results for Denmark show that the population of adults engaged in the shadow economy ranged from 8.3 percent (of the total labor force) in 1980 to 15.4 percent in 1994. In Germany, this figure rose from 8 percent-12 percent in 1974–82 to 22 percent in 1998. This constitutes a very strong increase for both countries. In other countries, the size of the shadow economy labor force is quite large, as well: in Italy, 30–48 percent (1997); Spain, 11.5–32.3 percent (1997–98); Sweden, 19.8 percent (1997) and France, 6–12 percent (1997–98). In the European Union, 10 million are at least engaged in shadow economy activities; in all OECD countries, about 16 million work "black" (illicit/ irregular/ unofficial). These figures demonstrate that the shadow economy labor force is quite active and may provide an explanation of why, for example, in Germany, we observe such high and persistent unemployment rates.

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[20] Pioneering work in this area has been done by L. Frey (1972, 1975, 1978, 1980); Cappiello (1986); Lubell (1991); Pozo (1996); Bartlett (1998) and Tanzi (1999).

[21] This is especially true in Europe (e.g. in Germany and Austria), where the total tax and social security burden adds up to 100 percent on top of the wage revenue effectively earned. See also Section IV. B.

[22] See Dallago (1985, 1990).

[23] For developing countries some literature about the shadow labor market exists, e.g., the latest works by Dallago (1990); Pozo (1996); Loayza (1996); and especially Chickering and Salahdine (1991).

Table 9: Estimates of the Size of the Shadow Economy Labor Force in Some OECD Countries 1974–98

Countries	Year	Participants, in 1,000 People[1]	Participants, in Percent of Labor Force[2]	Size of the Shadow Economy (in percent of GDP), Currency Demand Approach[3]	Sources of the Figures for the Participants
Austria	90–91 97–98	300 500	9.6 16.0	5.47 8.93	Schneider (1998)
Denmark	1980 1986 1991 1994	- - - -	8.3 13.0 14.3 15.4	8.6 - 11.2 17.6	Mogensen, et al. (1995)
France	1975-82 1997-98	800-1500 1400-3200	3.0-6.0 6.0-12.0	6.9 14.7	De Grazia (1983) and own calculations
Germany	1974-82 1997–98	2000–3000 5000	8.0–12.0 22.0	10.6 14.7	De Grazia (1983) F. Schneider (1998b)
Italy	1979 1997	4000–7000 6600–11400	20.0–35.0 30.0–48.0	16.7 27.3	Gaetani and d'Aragona (1979) own calculations
Spain	1979–80 1997–98	1250–3500 1500–4200	9.6–26.5 11.5–32.3	19.0 23.1	Ruesga (1984) own calculations
Sweden	1978 1997	750 1150	13.0–14.0 19.8	13.0 19.8	De Grazia (1983) and own calculations
European Union	1978 1997–98	10 000 20 000	-	14.5	De Grazia (1983) and own calculations
OECD	1978 1997–98	16 000 35 000	-	15.0	De Grazia (1983) and own calculations

[1] Estimated full-time jobs, including unregistered workers, illegal immigrants, and second jobs.
[2] In percent of the population aged 20–69, survey method. In Denmark; in percent of the population aged 20–69, survey method (percent of heavily engaged in shadow economy activities).
[3] Source of size of shadow economy: Schneider (1994a, 1998b, 1999).

IV. What are the Main Causes of the Increase in the Shadow Economy?

A. Macroeconomic and Microeconomic Approaches

In the economic literature on the shadow economy, two main approaches can be found to analyze the causes of the shadow economy. One is based on macroeconomic theories like the theory of

growth, and the other is based on microeconomic theory like the neoclassical leisure-income model.[24]

A recent macroeconomic analysis of some of the causes for the increase of the shadow economy is given by Loayza (1996). He presents a simple macroeconomic endogenous growth model whose production technology depends on congestable public services. The determinants and effects of excessive taxes and regulations on the informal sector are studied in areas where the government lacks the capability to enforce compliance. His empirical approach treats the informal sector as an unobserved variable for which multiple causes and multiple indicators exist and he uses the Multiple-Indicator-Multiple-Cause (MIMIC) model. He estimates the size of the informal sector in 14 Latin American countries and finds some evidence for three determinants being significantly relevant at the 10 percent confidence level. Tax burden (0.33) and labor-market restrictions (0.49) affect the relative size of the informal sector positively, while the strength and efficiency (−0.42) of the institutions of government demonstrate a negative influence.[25] These three causes are among those mentioned often in the analysis of causes of the increase in the shadow economy.

Because macroeconomic approaches can often only show statistical correlation rather than causal relations, they cannot provide answers to questions like: Why do people choose to work in the shadow economy? What other factors (besides income motive) cause an increase of informal activities? Can other theories provide further help in determining relevant factors?[26] Because only individuals can choose, according to methodological individualism, it might be helpful to have a closer look at the individual decision process.

Finding out determinants of a household's shadow economy activities presents a similar problem handled in the first study by Allingham and Sandmo (1972), namely that of discovering how much of its a households income is declared to the tax authorities.[27] Neck, Schneider, and Hofreither (1989), who developed the micro economic model of shadow economic activities investigated the determinants of a household's supply of underground labor and its demand for

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[24] A brilliant overview of the theoretical approaches is given in Thomas (1992).

[25] The numbers indicate the change of the size of the informal sector (in standard-deviation) with a one-standard deviation increase in each of the determinants.

[26] Other theories cover the area for micro-sociological and psychological approaches. The preferences of individuals, which are assumed to be stable, are the starting point of these approaches. In an interdisciplinary approach (like undertaken in economic psychology), variables such as tax morale, which was first discussed by Schmölders (1960, 1975), are included in these approaches. An interdisciplinary approach which is necessary for a successful analysis, would also consider factors like acceptance and perceived fairness of the tax system and the tax morale. However, as this paper concentrates on economic factors, we will focus on economic reasoning.

[27] For a comprehensive review of the literature, see Cowel (1998); Neck, Schneider and Hofreither (1989); and Feinstein (1999).

underground goods. Among other results, they showed that, at least under an additive-separable utility function and with a two-stage decision of the consumer, higher marginal income tax rates imply a higher supply of underground labor, and higher wage rates in the official economy imply a lower supply of underground labor. On the other hand, they showed that the firms' demand for underground labor and supply of underground goods depends positively on the indirect tax rate and on the wage rate in the official economy, at least under the assumption of fixed nonhuman factors of a production and separate production functions for official and underground goods. Disregarding other factors influencing the extent of the shadow economy, one can conjecture that in a partial equilibrium, higher indirect tax rates and higher marginal income tax rates tend to raise the amount of labor and goods bought and sold in the underground sector. Official sector wage rate changes may have a positive or negative influence on the equilibrium amount of underground labor, depending upon whether demand or supply changes dominate. In addition, the equilibrium quantities of the shadow economy labor and goods also depend on other variables like penalty rates and detection probabilities for tax evasion, which are to some extent under the control of the government. One must, however, be very careful not to draw premature policy conclusions from such a model. First, the comparative static results have been derived only under special assumptions and do not generalize to arbitrary utility and production functions. Second, Neck, Schneider, and Hofreither have concentrated on the determinants of the quantities of goods and labor supplied and demanded by individual firms and households and have not presented a rigorous analysis of market equilibrium conditions. Their model ought to be closed by putting individual decision makers into the context of a general equilibrium model, which in their case would consist of at least two labor markets and two goods markets, the official and the shadow economy markets in each case. Only in such a theoretical framework could all spillovers be analyzed appropriately, and prices and wages, which have been assumed to be given for the individual transactors, be determined endogenously. Also, on a more general level, an analysis of the effects of the degree of progression of the shadow economy has to take into account differences of reactions between individual consumers with respect to the total and official economy labor supply. The different effects on official and underground labor supply could be appropriately treated in a general equilibrium model, with official and underground markets for labor and goods and with different types of consumers. To our knowledge, such a theoretical model is, however, not available at the present time.

