

# Shadow Economies: Size, Causes, and Consequences

FRIEDRICH SCHNEIDER *and* DOMINIK H. ENSTE<sup>1</sup>

## 1. Introduction

SHADOW OR UNDERGROUND economic activity is a fact of life around the world, and there are strong indications that it is increasing. Most societies attempt to control these activities through various punitive measures or through education, rather than through reforms of the tax and social security systems which could improve the dynamics of the official economy. Gathering information about underground economic activity is difficult, because no one engaged in such activity wants to be identified. Obtaining accurate statistics about the allocation of a country's resources in the shadow economy is important for making effective economic policy decisions. Hence, it is crucial to know who is engaged in the shadow economy, and with what frequency and magnitude such activities occur.

<sup>1</sup>Schneider: Johannes Kepler University of Linz, Austria. Enste: University of Cologne, Germany. A first version of this paper was written during a stay of the first author at the IMF, Washington, D.C., and of the second author at the Center for Study of Public Choice, George Mason University, Fairfax, Virginia. We are grateful to Richard Hemming (IMF), Hendrik Juerges (University of Dortmund, Germany), Daniel Kaufmann (World Bank), Norman Loayza (World Bank), Melanie Muellenmeister (University of Cologne), Partho Shome (IMF), Vito Tanzi (IMF), Pablo Zoido-Lobaton (World Bank) and two anonymous referees of this journal for their helpful comments and stimulating criticism of earlier drafts.

Although a large literature exists on single aspects of the hidden economy, a current comprehensive survey is lacking. Disagreement persists about definitions and estimation procedures, and about the use of estimates in economic analysis and policy. The feature "Controversy: On the Hidden Economy" in *Economic Journal* (Vol. 109, No. 456, June 1999) documents the differing opinions of, e.g., Vito Tanzi (1999), James J. Thomas (1999), and David E. A. Giles (1999a). The size, causes, and consequences of the shadow economy vary for different types of countries, but some comparisons can be made which might be useful for social scientists and politicians, who must deal with this phenomenon sooner or later.

There are several important reasons why policy makers should be especially concerned about the rise of the shadow economy. Among the most important of these are:

- (i) A growing shadow economy can be seen as the reaction of individuals who feel overburdened by the state and who choose the "exit option" rather than the "voice option" (Albert O. Hirschman 1970). If the increase of the shadow economy is caused by a rise in the overall tax and social security burden together with "institutional sclerosis" (Mancur

Olson 1982), then the “consecutive flight” into the shadow economy may erode the tax and social security bases. The result can be a vicious circle of a further increase in the budget deficit or tax rates, additional growth of the shadow economy, and gradual weakening of the economic and social basis of collective arrangements.<sup>2</sup>

- (ii) A prospering shadow economy may cause severe difficulties for politicians because official indicators—on unemployment, labor force, income, consumption—are unreliable. Policy based on erroneous official indicators is likely to be ineffective, or worse.
- (iii) The effects of a growing shadow economy on the official one must also be considered. On the one hand, a prospering shadow economy may attract (domestic and foreign) workers away from the official economy and create competition for official firms. On the other hand, at least two-thirds of the income earned in the shadow economy is immediately spent in the official economy, thus having a positive effect on the official economy.<sup>3</sup>

We undertook the task of collecting available data on the shadow economy to determine its development and size over an extended period of time for as

<sup>2</sup> For further analysis of the impacts of the shadow economy, see Schneider and Enste (2000). Some more general implications for governments are discussed e.g. by Bruno S. Frey (1997); Frey, Felix Oberholzer-Gee, and Reiner Eichenberger (1996); Frey and Eichenberger (1996); and Elinor Ostrom (1990).

<sup>3</sup> This figure was derived from polls of the German and Austrian populations 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 without the activities in the shadow economy.

many countries as possible. In Section 2, we attempt to define shadow economy activities and present an overview of some empirical results. In Section 3 we examine the main causes of the development of the shadow economy, and in Section 4 we analyze the interactions between the official and unofficial economies. Section 5 provides a preliminary analysis of the link between corruption and the shadow economy, and in Section 6 the various methods of estimating the size of the shadow economy are presented. In Section 7 we discuss more detailed empirical findings on the size of the shadow economy for developing, transition, and OECD countries. Finally, in Section 8 we summarize and draw some conclusions.

## 2. *The Shadow Economy: Definition and Size*

### 2.1 *What Is the Shadow Economy?*

Attempts to measure the shadow economy first face the problem of defining it. One commonly used working definition is: all economic activities that contribute to the officially calculated (or observed) gross national product but are currently unregistered. This definition is used, for example, by Edgar L. Feige (1989, 1994), Schneider (1994a), Frey and Werner Pommerehne (1984), and Herald Lubell (1991). Philip 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.” But these definitions fall short of addressing all questions. Table 1 might be helpful in developing a reasonable consensus definition of the legal and illegal shadow economy.

According to Table 1, the shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter

TABLE 1  
A TAXONOMY OF UNDERGROUND ECONOMIC ACTIVITIES

	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

Source: Rolf Mirus and Roger S. Smith (1997, p. 5), with additional remarks.

transactions, hence all economic activities that 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.” (Gunnar Mogensen, Hans K. Kvist, Eszter Körmendi, and Soren Pedersen 1995, p. 5).<sup>4</sup>

Moreover, the definition often varies depending on the chosen method of measurement. In our analysis we concentrate on legal value-added creating activities which are not taxed or registered and where the largest part can be classified as “black” or clandestine labor.<sup>5</sup>

Our survey does not focus on tax

<sup>4</sup> For a detailed discussion, see “Controversy: On the Hidden Economy” in *Economic Journal* (Vol. 109, no. 456, June 1999), Frey and Pommerehne (1984); Feige (1989); Thomas (1992, 1999); and Schneider (1986, 1994a, 1998a).

<sup>5</sup> This means that unpaid or “pure” household production, voluntary nonprofit (social) services and criminal activities are excluded from the analysis. See Thomas (1992) for a broader view

evasion itself, but rather serves as a supplement to the recent survey on tax compliance by James Andreoni, Brian Erard, and Jonathan S. Feinstein (1998, p. 819) which explicitly excludes 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.”<sup>6</sup> Still, there are some connections between these two research areas. See for example Feinstein (1999), who tries to close the gap between tax evasion and shadow economy research.

and comprehensive analysis of the household, informal, irregular, and criminal sectors in different types of countries.