In another theoretical micro economic study, Schneider and Neck (1993) investigate how the complexity of the tax system effects the size of the shadow economy. They argue that the literature has not paid much attention to the question of how the complexity of the tax system effects the shadow economy. They try to capture the notion of the complexity of the income tax by making the following observation: A complex income tax schedule allows for more possibilities of legal tax avoidance than a simple one by providing tax exemptions and reductions of various kinds. For example, the Austrian tax reform of 1989 is generally considered to have made the income tax schedule less complex, because it has reduced marginal income tax rates and simultaneously broadened the tax base by abolishing several assumptions and loopholes in the income tax schedule. According to this view, a comprehensive income tax should be considered to display a very low degree of complexity. Schneider and Neck show in their theoretical model that a more complex tax system (a tax schedule admits more assumptions) implies, ceteris paribus, a smaller labor supply in the shadow economy. The economic reason for this is the following: A more complex tax system makes individual efforts to avoid taxation legally more profitable. At the same time it encourages households to do work in the official

economy instead of the underground economy, as reduced tax burden makes tax evasion (with a risk of being caught and punished) less attractive. Broadening the income tax base and removing tax exemptions as was done in Austria in 1989, for example, can therefore increase the size of the shadow economy, ceteris paribus. The next step in the paper by Schneider and Neck was to theoretically and empirically analyze the effects of changing tax systems and structures on the development of the Austrian shadow economy, emphasizing the negative effects of the complexity of the tax system on the extent of the shadow economy. After the tax system and the tax structure was significantly changed by the Austrian government (like e.g., in 1989), one would expect that, for example, a massive increase in the direct tax burden would lead to a decline in the shadow economy. In the major tax reform in Austria in 1989, such a result was actually not found and the explanation offered by Neck and Schneider is that not only the direct and indirect tax burden is an important factor influencing the shadow economy, but also the complexity of the tax system and the burden of regulation. The theoretical and empirical results in their study clearly indicate that both factors, that is, a less complex tax system with a broader tax base and an increased regulation, more than offset the significantly lower tax burden in 1989, showing that only lowering the direct tax burden is not sufficient to bring about a decline of the shadow economy.

B. The Influence of State Activities on the Shadow Economy

Increase of the tax and social security contribution burdens

In almost all studies,[28] the increase of the tax and social security contribution burdens is one of the main causes for the increase of the shadow economy. Since taxes affect labor-leisure choices and also stimulate labor supply in the shadow economy, or the untaxed sector of the economy, the distortion of this choice is a major concern of economists. The bigger the difference between the total cost of labor in the official economy and the after-tax earnings (from work), the greater is the incentive to avoid this difference and to participate in the shadow economy. Since this difference depends broadly on the social security system and the overall tax burden, they are key features of the existence and the increase of the shadow economy.

But even major tax reforms with major tax rate deductions will not lead to a substantial decrease of the shadow economy. They will only be able to stabilize the size of the shadow economy and avoid a further increase. Social networks and personal relationships, and the high profit from shadow economy activities and associated investments in real and human capital are strong ties which prevent people from working in the shadow economy. For Canada, Spiro (1993) expected similar reactions of people facing an increase in indirect taxes (VAT, GST). After the introduction of the GST in 1991—in the midst of a recession—the individuals, suffering economic hardships because of the recession, turned to the shadow economy, leading to a substantial loss in tax revenue. "Unfortunately, once this habit is developed, it is unlikely that it will be abandoned merely because economic growth resumes" (Spiro 1993 p. 255). They may not return to the

[28] See Thomas (1992); Lippert and Walker (1997); Schneider (1994, 1997, 1998); Johnson, Kaufmann, and Zoido-Lobatón (1998a,1998b); De Soto (1989); Zilberfarb (1986); Tanzi (1999); and Giles (1999a), just to quote a few recent ones.

formal sector, even in the long run. This fact makes it even more difficult for politicians to carry out major reforms, because they may not gain a lot from them.[29]

The most important factor in neoclassical models is the marginal tax rate. The higher the marginal tax rate, the greater is the substitution effect and the bigger the distortion of the labor-leisure decision. Especially when taking into account that the individual can also receive income in the shadow economy, the substitution effect is definitely larger than the income effect[30] and, hence, the individual works less in the official sector. The overall efficiency of the economy is, therefore (ceteris paribus), lower and the distortion leads to a welfare loss (according to official GDP and taxation.) But the welfare might also be viewed as increasing, if the welfare of those who are working in the shadow economy were taken into account, too.[31]

While there have been many theoretical studies on tax evasion in the last twenty years, empirical studies of tax evasion are hard to come by.[32] Most of them are based on tax compliance experiments and cover only some parts of the shadow economy.[33] Convincing empirical evidence for the theoretical hypothesis—why people evade taxes—is hard to find and the results are ambiguous (Pommerehne and Weck-Hanneman, 1992). The results are more convincing for the shadow economy: for example, Schneider (1994) and Johnson, Kaufmann, and Zoido-Lobatón (1998a, 1998b) found strong evidence for the general influence of taxation on the shadow economy.

The strong influence of indirect and direct taxation on the shadow economy will be further demonstrated by showing empirical results in the case of Austria and the Scandinavian countries. In the case of Austria, Schneider (1994b) estimates a currency demand function including as driving forces for the shadow economy the following four types of variables: the burden of total direct taxation, the burden of indirect taxation, the complexity of the tax system, and the intensity of government regulations.

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[29] See Schneider (1994b, 1998b), for a similar result of the effects of a major tax reform in Austria on the shadow economy. Schneider shows that a major reduction in the direct tax burden did not lead to a major reduction in the shadow economy. Because legal tax avoidance was abolished and other factors, like regulations, were not changed; hence, for a considerable part of the taxpayers, the actual tax and regulation burden remained unchanged.

[30] If leisure is assumed to be a normal good.

[31] See Thomas (1992), p. 134-7.

[32] For a broad survey, see Andreoni, Erard, and Feinstein (1998).

[33] See Alm (1996), for an overview of tax compliance explanations in different studies. The theoretical literature on tax evasion is summarized in Cowell (1990); see also Allingham and Sandmo (1972), for their path-breaking study in this area.

All coefficiencies of the independent variables have the theoretically expected sign and, with the exception of the indirect tax burden, are statistically significant at the 95 percent confidence level. Also, the other test statistics show satisfactory results, especially the "true ex-post" forecast of the currency demand for the period 1985–91, indicating that the major independent factors in the currency demand functions are included. As the driving force for the shadow economy activities, the direct tax burden (including social security payments) has the biggest influence, followed by the intensity of regulation and complexity of the tax system. A similar result has been achieved by Schneider (1986) for the Scandinavian countries (Denmark, Norway, and Sweden). In all three countries, various tax variables (average direct tax rate, average total tax rate (indirect and direct tax rate and marginal tax rates) have the expected positive sign (on currency demand) and are highly statistically significant. Similar results are reached by Kirchgaessner (1983, 1984) for Germany, and by Cloveland (1984) for Norway and Sweden.

Two other recent studies provide strong evidence of the influence of income taxes on the shadow economy: Cebula (1997), using Feige's data for the shadow economy, found evidence of the impact of government income tax rates, IRS audit probabilities, and IRS penalty policies on the relative size of the shadow economy in the United States. Cebula concludes that a restraint of any further increase of the top marginal income tax rate may at least not lead to a further increase of the shadow economy, while increased IRS audits and penalties might reduce the size of the shadow economy. His findings indicate that there is generally a strong influence of state activities on the size of the shadow economy: For example, if the marginal federal personal income tax rate increases by one percentage point, ceteris paribus, the shadow economy rose by 1.4 percentage points.

The estimation results of the currency demand function are shown in Table 10.

Table 10: Estimation Results of the Currency Demand Function for Austria [1]

	Dependent Variable: Real Currency Per Capita, ln (CUR_t/POP_t) Estimation Period	
	1956–91	1956–85
Independent Variables		
Lagged Dependent Variable ln (CUR_{t-1}/POP_{t-1})	0.534** (8.91)	0.551** (9.43)
Real Consumption per capita ln (C_t/POP_t)	0.703** (5.49)	0.724** (5.99)
Number of Eurocheque Systems per capita ln (ES_{t-1}/POP_{t-1})	-0.213* (-2.51)	-0.174* (-2.09)
Real Interest Rate on Bonds ln (IR_t)	-0.123* (-2.51)	-0.139* (-2.65)
Direct Tax Burden (*including* social security payments) ln $(DIRT_t)$	0.173** (3.09)	0.182* (2.86)
Indirect Tax Burden ln $(INDT_t)$	0.117(*) (1.88)	0.123(*) (1.92)
Complexity of the Tax System ln $(VIST_t)$	0.154** (2.77)	0.147** (2.86)
Intensity of Regulation ln (REG_t)	0.166** (2.94)	0.159** (2.72)
Constant Term	-2.24(*) (-1.80)	-2.39(*) (-1.74)
Test Statistics		
R^2	0.992	0.990
S.E.	0.014	0.015
Durbin's h	1.06	1.16
Rho (1)	0.18	0.20
D.F.	27	21
Ex-post Forecast 1985–1991		
RMSE	-	1.51
Theil's U 1	-	0.42

[1] All equations are estimated by an ordinary least-squares procedure using annual data. R^2 is the coefficient of determination (corrected for the degrees of freedom); S.E. shows the standard error of the estimation. Durbin's h is Durbin's h-test against auto-correlation when lagged dependent variables are used as regressors. Rho (1) is the auto-correlation coefficient of first order. D.F. stands for the "degrees of freedom ." RMSE is the root mean squared error and Theil's U 1 stands for Theil's inequality coefficient. The term "ln" indicates that these variables have been transformed to natural logarithms. Numbers in parentheses below coefficient estimates are t-values. (*), *, and ** indicate significance at the 90 percent, 95 percent and 99 percent-confidence level, respectively.