<sup>6</sup> While there have been many theoretical studies on tax evasion in the last twenty years, empirical studies are harder to find. Many are based on tax compliance experiments and cover only parts of the shadow economy. Convincing empirical evidence for the theoretical hypothesis on why people evade taxes is hard to find, and the empirical results are ambiguous (Pommerehne and Hannelore Weck-Hanneman 1992). James Alm (1996) gives an overview of tax compliance explanations in different studies. The theoretical literature on tax evasion is summarized in Frank Cowell (1990); see also Michael G. Allingham and Agnar Sandmo (1972) for their pathbreaking study in this area.

TABLE 2  
SIZE OF THE SHADOW ECONOMY IN VARIOUS  
DEVELOPING, TRANSITION, AND OECD COUNTRIES

Developing Countries	Size of shadow economy as % of GDP, average over 1990–93
Africa	
Nigeria	} 68–76%
Egypt	
Tunisia	} 39–45%
Morocco	
Central and South America	
Guatemala	} 40–60%
Mexico	
Peru	
Panama	
Chile	} 25–35%
Costa Rica	
Venezuela	
Brazil	
Paraguay	
Colombia	
Asia	
Thailand	} 70%
Philippines	
Sri Lanka	} 38–50%
Malaysia	
South Korea	
Hong Kong	} 13%
Singapore	

Source: Authors' calculations based on physical input (electricity) and currency demand approaches.

## 2.2 How Large Is the Shadow Economy?

A main focus of this survey is to give a comprehensive summary of available data on the size of the shadow economy, since there has been no consistent comparison of estimates on various countries generated using similar methods. An overview of some results, estimated with indirect or “indicator” methods, is given in Tables 2 and 3, which provide approximate magnitudes of the size and development of the underground economy, defined as productive value-adding activities that should be included in the official GNP.<sup>7</sup>

<sup>7</sup>The more detailed results for seventy-six developing, transition, and OECD countries can be

TABLE 2 (Cont.)

Transition Economies	Size of shadow economy as % of GDP, average over 1990–93
Central Europe	
Hungary	} 20–28%
Bulgaria	
Poland	
Romania	} 9–16%
Slovakia	
Czech Republic	
Former Soviet Union Countries	
Georgia	} 28–43%
Azerbaijan	
Ukraine	
Belarus	
Russia	} 20–27%
Lithuania	
Latvia	
Estonia	
OECD Countries	
Greece	} 24–30%
Italy	
Spain	
Portugal	
Belgium	
Sweden	
Norway	
Denmark	
Ireland	
France	
Netherlands	} 13–23%
Germany	
Great Britain	
Japan	
United States	} 8–10%
Austria	
Switzerland	

Source: Authors' calculations based on physical input (electricity) and currency demand approaches.

Table 2 provides a rough comparison of the size of the shadow economy relative to official GDP for a selection of developing, transition, and OECD economies in the early 1990s, using the physical input (electricity) and currency

found in Section 7 (including the sources). The different methods used to measure the size of the shadow economy are described in Section 6.

TABLE 3  
GROWTH OF SHADOW ECONOMY RELATIVE TO GNP  
SELECTED WEST EUROPEAN COUNTRIES AND THE UNITED STATES, 1960–95

Country	Size of Shadow Economy		Increase in Shadow Economy
	1960	1995	
Sweden	2%	16%	14%
Denmark	4.5%	17.5%	13%
Norway	1.5%	18%	16.5%
Germany	2%	13.2%	11.2%
United States	3.5%	9.5%	6%
Austria	0.5%	7%	6.5%
Switzerland	1%	6.7%	5.7%

Source: Authors' calculations based on the currency demand approach (rounded figures).

demand approaches. The estimates for some of these countries (Nigeria, Egypt, and Thailand) show an underground sector that is nearly three-quarters the size of officially recorded GDP. In many countries, especially in Central and South America, the size is one-quarter to one-third of GNP. In Asian countries, with a comparatively small public sector, high tax morale and/or high expected punishment (for example in Hong Kong and Singapore), the shadow economy is estimated to be similar to that in many “northern” European countries. Transition economies are estimated to often have substantial unofficial activity, many at around one-quarter of GNP. The biggest shadow economies belong to some of the former Soviet Union transition countries (between 28–43 percent of GDP), like Georgia, Ukraine and Belarus. The Czech Republic can be found at the lower end; according to these estimates, the underground sector is around 10 percent of GDP.

Turning to the OECD countries in Southern Europe, Greece and Italy have underground economies almost one-third as large as officially measured GNP. Spain, Portugal, and Belgium have shadow economies between 20–24

percent of (official) GNP. According to these estimates, the Scandinavian countries also have sizeable unofficial economies (between 18–20 percent of GNP) which is attributed mainly to the high fiscal burden. The “central” European countries (Ireland, the Netherlands, France, Germany and Great Britain) have smaller shadow economies (between 13–16 percent of GNP), probably due to lower fiscal burdens and moderate regulatory restrictions. The smallest underground economies are estimated to exist in countries with relatively small public sectors (Japan, the US, and Switzerland) and comparatively high tax morale (the US and Switzerland).

Table 3 reports estimates of the growth of the underground economy (relative to GNP) for selected Western countries and the US, using the currency demand approach. The Scandinavian countries (Sweden, Norway, and Denmark) and the German-speaking countries (Germany and Austria) exhibit a sizeable increase of their underground economies within the thirty-five years covered (1960–95). The countries with a low share (Switzerland, Austria, and the US) also show a significant increase; in all three countries the share more than doubled. Sizeable increases have

been estimated, with few exceptions, for all types of countries and with all kinds of approaches: the increasing importance of the underground relative to the official economy is a robust phenomenon (see Section 7).

### 3. *The Main Causes of the Increase*

The growth of the shadow economy is caused by many different factors. The most important and often cited ones are:<sup>8</sup> the rise of the burden of taxes and social security contributions; increased regulation in the official economy, especially of labor markets; forced reduction of weekly working time; earlier retirement; unemployment; and the decline of civic virtue and loyalty towards public institutions combined with a declining tax morale.

An interdisciplinary analysis of the causes of the increase of the shadow economy seems necessary, since economic factors can only partly explain the increase.<sup>9</sup> Micro-sociological and psychological approaches can provide interesting additional insights in the decision making process of individuals choosing to work underground (Schneider and Enste 2000). In an interdisciplinary approach (as undertaken in economic psychology), variables such as tax morale (first discussed by Günter Schmolders 1960, 1975) and acceptance and perceived fairness of the tax system

<sup>8</sup>When dealing with the various causes in sections 3.1 to 3.5, the most important references are given. For an overall view, see the studies by Dieter Cassel and E. Ulrich Cichy (1986); Tanzi (1982); Frey and Pommerehne (1984); Thomas (1992), and Schneider and Enste (2000).