More detailed information of the labor supply decision in the underground economy is given by Lemieux, Fortin, and Fréchette (1994), using micro data from a survey conducted in Quebec City, Canada. In particular, their study provides some economic insight into the size of the distortion caused by income taxation and the welfare system. The results of this study suggest that hours worked in the shadow economy are quite responsive to changes in the net wage in the regular (official) sector. It also provides some support for the existence of a Laffer curve. The Laffer curve suggests that an increase of the (marginal) tax rate leads to a decrease of tax revenue when the tax rate is too high. Their empirical results attribute this to a (mis-)allocation of work from the official to the informal sector, where it is not taxed. In this case, the substitution between labor market activities in the two sectors is quite high. These empirical findings clearly indicate that "participation rates and hours worked in the underground sector also tend to be inversely related to the number of hours worked in the regular sector" (Lemieux, Fortin, and Fréchette, 1994, p. 235). The findings demonstrate a large negative elasticity of hours worked in the shadow economy with respect to the wage rate in the regular sector and also to a high mobility between the sectors.

In another investigation, Hill and Kabir (1996) found empirical evidence that marginal tax rates are more relevant than average tax rates, and that a substitution of direct taxes by indirect taxes seems unlikely to improve tax compliance. More evidence on the effect of taxation on the shadow economy is presented by Johnson, Kaufmann, and Zoido-Lobatón (1998b), who come to the conclusion that it is not higher tax rates *per se* that increase the size of the shadow economy but the ineffective and discretionary application of the tax system and the regulations by governments. Their finding that there is a *negative* correlation[34] between the size of the unofficial economy and the *top* (marginal) tax rates might be unexpected. But since other factors like tax deductibility, tax reliefs, tax exemptions, the choice between different tax systems, and various other options for legal tax avoidance, were not taken into account, it is not all that surprising.[35] For example, hardly anybody is paying the top marginal tax rate in Germany, since there are many legal tax loopholes—of course, mostly used by wealthy people.[36]

Johnson, Kaufmann, and Zoido-Lobatón (1998b) find a *positive* correlation between the size of the shadow economy and the corporate tax burden. They come to the overall conclusion that there is a large difference between the impact of direct taxes as compared to the corporate tax burden. Institutional aspects, like the efficiency of the administration, the extent of control rights

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[34] The higher the top marginal tax rate, the lower the size of the shadow economy.

[35] Friedman, Johnson, Kaufmann, and Zoido-Lobatón (1999) found a similar result in a cross-country analysis that higher tax rates are associated with less official activity as percent of GDP. They argue entrepreneurs go underground not to avoid official taxes but they want to reduce the burden of bureaucracy and corruption. However, looking at their empirical (regression) results, the finding that higher tax rates are correlated with a lower share of the unofficial economy is not very robust and, in most cases, using different tax rates, they do not find a statistically significant result.

[36] See Enste (1997), for further details on the (postponed) major German tax reform.

held by politicians and bureaucrats, and the amount of bribery and especially corruption, therefore, play a major role in this "bargaining game" between the government and the taxpayers.

Intensity of regulations

The increase of the intensity of regulations (often measured in the numbers of laws and regulations, like licenses requirements) is another important factor, which reduces the freedom (of choice) for individuals engaged in the official economy.[37] One can think of labor market regulations, trade barriers, and labor restrictions for foreigners. Although Johnson, Kaufmann, and Zoido-Lobatón (1998b) did not find overall significant empirical evidence of the influence of labor regulations on the shadow economy, the impact is clearly described and theoretically derived in other studies, for example, for Germany (Deregulation Commission 1990/91). Regulations lead to a substantial increase in labor costs in the official economy. But since most of these costs can be shifted on the employees, these costs provide another incentive to work in the shadow economy, where they can be avoided.

Empirical evidence supporting the model of Johnson, Kaufmann, and Shleifer (1997), which predicts, inter alia that countries with more general regulation of their economies tend to have a higher share of the unofficial economy in total GDP, is found in their empirical analysis. A one point increase of the regulation index (ranging from 1 to 5, with 5 = the most regulation in a country), ceteris paribus, is associated with an 8.1 percentage point increase in the share of the shadow economy, when controlled for GDP per capita (Johnson et al. (1998b), p. 18). They conclude that it is the enforcement of regulation that is the key factor for the burden levied on firms and individuals, and not the overall extent of regulation—mostly not enforced—that drive firms into the shadow economy. Friedman, Johnson, Kaufmann, and Zoido-Lobatón (1999) reach a similar result. In their study, every available measure of regulation is significantly correlated with the share of the unofficial economy and the sign of the relationship is unambiguous: more regulation is correlated with a larger shadow economy. A one point increase in an index of regulation (ranging from 1–5) is associated with a 10 percent increase in the shadow economy for 76 developing, transition, and developed countries.

These findings demonstrate that governments should put more emphasis on improving enforcement of laws and regulations, rather than increasing their number. Some governments, however, prefer this policy option (more regulations and laws), when trying to reduce the shadow economy, mostly because it leads to an increase in power of the bureaucrats and to a higher rate of employment in the public sector.[38]

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[37] See, for a (social) psychological, theoretical foundation of this feature, Brehm (1966, 1972); and for a (first) application to the shadow economy, see Pelzmann (1988).

[38] See, e.g., Frey (1989), for a first application of the Public Choice Theory to the shadow economy.

Social transfers

The social welfare system leads to strong negative incentives for beneficiaries to work in the official economy since their marginal tax rate often equals or nearly reaches 100 percent. This can be derived either from the neoclassical leisure-income model or from empirical results.[39]. Such a system provides major disincentives for individuals who are getting welfare payments to even search for work in the official economy, since their overall income is much higher when they are still receiving these transfers, while possibly working in the underground economy.

Labor market

The numerous regulations in the official labor market and the total wage costs are also driving forces for the shadow economy. Two main aspects—the effects of the reduction in official working hours and the influence of the unemployment rate on the increase of the shadow economy—are discussed quite often in this context:

- As in most OECD countries, unemployment is, to a large extent, caused by the fact that total labor costs are too high. This can be seen as a cause for an increase of the shadow economy.

- The reduction in working hours in the official economy was introduced by governments (e.g., France) and/or labor unions (e.g., Germany) in order to reduce the unemployment rate. The idea behind this is that there is only a limited quantity of work, and that this quantity has to be "redistributed ." But this idea neglects a key factor that especially a forced reduction (but an increase in flexibility of working hours, too) increases the potential of hours that can be worked in the shadow economy.[40] Early retirements can also lead to more unofficial activities and part-time work offers great opportunities to the individual to adopt another job in the untaxed, unregulated economy, as argued by de Gijsel (1984) and Riebel (1983, 1984).[41]

Public sector services

An increase of the shadow economy leads to reduced state revenues, which in turn reduces the quality and quantity of publicly provided goods and services. Ultimately, this can lead to an increase in the tax rates for firms and individuals in the official sector, quite often combined with a deterioration in the quality of the public goods (such as the public infrastructure) and of the administration, with the consequence of even stronger incentives to participate in the shadow economy. Johnson, Kaufmann, and Zoido-Lobatón (1998b) present a simple model of this relationship. Their findings show that smaller shadow economies appear in countries with higher

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[39] See, e.g., Lemieux, Fortin, and Frechette (1994).

[40] After Volkswagen in Germany reduced the working hours considerably, there is some evidence that in the area around the firm, much more reconstruction and renovation of houses took place compared to similar other regions.

[41] See Becker (1965); Trockel (1987); and Werner (1990), for a more detailed analysis.

tax revenues, if achieved by lower tax rates, fewer laws and regulations, and less bribery facing enterprises. Countries with a better rule of the law, which is financed by tax revenues, also have smaller shadow economies. Transition countries have higher levels of regulation, leading to a significantly higher incidence of bribery, higher effective taxes on official activities, a large discretionary framework of regulations, and, consequently, to a higher shadow economy.

The overall conclusion is that "wealthier countries of the OECD, as well as some in Eastern Europe find themselves in the 'good equilibrium' of relatively low tax and regulatory burden, sizeable revenue mobilization, good rule of law and corruption control, and [relatively] small unofficial economy. By contrast, a number of countries in Latin American and the former Soviet Union exhibit characteristics consistent with a 'bad equilibrium': tax and regulatory discretion and burden on the firm is high, the rule of law is weak, and there is a high incidence of bribery and a relatively high share of activities in the unofficial economy." (Johnson, Kaufmann, and Zoido-Lobatón, 1998a, p. I).