<sup>9</sup>Although thus far interdisciplinary research focuses on tax compliance (see Alm, Gary McClelland, and William Schulze 1999; Cowell 1990; Pommerehne, Albert Hart, and Frey 1994; and the special issue on "Economic Psychological Perspectives on Taxation" of the *Journal of Economic Psychology*, Dec. 1992), interdisciplinary approaches can also be used to explain other hidden activities; see Frey (1997).

are considered. A discussion of the importance of interdisciplinary research can be found in recent articles in this journal by Matthew Rabin (1998), Jon Elster (1998), and Shira B. Lewin (1996). For a broader view see Robert H. Frank (1988) and Frey (1997). However, since our article concentrates on economic factors, we will focus on the economic reasoning.

#### 3.1 *The Burden of Tax and Social Security Contributions*

In almost all studies, one of the most important causes of the increase of the shadow economy is the rise of the tax and social security burdens.<sup>10</sup> Since taxes affect labor-leisure choices, and also stimulate labor supply in the shadow economy (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 after-tax earnings (from work), the greater the incentive to avoid this difference and to work 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 rise of the shadow economy.

A recent macroeconomic analysis of the matter is given by Norman V. 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, where the government lacks the capability to enforce

<sup>10</sup>See Tanzi (1982, 1999); Frey and Pommerehne (1984); Feige (1989); Susan Pozo (1996); Owen Lippert and Michael Walker (1997); Schneider (1994a,b, 1997, 1998a, 1999); Schneider and Enste (2000); Thomas (1992); Hernando De Soto (1989); Ben-Zion Zilberfarb (1986); and Giles (1999a).

compliance. Using the Multiple-Indicator-Multiple-Cause (MIMIC) model (see Section 6.3), his empirical approach treats the informal sector as an unobserved variable for which multiple causes and indicators exist. He estimates the size of the informal sector in fourteen 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 government institutions have a negative influence leading to a decrease of the informal sector.<sup>11</sup> Because Loayza's approach only shows statistical correlations rather than causal relations, he can only partly answer 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? Since, according to methodological individualism, only individuals can choose, it might be helpful to take a closer look at the individual decision (with respect to the influence of the tax and social security burden) to work in the shadow economy.

The determinants for a household to work in the shadow economy are similar to those of tax evasion, namely: how much income should be declared to the tax authorities. Reinhard Neck, Markus Hofreither, and Schneider (1989) investigated the determinants of a household's supply of underground labor and its demand for underground goods, showing that 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 depend positively on the indirect tax and wage rates in the official economy (under the assumption of fixed nonhuman factors of production, and separate production functions for official and underground goods). Disregarding other factors influencing the extent of the shadow economy, one can conjecture that 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 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 government control.

One must, however, be very careful not to draw premature policy conclusions from such a model. First, the comparative static results do not generalize to arbitrary utility and production functions. Second, the analysis concentrated on the determinants of the quantities of goods and labor supplied and demanded by individual firms and households, and did not analyze market equilibrium conditions. The model ought to be closed by putting individual decision makers into the context of a general equilibrium model, with at least two labor markets and two goods markets, the official and the shadow economy markets in each case. Only in such a framework

<sup>11</sup> The numbers indicate the change of the size of the informal sector (in standard deviations) with a one standard deviation increase in each of the determinants.

could all spillovers be analyzed appropriately, and prices and wages, which are assumed to be given for the individual transactors, could be determined endogenously. Also, on a more general level, an analysis of the effects of the degree of progression on the shadow economy has to take into account differences of reactions across consumers with respect to the total and official labor supply. The different effects on the official and underground labor supply so far seem to be an open question, which 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 not available at the present time.

In another study, Schneider and Neck (1993) investigate how the complexity of the tax system affects the size of the shadow economy. A complex income tax schedule allows more legal tax avoidance than a simple one by providing various tax exemptions and reductions. According to this view, a comprehensive income tax displays a low degree of complexity. Schneider and Neck show in their theoretical model that a more complex tax system implies, *ceteris paribus*, a smaller labor supply in the shadow economy, because a more complex tax system makes individual efforts to legally avoid taxation more profitable. At the same time, it encourages households to work in the official economy instead of the underground, because the reduced tax burden makes tax evasion (with the risk of being caught and punished) less attractive. Broadening the income tax base and removing tax exemptions can therefore increase the size of the shadow economy. The Austrian tax reform of 1989 not only reduced marginal income tax rates but also broadened the tax base by abolish-

ing several exemptions and loopholes, producing a less complex tax system. Schneider and Neck empirically analyze the effects of changing tax structures on the development of the Austrian shadow economy. One would expect that a decrease in direct taxes would lead to a decline in the shadow economy; such a result was actually not found. The explanation offered by Schneider and Neck was that not only are direct and indirect taxes an important factor influencing the shadow economy, but the complexity of the tax system and the burden of regulation are important as well. The theoretical and empirical results in their study indicate that both factors—i.e. a less complex tax system with a broader tax base, and increased regulation—more than offset the lower tax burden in 1989.<sup>12</sup>

The influence of indirect and direct taxation on the shadow economy can be further demonstrated by discussing empirical results on 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 variables: direct taxation; indirect taxation; complexity of the tax system; and intensity of government regulations. The direct tax burden (including social security payments) has the biggest estimated influence, followed by the intensity of regulation and complexity of the tax system on the currency demand. A similar result was obtained by Schneider (1986) for Denmark, Norway, and Sweden. In all three countries, tax variables (average direct tax rate, average total tax rate [indirect

<sup>12</sup> For Canada, Peter S. Spiro (1993) finds that people once working in the shadow economy like the high profiles from irregular activities, develop social networks and personal relationships and hence will not return to the official economy even in the long run.

and direct] and marginal tax rates) have the expected positive influence (on currency demand) and are statistically significant. Similar results were reached by Gebhard Kirchgassner (1983, 1984) for Germany and by Jan Klovland (1984) for Norway and Sweden.

Two other recent studies provide evidence of the influence of income taxes on the shadow economy. Richard J. Cebula (1997), using Feige's data, found some impact of income tax rates, IRS audit probabilities, and penalty policies on the relative size of the shadow economy in the United States. He concludes that restraining from increasing the top marginal income tax rate may prevent further increase of the shadow economy, while increased IRS audits and penalties might reduce the shadow economy; his findings indicate that government actions generally have a strong influence. For example, if the marginal federal personal income tax rate increases by one percentage point, *ceteris paribus*, the shadow economy rises by 1.4 percentage points. In another investigation, Roderick Hill and Muhammed 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 Simon Johnson, Daniel Kaufmann, and Pablo Zoido-Lobato (1998a,b), who conclude that it is not higher tax rates *per se* that increase the size of the shadow economy, but ineffective and discretionary application of the tax system and regulations by government. Their finding, that there is a negative correlation between the size of the unofficial economy and the top (marginal) tax rates, might be unexpected, but since other factors—like tax deductibility, tax relief, 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. Similarly, Eric Friedman, Johnson, Kaufmann and Zoido-Lobato (1999) found in a cross-country analysis that higher tax rates are associated with less unofficial activity as percent of GDP. They argue that entrepreneurs go underground not to avoid official taxes but 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. The overall conclusion of the studies is that there is a large difference between the impact of either the direct tax or the corporate tax burden, and institutional aspects like efficiency of the administration, the extent of control by politicians and bureaucrats, the amount of bribery, and especially corruption. Johnson, Kaufmann, and Zoido-Lobato (1998b) argue that these aspects play a bigger role in the bargaining game between the government and the taxpayers than the tax burden.

### 3.2 *Intensity of Regulation*

Increased regulation reduces individuals' choices in the official economy.<sup>13</sup> Intensity of regulation is often measured by the number of laws and requirements such as licenses, and one can think of labor market regulations, labor restrictions for foreigners, and trade barriers. The influence of labor

<sup>13</sup> For a psychological foundation of this feature (theory of reactance), see Jack W. Brehm (1966, 1972), and for a (first) application to the shadow economy Linde Pelzmann (1988). See Schneider and Enste (2000) for an integration of this theory in an interdisciplinary (rational choice) approach.

regulations on the shadow economy in Germany is described in Deregulation Commission (1991) and Monopol-kommission (1998). Regulations lead to increased labor costs in the official economy. Since most of these costs can be shifted onto employees, they provide another incentive to work in the shadow economy, where they can be avoided. Schneider and Günther Pöll (1999) present some empirical evidence of this impact.

The model of Johnson, Kaufmann, and Andrei Shleifer (1997) 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. 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, Kaufmann, and Zoido-Lobaton 1998b, p. 18). They conclude that the enforcement of regulation—rather than the overall extent of regulation (mostly not enforced)—is the key factor for the burden levied on firms and individuals that drives them into the shadow economy. Friedman, Johnson, Kaufmann, and Zoido-Lobaton (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 direction of the correlation 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 seventy-six developing, transition, and developed countries.<sup>14</sup>

<sup>14</sup> De Soto (1989) in his famous book describes in more detail the costs of regulation in Peru.

These findings demonstrate that governments should put more emphasis on reducing the density of regulations or at least on improving enforcement of laws and regulations, instead of increasing the number of regulations. Some governments, however, opt for more regulation and laws in trying to reduce the shadow economy, mostly because it leads to increased power for bureaucrats and to higher employment in the public sector. Some politicians may not have a sincere interest in substantially reducing the shadow economy, since many voters gain from unofficial activities. The signaling of “fighting for law and order” might therefore be more useful for getting politicians reelected than would deep reforms of the tax and social security systems.<sup>15</sup>

### 3.3 *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 approaches or equals 100 percent. This can be derived from the neoclassical leisure-income model presented by Peter de Gijssel (1984); Volker Riebel (1983, 1984); and Schneider and Enste (2000). For Canada, see Thomas Lemieux, Bernard Fortin, and Pierre Fréchette (1994). For Germany, Siegfried Lamnek, Gaby Olbrich, and Wolfgang Schäfer (1999) found empirical evidence of this impact. Such a system provides disincentives for individuals receiving welfare payments to even search for work in the official economy, since their overall income is higher if they receive these transfers while working in the underground economy.

<sup>15</sup> See Frey (1989) for a first application of the public choice theory to the shadow economy, and for further discussion Cassel (1989), and Schneider and Enste (2000).

### 3.4 Labor Market

Overregulation and labor costs in the official labor market are driving forces for the shadow economy. Two main aspects—the reduction of official working hours, and the unemployment rate—are discussed quite often in this context. In most OECD countries, unemployment is to a large extent caused by high total labor costs. This can also be seen as a cause for the 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 unemployment. An overview of these economic policy measures is given in OECD (1998, pp. 123–88). The thinking behind the policy is that there is a limited quantity of work, which has to be redistributed. But this idea neglects a key factor: a forced reduction of working hours contrary to employee preferences increases the potential hours they can work in the shadow economy (see for example Jennifer Hunt 1999).<sup>16</sup> Early retirement and part-time work also offer opportunities for individuals to work in the untaxed, unregulated economy (de Gijssel 1984; Riebel 1983, 1984). The redistribution of work can be successful only if it is in accordance with individual preferences for leisure or if individuals are incapable of working. Otherwise, they may choose to work more—underground.<sup>17</sup>

More detailed information on 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). The results of their study suggest that hours worked in the shadow economy are responsive to changes in the net wage in the regular sector. Their empirical findings 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). Their results emphasize a large negative elasticity of hours worked in the shadow economy with respect to the wage rate in the regular sector, and also a high mobility between the sectors. A (further) reduction of (official) working hours can therefore lead to an increase in the shadow economy, since—for example in Germany—almost all recent empirical investigations show that most employees do not want further reduction (Schneider and Enste 2000; DIW 1998; Bosch and Lehndorff 1998). Hence, a reasonable economic policy suggestion is more flexible working hours in accordance with employee preferences, because this would reduce distortion of the individual decision.

### 3.5 Public Sector Services

An increase in the shadow economy leads to decreased state revenue, which in turn reduces the quality and quantity of publicly provided goods and services. Ultimately, this can lead to increased tax rates in the official sector, often combined with deterioration in the quality of 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-Lobato (1998b) present a simple model of this relationship. Their findings show that smaller shadow

<sup>16</sup> After Volkswagen in Germany reduced working hours considerably, there was some (thus far basically anecdotal) evidence that in the area around the firm, much more reconstruction and renovation of houses took place than in other similar regions.

<sup>17</sup> See Gary S. Becker (1965) for the theoretical foundation, and F. Thomas Juster and Frank P. Stafford (1991) for a more detailed analysis of the allocation of time.

economies appear in countries with higher tax revenues, if achieved by lower tax rates, fewer laws and regulations, and less bribery facing enterprises. Countries with a better rule of 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, and a large discretionary framework of regulations—and consequently, larger shadow economies. Their 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 burdens, sizeable revenue mobilization, good rule of law and corruption control, and (relatively) small unofficial economy. By contrast, a number of countries of Latin America and the former Soviet Union exhibit characteristics consistent with a ‘bad equilibrium’: tax and regulatory discretion and burden on the firm are 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-Lobaton 1998a).