V. The Effects of the Shadow Economy on the Official Economy

In order to study the effects of the shadow economy on the official one, several studies integrate underground economies into macroeconomic models.[42] Houston (1987) develops a theoretical macro model of business cycle as well as tax and monetary policy linkages with the shadow economy. He concludes from his investigation of the growth of the shadow economy that, on the one side its effect should be taken into account in setting tax and regulatory policies, and, on the other side, the existence of a shadow economy could lead to an overstatement of the inflationary effects of fiscal or monetary stimulus. Adam and Ginsburgh (1985) focus on the implications of the shadow economy on "official" growth in their study concerning Belgium. They find a positive relationship between the growth of the shadow economy and the "official" one and, under certain assumptions (i.e., very low entry costs into the shadow economy due to a low probability of enforcement), they conclude that an expansionary fiscal policy has a positive stimulus for both the formal and informal economies. A study of the United States by Fichtenbaum (1989) argues that the United States productivity slowdown over the period 1970–89 was vastly overstated, as the underreporting of income due to the more rapid growth of the United States shadow economy during this period was *not* taken into account.[43]

Another hypothesis is that a substantial reduction of the shadow economy leads to a significant increase in tax revenues and therefore to a greater quantity and quality of public goods and services, which ultimately can stimulate economic growth. Some authors found evidence for this hypothesis. A recent study by Loayza (1996) presents a simple macroeconomic endogenous growth model whose production technology depends on congestable public services. The

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[42] For Austria, this was done by Schneider, Hofreither, and Neck (1989); and Neck, Hofreither, and Schneider (1989). For further discussion of this aspect, see Quirk (1996); and Giles (1999a).

[43] Compare also the findings of Pommerehne and Schneider (1985), who come to similar conclusions.

determinants and effects of the informal sector are studied, where excessive taxes and regulations are imposed by governments and where the capability to enforce compliance is low. The model concludes that in economies where (1) the statutory tax burden is larger than the optimal tax burden, and where (2) the enforcement of compliance is too weak, the increase of the relative size of the informal economy generates a reduction of economic growth. The reason for this correlation is the strongly negative correlation between the informal sector and public infrastructure indices, while public infrastructure is the key element for economic growth. For example, Loayza finds empirical evidence for Latin America countries that if the shadow economy increases by one percentage point of GDP ceteris paribus, the growth rate of official real GDP per capita decreases by 1.22 percentage points of GDP.

This negative impact of informal sector activities on economic growth is not broadly accepted.[44] For example, the key feature of the model has been criticized, because the model is based on the assumption that the production technology essentially depends on tax-financed public services, which are subject to congestion. In addition, the informal sector is not paying any taxes but must pay penalties which are not used to finance public services. Based on these assumptions the negative correlation between the size of the informal sector and economic growth is therefore not very surprising.

Depending on the prevailing view of the informal sector, one might also come to the opposite conclusion. In the neoclassical view, the underground economy is optimal in the sense that it responds to the economic environment's demand for urban services and small-scale manufacturing. From this point of view, the informal sector provides the economy with a dynamic and entrepreneurial spirit and can lead to more competition, higher efficiency and strong boundaries and limits for government activities. The informal sector may offer great contributions "to the creation of markets, increase financial resources, enhance entrepreneurship, and transform the legal, social, and economic institutions necessary for accumulation" (Asea, 1996, p. 166). The voluntary self-selection between the formal and informal sectors, as described above in microeconomic models, may provide a higher potential for economic growth and, hence, a positive correlation between an increase of the informal sector and economic growth. The effects of an increase of the shadow economy on economic growth therefore remain considerably ambiguous.

The empirical evidence of these hypotheses is also not clear. Since many Latin American countries had or still have a tradition of excessive regulations and weak government institutions, Loayza (1996) finds some evidence of the implications of his growth model in the early 1990s in these countries: the increase in the size of the shadow economy negatively affects growth (1) by reducing the availability of public services for everyone in the economy, and (2) by using the existing public services less efficiently, or not at all.

On the other side, the positive "side effects" of shadow economy activities must be considered. Empirical findings of Schneider (1998b) show clearly that over 66 percent of the earnings in the shadow economy are rather immediately spent in the official sector. The positive effects of this

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[44] See Asea (1996), for a more detailed criticism of the Loayza model.

expenditure for economic growth and for the (indirect) tax revenues must be taken into account as well. Bhattacharyya (1993, 1999) found clear evidence for the United Kingdom (1960–84) that the hidden economy has a significant effect on consumer expenditures. He points out that the hidden economy has a positive effect on consumer expenditures of nondurable goods and services, but an even stronger positive effect on consumer expenditures of durable goods and services.[45]

VI. Corruption and the Shadow Economy—Substitutive or Complementary Effects?

Over the last 10 years, corruption has gained growing attention among scientists, politicians, and public officials regarding its origins, consequences, and ways to fight it.[46] Corruption has been defined in many different ways but "the most popular and simplest definition of corruption is that it is the abuse of public power for private benefit"(Tanzi, 1998, p.8). From this definition the private sector seems to be excluded, which is, of course, not the case—a more general definition is "that corruption is the intentional non-compliance with arm's length relationship from this behavior for oneself or for related individuals" (Tanzi, 1998, p. 8). There are various kinds of corruption including cost reductions in response to bribes and cash payments, and there is an extensive literature about which factors stimulate corruption.[47] Activities in which corruption is sometimes involved include:

- regulations or licenses to engage in particular activities (e.g., opening a shop, a taxi license);
- land zoning and other similar official decisions;
- access to publicly provided goods and services;
- control over decision making regarding procurement of public investment contracts;
- control over the provision of tax incentives; and
- control over hiring and promotion within the public sector.

The effect of corruption on the official economy can be seen from different sides: Romer (1994) has suggested that corruption, as a tax on ex-post profits, may in general stimulate the entry of new goods or technologies, which require an initial fixed-cost investment. Mauro (1995) finds a significant negative correlation between the corruption index and the investment rate or rate of GDP growth. A one-standard-deviation improvement in the corruption index is estimated by

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[45] A close interaction between official and unofficial economies is also emphasized in Giles (1999a), and in Tanzi (1999).

[46] The literature is quite large and only some of it (mostly more recent) is given here: Rose-Ackermann (1978, 1997, 1999); Shleifer and Vishny (1993); Tanzi (1994, 1997, 1998); Johnson, Kaufmann, and Zoido-Lobatón (1998a, 1998b); and Kaufmann and Sachs (1998). For the latest survey, see Bardhan (1997); Jain (1998); and Rose-Ackermann (1999).

[47] See, e.g., Rose-Ackermann (1997, 1999); Jain (1998); Tanzi (1998); and Bardhan (1997).

Mauro to increase the investment rate by about 3 percent. Johnson et al. (1998b, p. 39) find a significant relationship between corruption and GDP growth (an increase in corruption on an indexed scale from 0 to 6 by only 1 point decreases GDP growth by 0.84 percentage points) but the relationship becomes insignificant if the shadow economy is entered as an independent variable. On the other side, Bardhan (1997, p. 1329) concludes that "it is probably correct to say that the process of economic growth ultimately generates enough forces to reduce corruption"—a view supported by Rose-Ackermann (1997), who further argues that any reform that increases the competitiveness of the economy will help reduce incentives for corruption. Thus, policies that liberalize foreign trade and remove entry barriers for industry promote competition and reduce corruption. Such reforms will also encourage firms to move from the shadow economy into the official economy, where they can obtain access to capital at market rates. Rose-Ackermann (1997, p. 21) concludes that "going underground is a *substitute* for bribery, although sometimes firms bribe officials in order to avoid the official states."

There are only a few studies which empirically investigate the relationship between the shadow economy and corruption, either in a country or over a sample of countries.[48] Johnson et al. (1998, p. 21) find, in their empirical investigation of 49 countries of Latin America, the OECD, and the post-communist countries of Eastern Europe and the former Soviet Union, a statistically highly significant relationship between the various measures of bribery or corruption and the shadow economy; a 1 point improvement (= less corruption) in the corruption index ICRG[49] leads to about an 8–11 percentage point decline in the shadow economy, ceteris paribus. Using another measure for corruption, the transparency International Corruption Index,[50] Johnson et al. found that a 1 point increase in this index (= less corruption) decreases the shadow economy by 5.1 percentage points, ceteris paribus. Friedman, Johnson, Kaufmann, and Zoido-Lobatón (1999, p.27) conclude: "... In summary, the relationship between the share of the unofficial economy and rule of law (including corruption) is strong and consistent across eight measures provided by six distinct organizations. All eight of the indices suggest that countries with more corruption have a higher share of the unofficial economy ." In their investigation, they show that a one point increase in the index of corruption increased the share of the unofficial economy by 7.6 percentage points in the year 1997.

To summarize, the relationship between the share (size) of the shadow economy and the amount of corruption is strong and consistent, as different measures show. Countries with more corruption and briberies have a higher share (size) of the shadow economy. Whereas Rose-Ackermann concludes from her work that going underground is a *substitute* for corruption (bribery), the empirical results of Johnson et al. point more to a complementary process: *countries with more corruption, ceteris paribus, have higher shares of the shadow economy.*

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[48] See, e.g., Johnson et al. (1998a, 1998b); Johnson, Kaufmann, and Shleifer (1997); and Kaufmann and Sachs (1998).

[49] This index ranks between 1 and 6 (best = no corruption), and was averaged by Johnson et al. (1998, p. 21) for the 1990s.