In many countries, therefore, the public sector faces the challenge of substantially reforming the social security and tax systems to prevent the total defeat of the protective welfare state because of the vicious circle: high tax and regulatory burdens cause an increase in the shadow economy, bringing additional pressure on public finance, resulting in higher tax rates, which again increase the incentives to evade taxes and to escape into the shadow economy, and so on. In a cumulative process, existing institutions and rules might lose acceptance in the society, resulting in a situation where democratic voting (voice) is less attractive than using the

exit option—the shadow economy. Eventually, loyalty to democratic political institutions is abandoned or cannot develop, as can be seen in some former Soviet Union states. The shadow economy can therefore be seen as a “challenge to the welfare state” (Manfred E. Streit 1984).

#### 4. *Effects of the Shadow Economy on the Official Economy*

In order to study the effects of the shadow economy on the allocation of resources, several studies integrate underground economies into macroeconomic models.<sup>18</sup> John F. Houston (1987) develops a theoretical model of the business cycle as well as tax and monetary policy linkages with the shadow economy. He concludes that, on the one hand, the shadow economy’s effect should be taken into account in setting tax and regulatory policies, and on the other hand, the existence of a shadow economy could lead to overstatement of the inflationary effects of fiscal or monetary stimuli. In their study for Belgium, Markus C. Adam and Victor Ginsburgh (1985) focus on the implications of the shadow economy on official growth. They find a positive relationship between the growth of the shadow economy and the official one, and they conclude under certain assumptions (i.e. low entry costs into the shadow economy due to low probability of enforcement) that an expansionary fiscal policy is a positive stimulus for both the formal and informal economies. A study for the United States by Ronald Fichtenbaum (1989) argues that the US productivity slowdown over the period 1970–89 was overstated, as underreporting of income due to the more

<sup>18</sup> For Austria this was done by Schneider, Hofreither, and Neck (1989) and Neck, Hofreither, and Schneider (1989). For further discussion of this see Peter J. Quirk (1996) and Giles (1999a).

rapid growth of the US shadow economy during this period was not taken into account. Similar impacts were found by Pommerehne and Schneider (1985).

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. Loayza (1996) concludes that in economies where (1) the statutory tax burden is larger than optimal, and where (2) enforcement of compliance is too weak, the increase in the relative size of the informal economy generates a reduction of economic growth. The reason for this is the 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 American 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 1.2 percentage points.

This negative impact of informal sector activities on economic growth is not broadly accepted. For example, the key feature of the model has been criticized. The model is based on the assumption that the production technology depends on tax-financed public services which are subject to congestion; that is contrary to the general definition of public goods, which are not subject to congestion (unlike private goods). In addition, the informal sector does not pay taxes but must pay penalties which are not used to finance public services. The negative correlation between the size of the informal sector and economic growth is therefore not

surprising. Patrick K. Asea (1996) gives a more detailed criticism of the Loayza model.

Depending on the prevailing view of the informal sector, one might also come to the opposite conclusion. In the neoclassical view, the underground economy, responding to the economic environment's demand for urban services and small-scale manufacturing, adds to the economy a dynamic and entrepreneurial spirit and can lead to more competition, higher efficiency, and limits on government activities. The informal sector may also contribute "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 may provide a higher potential for economic growth and, hence, a positive correlation between an increase in the informal sector and economic growth. The effects of the shadow economy on economic growth therefore remain ambiguous.

The empirical evidence on these opposite hypotheses is also not clear. Since many Latin American countries had or still have excessive regulation and weak government institutions, Loayza (1996) finds evidence for the implications of his growth model in the early 1990s in these countries. An increase in the size of the shadow economy negatively affects growth (1) by reducing the availability of public services for everyone, and (2) by using the existing public services less efficiently or not at all. But the positive side effects of shadow economy activities must be considered, too. Empirical findings by Schneider (1998b) show that over 66 percent of earnings in the shadow economy are immediately spent in the official sector, with positive effects for

economic growth and for indirect tax revenues. Dilip K. Bhattacharyya (1993, 1999) found evidence for the United Kingdom (1960–84) that the hidden economy has a positive effect on consumer expenditures of nondurable goods and services, and an even stronger positive effect on consumer expenditures on durable goods and services. A close interaction between official and unofficial economies is also emphasized in Giles (1999a) and Tanzi (1999).

5. *Corruption and the Shadow Economy—Substitutive or Complementary Effects?*<sup>2</sup>

Over the last ten years, corruption has gained growing attention among scientists, politicians, and public officials. Its origins and consequences and ways to fight it have been analyzed. The literature is quite large and only some (recent) publications can be mentioned here: Susan Rose-Ackermann (1978, 1997, 1999); Arvind Jain (1998); Shleifer and Robert W. Vishny (1993); Tanzi (1994, 1998); Tanzi and Hamid Davoodi (1997); Johnson, Kaufmann, and Zoido-Lobatón (1998a,b); Kaufmann and Jeffrey Sachs (1998); for the latest survey see Pranab Bardhan (1997).

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). In 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” (ib). There are various kinds of corruption, such as bribes to reduce costs; the literature gives extensive analyses of factors that stimulate corruption. Corruption is sometimes involved in: satisfying regu-

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

The effects of corruption on the official economy can be seen from two different perspectives: Paul Romer (1994) suggested that corruption, as a tax on ex-post profits, may in general stimulate the entry of new goods or technology which require an initial fixed-cost investment. Paolo Mauro (1995) finds a significant negative correlation between a corruption index and the investment rate or rate of GDP growth. A one-standard-deviation improvement in the corruption index is estimated by Mauro to increase the investment rate by about 3 percent. Johnson, Kaufmann, and Zoido-Lobatón (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 one point decreases GDP growth by 0.84 percentage points) but the relationship becomes insignificant if the shadow economy is entered as an independent variable. In contrast, 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.”

Only a few studies empirically investigate the relationship between the shadow economy and corruption, either in a country or over a sample of countries. In their empirical investigation of forty-nine countries in Latin America, the OECD, and the post-communist countries of Eastern Europe and the former Soviet Union, Johnson, Kaufmann, and Zoido-Lobato (1998a, p. 21) find a statistically significant relationship between the various measures of bribery or corruption and the shadow economy: *ceteris paribus*, a one-point improvement in the corruption index ICRG<sup>19</sup> leads to an eight to eleven percentage point decline in the shadow economy. Using another measure for corruption, the transparency International Corruption Index,<sup>20</sup> Johnson, Kaufmann, and Zoido-Lobato (1998b) found that, *ceteris paribus*, a one-point increase in this index decreases the shadow economy by 5.1 percentage points. Friedman, Johnson, Kaufmann, and Zoido-Lobato (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.”

To summarize, the relationship be-

tween the size of the shadow economy and the amount of corruption is strong and consistent, as different measures show. Whereas Rose-Ackermann concludes from her work that going underground is a substitute for corruption (bribery), the empirical results of Johnson, Kaufmann, and Zoido-Lobato (1998b) point more to a complementary process: Countries with more corruption and bribery have larger shadow economies.