[50] This index ranks between 0 and 10 (best = no corruption).

VII. Methods to Estimate the Size of the Shadow Economy

To measure the size and development of the shadow economy there are three different types of methods used most often. These are briefly discussed in the following three subsections.[51]

A. Direct Approaches

These are micro approaches which employ either well-designed surveys and samples based on voluntary replies or tax auditing and other compliance methods. Sample surveys designed for estimation of the shadow economy are widely used in a number of countries[52] to measure the shadow economy. The main disadvantage of this method is that it presents the flaws of all surveys: average precision and results depend greatly on the respondents willingness to cooperate. It is difficult to asses the rise of the undeclared work from a direct questionnaire. Most interviewed hesitate to confess a fraudulent behavior and quite often responses are rarely reliable so that it is difficult, from these types of questionnaires, to make a real estimate—in monetary terms—of the extent of undeclared work. The main advantage of this method lies in the detailed information about the structure of the shadow economy, but the results from these kinds of surveys are very dependent on how the questionnaire is formulated.[53]

Estimates of the shadow economy can also be based on the discrepancy between income declared for tax purposes and that measured by selective checks. Fiscal auditing programs have been particularly effective in this regard. Designed to measure the amount of undeclared taxable income, they have been used to calculate the shadow economy in several countries.[54] A number of difficulties beset this approach. Firstly, using tax compliance data is equivalent to using a (possibly quite biased) sample of the population. However, since, in general a selection of taxpayers for tax audit is not random, but based on properties of submitted (tax) returns which indicate a certain likelihood of (tax) fraud, such a sample is not a random one of the whole

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[51] For a detailed discussion, see Frey and Pommerehne (1984); Feige (1989); Thomas (1992, 1999); and Schneider (1986, 1994a and 1998a).

[52] The direct method of voluntary sample surveys has been extensively used for Norway by Isachsen, Klovland, and Strom (1982); and Isachsen and Strom (1985). For Denmark, this method is used by Mogensen et al. (1995), in which they report "estimates" of the shadow economy of 2.7 percent of GDP for 1989, 4.2 percent of GDP for 1991, 3.0 percent of GDP for 1993, and 3.1 percent of GDP for 1994.

[53] The advantages and disadvantages of this method are extensively dealt by Mogensen et al. (1995), in their excellent and very carefully done investigation.

[54] In the United States, see IRS (1979, 1983); Simon and Witte (1982); Witte (1987); Clotefelter (1983); and Feige (1986). For a more detailed discussion, see Dallago (1990); and Thomas (1992).

population. This factor is likely to bias compliance–based estimates of the black economy. Secondly, estimates based on tax audits reflect that portion of black economy income which the authorities actually succeeded in discovering and is thus representative of only a fraction of the hidden income.

A further disadvantage of the two direct methods (surveys and tax auditing) is that they lead only to point estimates. Moreover, it is sure that they do not capture all "shadow" activities, so they can be seen as providing lower bound estimates. They are unable (at least at present) to provide estimates of the development and growth of the shadow economy over a longer period of time. As already argued, they have, however, at least one considerable advantage–they can provide detailed information about shadow economy activities and the structure and composition of those who work in the shadow economy.

B. Indirect Approaches

These approaches, which are also called "indicator" approaches, are mostly macroeconomic ones and use various economic and other indicators that contain information about the development of the shadow economy (over time). Currently, there are five indicators which leave some "traces" of the development of the shadow economy.

The discrepancy between national expenditure and income statistics

This approach is based on discrepancies between income and expenditure statistics. In national accounting, the income measure of GDP should be equal to the expenditure measure of GDP. Thus, if an independent estimate of the expenditure site of the national accounts is available, the gap between the expenditure measure and the income measure can be used as an indicator of the extent of the black economy.[55] However, since national accounts statisticians will be anxious to minimize this discrepancy, the initial discrepancy or first estimate rather than the published discrepancy should be employed for this purpose. If all the components of the expenditure site were measured without error, then this approach would indeed yield a good estimate of the scale of the shadow economy. Unfortunately, however, this is not the case and the discrepancy therefore reflects all omissions and errors everywhere in the national accounts statistics as well as

[55] See, e.g., Franz (1983), for Austria. For the United Kingdom, see MacAfee (1980); O'Higgins (1989); and Smith (1985). For Germany, see Petersen (1982); and Del Boca (1981). For the United States, see Park (1979). For a survey and critical remarks, see Thomas (1992). The latest international comparison of the shadow economy using micro level data has been undertaken by Yoo and Hyun (1998); they calculate the size of the shadow economy of Korea (1996: 20.3 percent of GDP), Taiwan (1995: 16.5 percent of GDP), Italy (1995: 19.2 percent of GDP), Spain (1990: 50.5 percent of GDP), Russia (1995: 74.9 percent of GDP) and Hungary (1994: 56.9 percent of GDP).

the shadow economy activity. These estimates may therefore be very crude and of questionable reliability.[56]

The discrepancy between the official and actual labor force

A decline in participation of the labor force in the official economy can be seen as an indication of increased activity in the shadow economy. If total labor force participation is assumed to be constant, a decreasing official rate of participation can be seen as an indicator of an increase in the activities in the shadow economy, ceteris paribus.[57] The weakness of this method is that differences in the rate of participation may also have other causes. Moreover, people can work in the shadow economy and have a job in the "official" economy. Therefore, such estimates may be viewed as weak indicators of the size and development of the shadow economy.

The transactions approach

This approach has been developed by Feige.[58] It assumes that there is a constant relation over time between the volume of transaction and official GDP. Feige's approach therefore starts from Fisher's quantity equation, M*V = p*T (with M = money, V = velocity, p = prices, and T = total transactions). Assumptions have to be made about the velocity of money and about the relationships between the value of total transactions (p*T) and total (=official + unofficial) nominal GDP. Relating total nominal GDP to total transactions, the GDP of the shadow economy can be calculated by subtracting the official GDP from total nominal GDP. However, to derive figures for the shadow economy, Feige would have to assume a base year in which there is no shadow economy, and therefore the ratio of p*T to total nominal (official = total) GDP was "normal" and would have been constant over time, if there had been no shadow economy. This method, too, has several weaknesses: for instance, the assumption of a base year with no shadow economy, and the assumption of a "normal" ratio of transactions being constant over time. Moreover, to obtain reliable estimates, precise figures of the total volume of transactions should be available. This availability might be especially difficult to achieve for cash transactions, because they depend, among other factors, on the durability of bank notes, in terms of the quality

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[56] A related approach is pursued by Pissarides and Weber (1988), who use micro data from household budget surveys to estimate the extent of income understatement by the self-employed. Also in this micro approach, more or less the same difficulties arise and the figures calculated for the shadow economies may be crude.

[57] Such studies have been made for Italy: see, e.g., Contini (1981, 1982); and Del Boca (1981). For the United States, see O'Neill (1983). For a survey and critical remarks, see Thomas (1992).

[58] For an extended description of this approach, see Feige (1979, 1989 and 1996). For a further application for the Netherlands, see Boeschoten and Fase (1984). For Germany, see Langfeldt (1984).

of the papers on which they are printed.[59] Also, in this approach, the assumption is made that all variations in the ratio between the total value of transaction and the officially measured GDP are due to the shadow economy. This means that a considerable amount of data is required in order to eliminate financial transactions from "pure" cross payments, which are totally legal and have nothing to do with the shadow economy. In general, although this approach is theoretically attractive, the empirical requirements necessary to obtain reliable estimates are so difficult to fulfil that its application may lead to doubtful results.

The currency demand approach

The currency demand approach was first used by Cagan (1958), who calculated a correlation of the currency demand and the tax pressure (as one cause of the shadow economy) for the United States over the period 1919–55. Twenty years later, Gutmann (1977) used the same approach but did not use any statistical procedures; instead he "only" looked at the ratio between currency and demand deposits over the years 1937–76.

Cagan's approach was further developed by Tanzi (1980, 1983), who econometrically estimated a currency demand function for the United States for the period 1929–80 in order to calculate the shadow economy. His approach assumes that shadow (or hidden) transactions are undertaken in the form of cash payments, so as to leave no observable traces for the authorities. An increase in the size of the shadow economy will therefore increase the demand for currency. To isolate the resulting "excess" demand for currency, an equation for currency demand is econometrically estimated over time. All conventional possible factors, such as the development of income, payment habits, interest rates, and so on, are controlled for. Additionally, such variables as the direct and indirect tax burden, government regulation and the complexity of the tax system, which are assumed to be the major factors causing people to work in the shadow economy, are included in the estimation equation. The basic regression equation for the currency demand, proposed by Tanzi (1983), is the following:

$$\ln (C / M_2)_t = \beta_0 + \beta_1 \ln (1 + TW)_t + \beta_2 \ln (WS / Y)_t + \beta_3 \ln R_t + \beta_4 \ln (Y / N)_t + u_t$$
with $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 > 0$

where

ln denotes natural logarithms,
C / M_2 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 shadow 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 savings deposits (to capture the opportunity cost of holding cash) and

[59] For a detailed criticism of the transaction approach see, Boeschoten and Fase (1984); Frey and Pommerehne (1984); Kirchgaessner (1984); Tanzi (1982, 1986); Dallago (1990); Thomas (1986, 1992, 1999); and Giles (1999a).