## 6. *Methods of Estimating the Size of the Shadow Economy*

The three methods most widely used to measure the size and development of the shadow economy are discussed in the following three subsections. More detailed discussions are given in Frey and Pommerehne (1984); Feige (1989); Thomas (1992, 1999); and Schneider (1986, 1994a, 1998a, 1999).

### 6.1 *Direct Approaches*

These are micro approaches that employ either surveys and samples based on voluntary replies, or tax auditing and other compliance methods. Sample surveys are widely used in a number of countries to measure the shadow economy. The direct method of voluntary sample surveys was used for Norway by Arne J. Isachsen, Jan Klovland, and Steinar Strom (1982); and Isachsen and Strom (1985). For Denmark this method was used by Mogensen, Kvist, Kormendi, and Pedersen (1995), who estimate the shadow economy to be 2.7 percent of GDP for 1989; 4.2 percent for 1991; 3.0 percent for 1993; and 3.1 percent for 1994. Further results for other countries can be found in Table 8.

The main advantage of this method lies in the detailed information that can be gained about the structure of the shadow economy. But results from

<sup>19</sup>This index ranks between 1 and 6 (with 6 meaning no corruption) and was averaged by Johnson, Kaufmann, and Zoido-Lobato (1998b, p. 21) for the 1990s.

<sup>20</sup>This index ranks between 0 and 10 (10 means no corruption).

these surveys are sensitive to the way the questionnaire is formulated, and, as with all surveys, precision and results depend greatly on the respondents' willingness to cooperate. Most interviewed hesitate to confess fraudulent behavior, and quite often responses are unreliable, making it difficult to estimate the extent of undeclared work. The advantages and disadvantages of this method are extensively discussed by Mogensen et al. (1995).

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. For the United States see for example IRS (1979, 1983); C. P. Simon and A. D. Witte (1982); Witte (1987); Charles T. Clotfelter (1983); and Feige (1986). A detailed discussion is given in Bruno Dallago (1990) and in Thomas (1992).

A number of difficulties beset this approach. First, using tax compliance data is equivalent to using a (possibly biased) sample of the population. However, since in general selection of taxpayers for audit is based on properties of submitted (tax) returns which indicate some likelihood of (tax) fraud, such a sample is not a random one of the whole population. This factor is likely to bias compliance-based estimates of the shadow economy. Second, estimates based on tax audits reflect only that portion of shadow economy income which the authorities succeeded in discovering, and this is likely to be only a fraction of 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 unlikely that they 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 at least one considerable advantage. They can provide detailed information about shadow economy activities and the structure and composition of labor in the shadow economy.

## 6.2 *Indirect Approaches*

These approaches, which are also called indicator approaches, are mostly macroeconomic, and use various economic and other indicators that contain information about the development over time of the shadow economy. Currently there are five such indicators, discussed next.

### 6.2.1 *Discrepancy between National Expenditure and Income Statistics*

In national accounting, the income measure of GNP should be equal to the expenditure measure of GNP. Thus, if an independent estimate of the expenditure side 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 shadow economy.

This approach was used by A. Franz (1983) for Austria; by Kerrick MacAfee (1980), Michael O'Higgins (1989), and James D. Smith (1985) for Great Britain; by Hans-Georg Petersen (1982) and Daniela Del Boca (1981) for Germany; and by T. Park (1979) for the United States. The latest international comparison of the shadow economy using micro-level data was undertaken by Tiho Yoo and Jin K. Hyun (1998), who calculate the size of the shadow economies of Korea (1996: 20.3 percent), Taiwan

(1995: 16.5 percent), Italy (1995: 19.2 percent), Spain (1990: 50.5 percent), Russia (1995: 74.9 percent) and Hungary (1994: 56.9 percent). See Thomas (1992) for a survey and critical remarks.

Since national account 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 side were measured without error, then this approach would indeed yield a good estimate of the scale of the shadow economy. However, this is not the case, unfortunately, and the discrepancy therefore reflects all omissions and errors everywhere in the national account statistics as well as the shadow economy activity. These estimates are therefore of questionable reliability.<sup>21</sup>

### 6.2.2 *Discrepancy between Official and Actual Labor Force*

A decline in labor force participation 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, *ceteris paribus*. Such studies have been done for Italy (Bruno Contini 1981, 1982; Del Boca 1981) and for the United States (David M. O'Neill 1983).

The weakness of this method is that differences in the rate of participation may have other causes. Moreover, people can work in both the shadow and the official economies. Therefore, such estimates may be viewed as weak indicators of the size of the shadow economy.

<sup>21</sup>A related approach is pursued by C. Pisarides and G. Weber (1988), who use micro data from household budget surveys to estimate the extent of income understatement by the self-employed. In this micro approach, more or less the same difficulties arise, and the figures calculated for the shadow economies seem to be crude.

### 6.2.3 *The Transactions Approach*

This approach was developed by Feige (1979, 1989, and 1996). Further application can be found for the Netherlands (Werner C. Boeschoten and Marcel M. G. Fase 1984), and for Germany (Enno Langfeldt 1984). Feige assumes that there is a constant relation over time between the volume of transactions and official GNP. This approach therefore starts from Fisher's quantity equation,  $MV = pT$  (with  $M$  = money,  $V$  = velocity,  $p$  = prices, and  $T$  = total transactions). Assumptions have to be made about the velocity of money and the relationships between the value of total transactions ( $pT$ ) and total (= official + unofficial) nominal GNP. Relating total nominal GNP to total transactions, the GNP of the shadow economy is calculated by subtracting official GNP from total nominal GNP. However, Feige has to assume a base year in which there is no shadow economy, and therefore the ratio of  $pT$  to total nominal (official = total) GNP was normal.

This method, too, has several weaknesses; for instance, the assumption of a base year with no shadow economy, and the assumption that the ratio of transactions to official GNP is constant over time. Moreover, to obtain reliable estimates, precise figures of the total volume of transactions need to 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 of the paper on which they are printed. In this approach the additional assumption is made that all variations in the ratio between the total value of transactions and the officially measured GNP 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 legal and have nothing to do with the shadow economy. 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). 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.

#### 6.2.4 *The Currency Demand Approach*

Phillip Cagan (1958) initiated the currency demand approach, correlating currency demand and tax pressure for the United States over the period 1919–55. Pierre M. Gutmann (1977) used a similar approach but without statistical procedures, looking only 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 1929–80. His approach assumes that shadow transactions are undertaken in the form of cash payments, so as to leave no traces for the authorities. An increase in the shadow economy will therefore increase the demand for currency. To isolate the resulting excessive demand for currency, an equation for currency demand is econometrically estimated over time. All conventional possible factors, such as 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 currency demand proposed by Tanzi (1983) is:

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

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 a 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  $Y/N$  is the per capita income.