Y / N is the per capita income.[60]

The "excess" increase in currency, which is the amount not taken account of the conventional or normal factors (mentioned above), is then attributed to the rising tax burden and the other reasons leading people to work in the shadow economy. Figures for the size and development of the shadow economy can be calculated in a first step by comparing the difference between the development of currency when the direct and indirect tax burden (and government regulations) are held at their lowest values, and the development of currency with the current (much higher) burden of taxation and government regulations. Assuming in a second step the same income velocity for currency used in the shadow economy as for legal M1 in the official economy, the size of the shadow economy can be computed and compared to the official GDP.

The currency demand approach is one of the most commonly used approaches. It has been applied to many OECD countries,[61] but has nevertheless been criticized on various grounds.[62] The most commonly raised objections to this method are:

- Not all transactions in the shadow economy are paid in cash. Isachsen and Strom (1980, 1985) used the survey method to find out that in Norway, in 1980, roughly 80 percent of all transactions in the hidden sector were paid in cash. The size of the total shadow economy (including barter) may thus be even larger than previously estimated.

- Most studies consider only one particular factor, the tax burden, as a cause of the shadow economy. But others—such as the impact of regulation, taxpayers' attitudes toward the state, and "tax morality"—are not considered, because reliable data for most countries is not available. If, as seems likely, these other factors also have an impact on the extent of the hidden economy, it might again be higher than reported in most studies.[63]

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[60] In Chapter IV, Table 10, the econometric estimation of such a currency demand function for Austria is shown. There, more causes for the shadow economy (regulation, different tax rates, complexity of the tax system) are included. The estimation of such a currency demand equation has been criticized by Thomas (1999), but part of this criticism has been considered by the work of Giles (1999a, 1999b); and Bhattacharyya (1999); who both use the latest econometric technics.

[61] See Schneider (1997, 1998a); Johnson, Kaufmann, and Zoido-Lobatón (1998a); and Williams and Windebank (1995).

[62] See Thomas (1986, 1992, 1999); Feige (1986); and Pozo (1996).

[63] One (weak) justification for the use of only the tax variable is that this variable has by far the strongest impact on the size of the shadow economy in the studies known to the authors. The only exception is the study by Frey and Weck-Hannemann (1984), where the variable "tax immorality" has a quantitatively larger and statistically stronger influence than the direct tax share in the model approach. In the study of Pommerehne and Schneider (1985) for the U.S., besides various tax measures, data for regulation, tax immorality, minimum wage rates are available. The tax variable has a dominating influence and contributes roughly 60-70 percent to the size of the shadow economy. See also Zilberfarb (1986).

- A further weakness of this approach, at least when applied to the United States, is discussed by Garcia (1978); Park (1979); and Feige (1996), who point out that increases in currency demand deposits are due largely to a slowdown in demand deposits rather than to an increase in currency caused by activities in the shadow economy.

- Blades (1982) and Feige (1986, 1997), criticize Tanzi's studies on the grounds that the U.S. dollar is used as an international currency. Tanzi should have considered (and controlled for) the U.S. dollars, which are used as an international currency and held in cash abroad.[64] Moreover, Frey and Pommerehne (1984), and Thomas (1986, 1992, 1999) claim that Tanzi's parameter estimates are not very stable.[65]

- Another weak point of this procedure, in most studies, is the assumption of the same velocity of money in both types of economies. As Hill and Kabir (1996), for Canada, and Klovland (1984), for the Scandinavian countries argue, there is already considerable uncertainty about the velocity of money in the official economy; the velocity of money in the hidden sector is even more difficult to estimate. Without knowledge about the velocity of currency in the shadow economy, one has to accept the assumption of an "equal" money velocity in both sectors.

- Finally, the assumption of no shadow economy in a base year is open to criticism. Relaxing this assumption would again imply an upward adjustment of the figures attained in the bulk of the studies already undertaken.

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[64] In another study by Tanzi (1982, esp. pp. 110–113), he explicitly deals with this criticism. A very careful investigation of the amount of U.S. currency used abroad in the shadow economy and for "classical" crime activities has been undertaken by Rogoff (1998), who concludes that large denomination bills are a major driving force for the growth of the shadow economy and classical crime activities due to reduced transactions costs.

[65] However, in studies for European countries, Kirchgaessner (1983, 1984); and Schneider (1986) reach the conclusion that the estimation results for Germany, Denmark, Norway, and Sweden are quite robust when using the currency demand method. Hill and Kabir (1996) find for Canada that the rise of the shadow economy varies with respect to the tax variable used; they conclude "when the theoretically best tax rates are selected and a range of plausible velocity values is used, this method estimates underground economic growth between 1964 and 1995 at between 3 and 11 percent of GDP." (Hill and Kabir, 1996, p. 1553).

The physical input (electricity consumption) method

The Kaufmann - Kaliberda Method [66]

To measure overall (official and unofficial) economic activity in an economy, Kaufmann and Kaliberda (1996) assume that electric-power consumption is regarded as the single best physical indicator of overall economic activity. Overall (official and unofficial) economic activity and electricity consumption have been empirically observed throughout the world to move in lockstep with an electricity/GDP elasticity usually close to one. By having a proxy measurement for the overall economy and subtracting it from estimates of official GDP, Kaufmann and Kaliberda derive an estimate of unofficial GDP. This means that Kaufmann and Kaliberda suggest that the growth of total electricity consumption is an indicator for representing a growth of official and unofficial GDP. According to this approach, the difference between the gross rate of registered (official) GDP and the cross rate of total electricity consumption can be attributed to the growth of the shadow economy. This method is very simple and appealing, however, it can also be criticized on various grounds:

- Not all shadow economy activities require a considerable amount of electricity (e.g., personal services), and other energy sources can be used (gas, oil, coal, etc.), so that only a part of the shadow economy will be captured.

- Over time, there has been considerable technical progress. Both the production and use of electricity are more efficient than in the past, and that will apply in both official and unofficial uses.

- There may be considerable differences or changes in the elasticity of electricity/GDP across countries and over time.[67]

The Lackó method

Lackó (1996, 1998, 1999) assumes that a certain part of the shadow economy is associated with the household consumption of electricity. It comprises, among others, the so-called household production, do-it-yourself activities, and other nonregistered production and services. Lackó assumes that in countries where the section of the shadow economy associated with the household electricity consumption is high, the rest of the hidden economy—that is, the part Lackó cannot measure—will also be high. Lackó (1996, pp.19 ff.) assumes that in each country, a part of the household consumption of electricity is used in the shadow economy.

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[66] This method was used earlier by Lizzeri (1979); and Del Boca and Forte (1982); then used much later by Portes (1996); Kaufmann and Kaliberda (1996); and Johnson, Kaufmann, and Shleifer (1997). For a critique, see Lackó (1996, 1997a, 1997b, 1998).

[67] Johnson, Kaufmann, and Shleifer (1997) make an attempt to adjust for changes in the elasticity of electricity/GDP.

Lackó's approach (1998, p.133) can be described by the following two equations:

$$\ln E_i = \alpha_1 \ln C_i + \alpha_2 \ln PR_i + \alpha_3 G_i + \alpha_4 Q_i + \alpha_5 H_i + u_i \quad (1)$$

with $\alpha_1 > 0, \alpha_2 < 0, \alpha_3 > 0, \alpha_4 < 0, \alpha_5 > 0$

$$H_i = \beta_1 T_i + \beta_2 (S_i - T_i) + \beta_3 D_i \quad (2)$$

with $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0$

where

i: the index assigned to the country,
E_i: per capita household electricity consumption in country i
C_i: per capita real consumption of households excluding the consumption of electricity in country i in US dollars (at purchasing power parity),
PR_i: the real price of consumption of 1 kwh of residential electricity in US dollars (at purchasing power parity),
G_i: the months of heating needed in houses in country i,
Q_i: the ratio of energy sources other than electricity energy to all household energy consumption,
H_i: the per capita output of the hidden economy,
T_i: the ratio of the sum of paid personal income, corporate profit and taxes on goods and services to GDP,
S_i: the ratio of public social welfare expenditures to GDP, and
D_i: the sum on number of dependants over 14 years and of inactive earners, both per 100 active earners.

In a cross-country study, she econometrically estimates equation (1) substituting H_i by equation (2). The econometric estimation results can then be used to establish an ordering of the countries with respect to electricity use in their shadow economies. For the calculation of the actual size (value added) of the shadow economy, Lackó should know how much GDP is produced by one unit of electricity in the shadow economy of each country. Since these data are not known, she takes the result of one of the known shadow economy estimations that was carried out for a market economy with another approach for the early 1990s, and she applies this proportion to the other countries. Lackó used the shadow economy of the United States as such a base (the shadow economy value of 10.5 percent of GDP taken from Morris (1993), and she then calculates the size of the shadow economy for other countries. Lackó's method is also open to criticism.