The excessive increase in currency—the amount unexplained by the conventional factors mentioned above—is then attributed to the rising tax burden and other factors leading people to work in the shadow economy. Figures for the size and development of the shadow economy can be initially calculated by comparing the development of currency when taxes and government regulations are at their lowest values, with the development of currency at the current (higher) levels of taxation and regulations. Next, assuming the same income velocity for currency in the shadow economy as for money (as measured by  $M1$ ) in the official economy, the size of the shadow economy can be computed and compared to the official GDP. This currency demand equation is criticized by Thomas (1999), and some of the criticisms are addressed by Giles (1999a,b) and Bhattacharyya (1999), who use the latest econometric techniques.

The currency demand approach is one of the most commonly used methods. It has been applied to many OECD

countries (e.g. Schneider 1997, 1998a; Johnson, Kaufmann, and Zoido-Lobaton (1998a); and Colin C. Williams and Jan Windebank (1995). But it has nevertheless been criticized on various grounds (e.g. Thomas 1986, 1992, 1999; Feige 1986; and Pozo 1996). The most commonly raised objections to this method are:

- (i) Not all transactions in the shadow economy are paid in cash. Isachsen and Strom (1980, 1985), using the survey method, concluded that in Norway in 1980, roughly 80 percent of all transactions in the underground sector were paid in cash. The size of the total shadow economy (including barter) may thus be even larger than previously estimated.
- (ii) 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, "tax morality," and so on) are not considered, because reliable data for most countries are not available. If, as seems likely, these other factors also affect the extent of the hidden economy, it might again be higher than reported in most studies.<sup>22</sup>
- (iii) Increases in currency demand deposits are due largely to a slowdown in demand deposits, rather than to

<sup>22</sup> One (weak) justification for the use of only the tax variable is that this variable has a very strong impact on the size of the shadow economy in the studies known to the authors. One 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 by 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 of the size of the shadow economy. See also Zilberfarb (1986).

an increase in currency caused by activities in the shadow economy, at least in the United States, as discussed by Gillian Garcia (1978), Park (1979), and Feige (1996). Also, Derek Blades (1982) and Feige (1986, 1997) criticize Tanzi's studies on the grounds that the US dollar is used as an international currency. Tanzi should have considered (and controlled for) the US dollars, which are used as an international currency and held in cash abroad.<sup>23</sup> Frey and Pommerehne (1984) and Thomas (1986, 1992, 1999) claim that Tanzi's parameter estimates are not very stable.<sup>24</sup>

- (iv) 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

<sup>23</sup> In another study by Tanzi (1982, especially pp. 110–13), he explicitly deals with this criticism. A very careful investigation of the amount of US dollars used abroad and in the shadow economy and "classical" crime activities was undertaken by Kenneth 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.

<sup>24</sup> However, in studies for European countries, Kirchgassner (1983, 1984) and Schneider (1986) conclude 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).

currency in the shadow economy, one has to accept the assumption of an “equal” money velocity in both sectors.

- (v) Finally, the assumption of no shadow economy in a base year is problematic, and relaxing the assumption would again imply an upward adjustment of the figures attained in the bulk of the studies already undertaken.

### 6.2.5 *The Physical Input (Electricity Consumption) Method*

*The Kaufmann–Kaliberda Method.* This method was used earlier by C. Lizzeri (1979), and Del Boca and Francesco Forte (1982); and then later by Alejandro Portes (1996); Kaufmann and Aleksander Kaliberda (1996); and Johnson, Kaufmann, and Shleifer (1997). For a critique see Mária Lackó (1996, 1997, 1998). To measure overall (official and unofficial) economic activity in an economy, Kaufmann and Kaliberda (1996) assume that electricity consumption is 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 lock-step, 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. The difference between the growth of official GDP and the growth of electricity consumption is attributed to the growth of the shadow economy. This method is simple and appealing; however, it can also be criticized:

- (i) 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.

- (ii) Over time, there has been considerable technical progress. The use of electricity is more efficient than in the past, in both official and unofficial uses.
- (iii) There may be considerable differences in the elasticity of electricity/GDP across countries or changes over time.<sup>25</sup>

*The Lackó Method.* Lackó (1996, 1998, 1999) assumes that a certain part of the shadow economy is associated with the household consumption of electricity, including so-called household production, do-it-yourself activities, and other non-registered production and services. Lackó assumes that in countries where the part of the shadow economy associated with 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.

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  $i$  is the number assigned to the country;  $E_i$  is per capita household electricity consumption in country  $i$  in Mtoe;  $C_i$  is per capita real consumption of households without the consumption of

<sup>25</sup> Johnson, Kaufmann, and Shleifer (1997) attempt to adjust for changes in the elasticity.

electricity in country  $i$  in US dollars (at purchasing power parity);  $PR_i$  is the real price of consumption of 1 kwh of residential electricity in US dollars (at purchasing power parity);  $G_i$  is the relative frequency of months with the need to heat houses in country  $i$ ;  $Q_i$  is the ratio of energy sources other than electricity to all energy sources in household energy consumption;  $H_i$  is the per capita output of the hidden economy;  $T_i$  is the ratio of the sum of paid personal income, corporate profit, and taxes on goods and services to GDP;  $S_i$  is the ratio of public social welfare expenditures to GDP; and  $D_i$  is the sum of the numbers of dependants over 14 years and of inactive earners, both per 100 active earners.

In a cross-country study, Lackó estimates equation (1) substituting  $H_i$  by equation (2). The econometric results can then be used to order 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 needs to 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 one of the shadow economy estimates obtained using another approach, and applies this proportion to the other countries. Lackó uses the shadow economy of the United States in the early 1990s as such a base (the shadow economy value of 10.5 percent of GDP taken from B. Morris 1993), and then calculates the size of the shadow economy for other countries. Lackó's method is also open to criticism:

- (i) Not all shadow economy activities require a considerable amount of electricity, and other energy sources can be used.
- (ii) Shadow economy activities do not take place only in the household sector.

- (iii) 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.

- (iv) It is unclear which is the most reliable base value of the shadow economy to calculate its size for all other countries, especially for the transition and developing countries.

### 6.3 *The Model Approach*

The pioneers of this approach are Weck (1983), Frey and Weck (1983a,b), Frey and Weck-Hannemann (1984), who applied it to cross-section data from the twenty-four OECD countries for various years. Before turning to this approach they developed the concept of "soft modeling" (Frey, Weck, and Pommerehne 1982; Frey and Weck 1983a,b), an approach that has been used to provide a ranking of the relative size of the shadow economy in different countries.