- Not all shadow economy activities require a considerable amount of electricity, and other energy sources can be used.

- Shadow economy activities do not take place only in the household sector.

- It is doubtful whether the ratio of social welfare expenditures can be used as the explanatory factor for the shadow economy, especially in transition and developing countries.

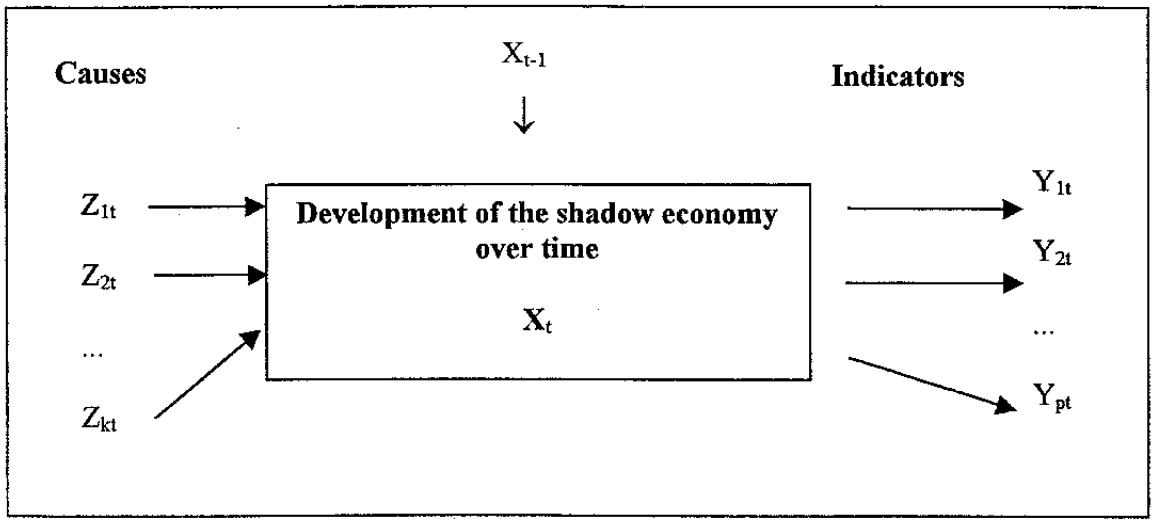
- It is questionable which is the most reliable base value of the shadow economy in order to calculate the size of the shadow economy for all other countries, especially for the transition and developing countries.

The model approach[68]

All methods described so far that are designed to estimate the size and development of the shadow economy consider just one indicator to capture all effects of the shadow economy. However, it is obvious that the effects of the shadow economy show up simultaneously in the production, labor, and money markets. An even more important critique is that the causes which determine the size of the hidden economy are taken into account only in some of the monetary approach studies which usually consider one cause—the burden of taxation. The model approach explicitly considers multiple causes leading to the existence and growth as well as the multiple effects of the shadow economy over time. The empirical method used is quite different from those used so far. It is based on the statistical theory of unobserved variables, which considers multiple causes and multiple indicators of the phenomenon being measured. For the estimation, a factor-analytic approach is used to measure the hidden economy as an unobserved variable over time. The unknown coefficients are estimated in a set of structural equations within which the "unobserved" variable cannot be measured directly. The DYMIMIC (dynamic multiple-indicators multiple-causes) model consists in general of two parts, the measurement model links the unobserved variables to observed indicators. The structural equations model specifies causal relationships among the unobserved variables. In this case, there is one unobserved variable, the size of the shadow economy. It is assumed to be influenced by a set of indicators for the shadow economy's size, thus capturing the structural dependence of the shadow economy on variables that may be useful in predicting its movement and size in the future. The interaction over time between the causes Z_{it} (i = 1, 2, ..., k), the size of the shadow economy X_t, and the indicators Y_{jt} (j = 1, 2, ..., p), is shown in Figure 1.

[68]This part is summarized from a longer study by Aigner, Schneider, and Ghosh (1988, p. 303), applying this approach for the United States over time. The pioneers of this approach are Weck (1983); and Frey and Weck-Hannemann (1984), who applied this approach to cross-section data from the 24 OECD countries for various years. Before turning to this approach they developed the concept of "soft modelling" (Frey, Weck, and Pommerehne (1982); Frey and Weck (1983a and 1983b)), an approach which has been used to provide a ranking of the relative size of the shadow economy in different countries.

Figure 1: Development of the Shadow Economy Over Time



There is a large body of literature[69] on the possible causes and indicators of the shadow economy, in which the following three types of causes are distinguished:

Causes

- The burden of direct and indirect taxation, both actual and perceived: a rising burden of taxation provides a strong incentive to work in the shadow economy.
- The burden of regulation as proxy for all other state activities: it is assumed that increases in the burden of regulation give a strong incentive to enter the shadow economy.
- The "tax morality" (citizens' attitudes toward the state), which describes the readiness of individuals (at least partly) to leave their official occupations and enter the shadow economy: it is assumed that a declining tax morality tends to increase the size of the shadow economy.[70]

[69]Thomas (1992); Schneider (1994a, 1997); Pozo (1996); Johnson, Kaufmann and Zoido-Lobatón (1998a, 1998b); and Giles (1999a, 1999b).

[70] When applying this approach for European countries, Frey and Weck-Hannemann (1984) had difficulty obtaining reliable data for the cause series, besides the ones of direct and indirect tax burden. Hence, their study was criticized by Helberger and Knepel (1988), who argue that the results were unstable with respect to changing variables in the model and over the years.

Indicators

A change in the size of the shadow economy may be reflected in the following indicators.

- Development of monetary indicators: if activities in the shadow economy rise, additional monetary transactions are required.

- Development of the labor market: increasing participation of workers in the hidden sector results in a decrease in participation in the official economy. Similarly, increased activities in the hidden sector may be expected to be reflected in shorter working hours in the official economy.

- Development of the production market: an increase in the shadow economy means that inputs (especially labor) move out of the official economy (at least partly). This displacement might have a depressing effect on the official growth rate of the economy.

The latest use of the model approach has been undertaken by Giles (1999a, 1999b), and by Giles, Linsey, and Gupsa (1999). They basically estimate a comprehensive (dynamic) MIMIC model to get a time series index of the hidden/measured output of New Zealand or Canada, and then estimate a separate "cash-demand model" to obtain a benchmark for converting this index into percentage units. Unlike earlier empirical studies of the hidden economy, they paid proper attention to the nonstationarity, and possible co-integration of time series data in both models. Again, this MIMIC model treats hidden output as a latent variable, and uses several (measurable) causal variables and indicator variables. The former include measures of the average and marginal tax rates, inflation, real income, and the degree of regulation in the economy. The latter include changes in the (male) labor force participation rate and in the cash/money supply ratio. In their cash-demand equation they allow for different velocities of currency circulation in the hidden and recorded economies. Their cash-demand equation is not used as an input to determine the variation in the hidden economy over time—it is used only to obtain the long-run average value of hidden/measured output, so that the index for this ratio predicted by the MIMIC model can be used to calculate a level and the percentage units of the shadow economy. Giles latest combination of the currency demand and MIMIC approach clearly shows that some progress in the estimation technique of the shadow economy has been achieved and a number of critical points have been overcome.

VIII. More Detailed Empirical Findings for OECD Countries

A. The Development of the Shadow Economy Over Time

The results of the estimations of the shadow economy of 18 OECD western-type countries over an extended period of time are shown in Table 11.

Table 11: The Development of the Size of the Shadow Economy in Selected OECD Countries Over Time, Applying the Currency Demand Approach

	Size of the Shadow Economy (in percent of official GDP) Currency Demand Approach						
	1960	1970	1980	1994	1995	1996	1997
Australia	-	-	-	13.0	13.2	14.0	13.9
Austria	0.4	1.8	3.0	6.7	7.3	8.3	8.9
Belgium	-	10.4	16.4	21.4	21.6	21.9	22.4
Canada	-	-	10.1–11.2	14.6	15.0	15.1	14.8
Denmark	3.8–4.8	5.3–7.4	6.9–10.2	17.6	18.1	18.3	18.1
France	-	3.9	6.9	14.3	14.8	14.9	14.7
Germany	2.0–2.1	2.7–3.0	10.3–11.2	13.1	13.9	14.5	15.0
Greece	-	-	-	26.0	26.6	28.5	-
Ireland	-	4.3	8.0	15.3	15.6	15.9	16.1
Italy	-	10.7	16.7	25.8	26.2	27.0	27.3
Netherlands	-	4.8	9.1	13.6	14.1	14.0	13.5
New Zealand[1]	-	6.9	9.2	11.3	-	-	-
Norway	1.3–1.7	6.2–6.9	10.2–10.9	17.9	18.5	18.9	19.4
Spain	-	10.3	17.2	22.3	22.6	22.9	23.1
Sweden	1.5–1.8	6.8–7.8	11.9–12.4	18.3	18.9	19.2	19.8
Switzerland	1.2	4.1	6.5	6.6	6.9	7.5	8.1
United Kingdom	-	2.0	8.4	12.4	12.6	13.1	13.0
United States	2.1–4.1	2.6–4.6	3.9–6.1	9.4	9.0	8.8	8.8

Source: Schneider (1997, 1999).
[1] Source: Giles (1999b).

If one examines the results achieved by the currency demand approach for the latest available year, 1997 it can be seen that Italy (27.3 percent of GDP), Spain (23.1 percent of GDP), and Belgium (22.4 percent of GDP) have the largest shadow economies. In the mid-group are Sweden (19.8 percent of GDP), Norway (19.4 percent of GDP), Denmark (18.1 percent of GDP), Ireland (16.1 percent of GDP), Canada (14.8 percent of GDP), France (14.7 percent of GDP), the Netherlands (13.5 percent of GDP), and at the lower end the United States (8.8 percent of GDP), Austria (8.9 percent of GDP), and Switzerland (8.1 percent of GDP).

From Table 11 it can be seen that the shadow economy has increased over time for these OECD countries. Whereas in the investigated countries in 1970 the size of the shadow economy was far below 10 percent of GDP in most countries, the shadow economy increased in 1997 in Belgium, Denmark, Italy, Norway, Spain, and Sweden to almost 20 percent of GDP. If one considers the development of the shadow economy over time for single countries, the size of the shadow economy in Belgium was 10.4 percent of GDP in 1970, and had more than doubled to 22.4 percent of GDP in 1997. In Italy, the size of the shadow economy was 10.7 percent of GDP in 1970, and reached a size of 27.3 percent of GDP in 1994—an increase of more than

165 percent in 28 years. The increase has also been remarkable in countries where the size of the shadow economy is considerably smaller. In the United States, the shadow economy was 3.6 percent of GDP in 1970 and rose to 8.8 percent of GDP in 1997—an increase of more than 144 percent. These results demonstrate a strong expansion of the shadow economy in the examined countries over the years 1970–97.

B. Comparison of the Results of Estimates of the Shadow Economy Using Different Methods

As discussed in Chapter 7, there are at least nine different methods used to estimate the shadow economy. In Table 12, the empirical results of these methods which were applied to Canada, Germany, Great Britain, Italy, and the United States are shown.

The survey method, which has been used for all five countries, provides lower-bound estimates ranging from 1.5 percent to 4.5 percent for the period 1970–80. The tax auditing method provides higher estimates of the shadow economy, ranging from 2.9 percent of GDP to 8.2 percent of GDP for the period 1970–80. Both methods also show that the shadow economy increases over time (e.g., for the United States). The two discrepancy methods (expenditure versus income, and official versus actual labor force) show no clear pattern. For some countries, they "produce" high shadow economy values (compared to the other methods for these countries, e.g., Germany), for some, low (e.g., Canada). Also, they do not show a consistent time pattern. The physical input (electricity) method, for which only values for the period 1986–90 are available for all five countries, shows values in the middle range for all countries (average value of 12.7 percent of GDP over all countries and all periods). If one compares the three monetary approaches (currency demand, cash-deposit ratio, and transactions approach) a clear pattern shows up. The largest size of the shadow economies for all five countries were achieved using the transactions approach (Feige method), ranging from 15 percent to 35 percent of GDP (average value of 21.9 percent of GDP over all countries and periods). Somewhat lower results are achieved with the cash-deposit ratio (Gutmann method), ranging between 10 percent and 30 percent of GDP for all countries (average value of 15.5 percent of GDP over all countries and all periods). Considerably lower values were achieved using the currency demand approach, ranging from 4 percent to 20 percent of GDP over the period 1970–90 for all five countries (average value of 8.9 percent of GDP over all countries and periods). The currency demand approach shows a strongly rising shadow economy in all five countries, a result opposite that given by the transactions and cash deposit methods. The model approach shows values in the medium range from 6.1 percent to 10.5 percent of GDP for the period 1976–80 (average value of 7.9 percent of GDP for all countries over all periods). In general, these results demonstrate quite clearly what a huge range of estimates for the shadow economy of a country in a given time span are achievable using different "calculation" methods. Hence, one should be very careful when interpreting the size of shadow economy in a country using only one method.

Table 12: A Comparison of the Results of the Estimations of the Shadow Economies of Five OECD Countries, Using Nine Different Methods Over the Period 1970–90

	Size of the Shadow Economy (in percent of GDP)																			
	Canada Average over				Germany Average over				Great Britain Average over				Italy Average over				United States Average over			
	70–75	76–80	81–85	86–90	70–75	76–80	81–85	86–90	70–75	76–80	81–85	86–90	70–75	76–80	81–85	86–90	70–75	76–80	81–85	86–90
Method																				
Surveys of households	-	-	1.3	1.4	3.6	-	-	-	1.5	-	-	-	-	-	-	-	3.7	4.5	5.6	-
Tax auditing	-	-	2.9	-	-	-	-	-	-	-	-	-	3.0	3.9	-	10.0	4.9	6.3	8.2	10.0
Discrepancy between expenditure and income	-	-	-	-	11.0	10.2	13.4	-	2.5	3.6	4.2	-	3.2	4.3	-	9.3	3.2	4.9	6.1	10.2
Discrepancy bet. off. and actual employment.	-	-	-	-	23.0	38.5	34.0	-	-	-	-	-	-	18.4	-	-	-	-	-	-
Physical input (el) method	-	-	-	11.2	-	-	-	14.5	-	-	-	13.2	-	-	-	19.3	-	-	7.8	9.9
Currency demand (Tanzi)	5.1	6.3	8.8	12.0	4.5	7.8	9.2	11.3	4.3	7.9	8.5	9.7	11.3	13.2	17.5	21.3	3.5	4.6	5.3	6.2
Cash-deposit ratio (Gutmann)	13.8	15.9	11.2	18.4	-	-	-	-	14.0	7.2	6.2	-	23.4	27.2	29.3	-	8.8	11.2	14.6	-
Transactions approach (Feige)	-	26.5	15.4	21.2	17.2	22.3	29.3	31.4	17.2	12.6	15.9	-	19.5	26.4	34.3	-	17.3	24.9	21.2	19.4
MIMIC method (Frey /Weck-H.)	-	8.7	-	-	5.8	6.1	8.2	-	-	8.0	-	-	-	10.5	-	-	-	8.2	-	-
Number of methods used	2	4	5	5	6	5	5	3	5	5	4	2	5	7	3	4	6	7	7	5

Notes: The values were grouped (when possible, averaged) in the time periods 1970–75, 1976–80, 1981–85, and 1986–90, in order to undertake a rough comparison. The sources of the values are given by country.

Source: Own calculations by using the following sources:

[1] For Canada, Lippert and Walker (1997); Thomas (1992); Hill and Kabir (1996); Schneider (1997); and Bendelac and Clair (1993).

[2] For Germany, Lippert and Walker (1997); Schneider (1994a, 1994b) and Schneider (1997).

[3] For Great Britain,Thomas (1992); Lippert and Walker (1997); Schneider (1994a, 1994b, 1997); Pozo (1996).

[4] For Italy, Thomas (1992); Lippert and Walker (1997); Pozo (1996); Schneider (1994a, 1994b, 1997); Bendelac and Clair (1993).

[5] For the United States, Thomas (1992); Lippert and Walker (1997); Pozo (1996); Schneider (1994a, 1994b, 1997); Bendelac and Clair (1993); Tanzi (1986); Feige (1986); Thomas (1986).

IX. Summary and Conclusions

There are many obstacles to be overcome in measuring the size of the shadow economy and analyzing its consequences for the official economy. In this paper, it is shown that although it is difficult to estimate the size of the shadow economy, it is not impossible. We have demonstrated that with various methods (e.g., the currency demand, the physical input measure, and the model approach), some insights can be provided into the size and development of the shadow economy of developing, transition, and the OECD countries. The general impression from the results of these methods is that, for all countries investigated, the shadow economy has reached a remarkably large size.

There is no "best" or commonly accepted method of estimating the size of the shadow economy; each approach has its specific strengths and weaknesses, and yields its own insights and results. Although the different methods provide a rather wide range of estimates, there is a common finding that the size of the shadow economy in most transition and all investigated OECD countries has been growing over the recent decade. A similar finding can be made for the "shadow labor market," which is attracting growing attention due to high unemployment in European OECD countries. Furthermore, the results in this paper show that an increasing burden of taxation and social security payments, combined with rising state regulatory activities, are the major driving forces behind the size and growth of the shadow economy. According to some studies, a growing shadow economy has a negative impact on official GDP growth and is linked to the amount of corruption.

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