All methods described so far for estimating the size and development of the shadow economy consider just one indicator of all effects of the shadow economy. However, its effects show up simultaneously in the production, labor, and money markets. A more important critique is that some of the monetary approach studies consider just one cause, the burden of taxation. The model approach explicitly considers the multiple causes of, as well as the multiple effects of, the shadow economy. The empirical method, quite different from those discussed so far, is based on the statistical theory of unobserved variables, which considers multiple causes and multiple indicators of the phenomenon. 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

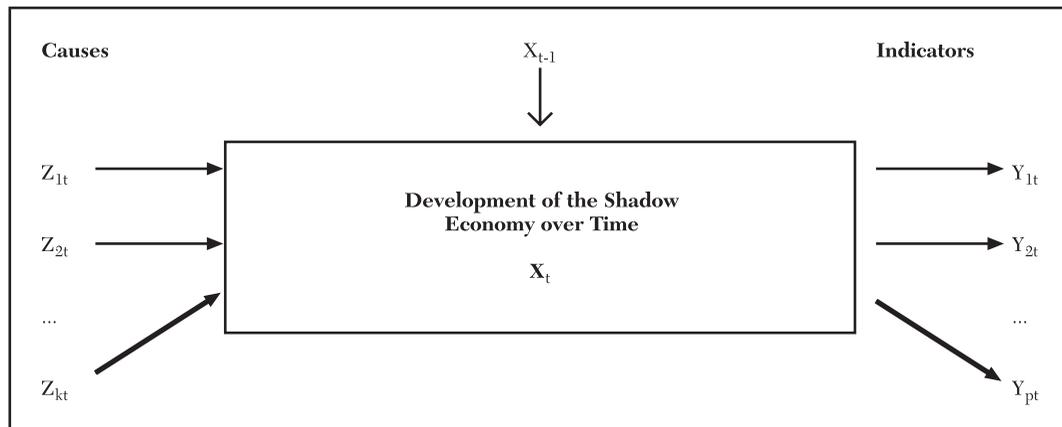


Figure 1. Development of the Shadow Economy over Time

within which the unobserved variable cannot be measured directly (see Dennis Aigner, Schneider, and Victor Ghosh 1988).

The dynamic multiple-indicators multiple-causes model consists 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 of 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  $Z_{it}$  ( $i = 1, 2, \dots, k$ ) the size of the shadow economy  $X_t$ , and the indicators  $Y_{jt}$  ( $j = 1, 2, \dots, p$ ) is shown in Figure 1.

As discussed in Section 3 above, there are three main possible causes of the shadow economy: high taxation, heavy regulation, and declining "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. When applying this approach for European countries, Frey and Weck-Hannemann (1984) had difficulty obtaining reliable data for regulation and tax morality. Their study was criticized by Claus Helberger and Hans Knepel (1988), who argue that the results were unstable with respect to changing variables in the model and over time.

*Indicators.* A change in the size of the shadow economy may be reflected in the following indicators: monetary indicators—if activities in the shadow economy rise, additional monetary transactions are required; labor market—increasing participation of workers in the hidden sector results in decreased participation in the official economy (similarly, increased activities in the hidden sector may be reflected in shorter working hours in the official economy); production market—an increase in the shadow economy means that inputs (especially labor) move out of the official economy (at least partly), and this displacement might have a depressing effect on the official growth rate of the economy.

The model approach has been further developed by Giles (1999a,b) and Giles,

Linsey M. Tedds, and Gugsu Werkneh (1999), who estimate a comprehensive dynamic multiple-indicators multiple-causes model to get a time-series index of the hidden/measured output of New Zealand and Canada, and then estimate a separate “cash-demand model” to obtain a benchmark for converting this index into percentage units. Unlike earlier empirical studies, they paid attention to the nonstationarity and possible cointegration of time-series data in both models. This model treats hidden output as a latent variable, and uses several (measurable) causal variables and indicator variables. The former include 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 ratio predicted by the model can be used to estimate the shadow economy.

## 7. *The Empirical Findings in More Detail*

### 7.1 *How Large Is the Shadow Economy?*<sup>26</sup>

For single countries, and sometimes for a group of countries (like the OECD or transition countries), the size of the shadow economy has been estimated using various methods and different time periods, but until now there has been no consistent comparison of estimates of the size of the shadow economies of various countries, for a fixed period,

generated by using similar methods. In Tables 4 to 6, such a comparison is made, reporting the results for the shadow economies of 76 countries for 1989–90 and 1990–93 using the physical input (electricity) method, the currency demand approach and the model approach. Unfortunately, comparison of the size of shadow economies between countries remains crude, since at least two methods have not been applied for all seventy-six countries.<sup>26</sup>

#### 7.1.1 *Developing Countries*

Table 4 shows the results of applying the physical input (electricity), currency demand, and model approaches for developing countries. The results from eight countries in Africa are reported. Among these, Nigeria and Egypt have the largest shadow economies with 76 percent and 68 percent of GDP; Mauritius has the smallest shadow economy with 20 percent. Applying the currency demand approach, Tanzania had a shadow economy of 31 percent (of GDP) in 1989–90, and South Africa, 9 percent in 1989–90. The ranking of the size of the shadow economies for the African countries is supported by similar findings and anecdotal evidence from Lubell (1991); Lawrence Chickerling and Muhamed Salahdine (1991); and Pozo (1996).

For Central and South American countries, we have two estimates—one using the physical input method (Lackó 1996) and one the model approach (Loayza 1996). For some countries, the estimates of the size of the shadow economy are quite similar, e.g., Venezuela, Brazil, and Guatemala. For others there are great differences, e.g.,

<sup>26</sup>In this comparison the same time periods (1989–90 or 1990–93) are used for all countries, and, if possible, the values were calculated as averages over the time periods.

TABLE 4  
SHADOW ECONOMIES IN DEVELOPING COUNTRIES

Countries	Size of Shadow Economy (as % of GDP)		
	Physical Input Method	Currency Demand Approach	MIMIC Approach
	Average 1989–90	Average 1989–90	Average 1990–93
Africa			
Botswana	27.0	—	—
Egypt	68.0	—	—
Mauritius	20.0	—	—
Morocco	39.0	—	—
Nigeria	76.0	—	—
South Africa	—	9.0 <sup>1</sup>	—
Tanzania	—	31.0 <sup>2</sup>	—
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 <sup>3</sup>	27.1 (35.1) <sup>3</sup>
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 <sup>4</sup>	—
Israel	29.0	—	—
Malaysia	39.0	—	—
Philippines	50.0	—	—
Singapore	13.0	—	—
South Korea	38.0	—	20.3 <sup>5</sup>
Sri Lanka	40.0	—	—
Taiwan	—	—	16.5 <sup>5</sup>
Thailand	71.0	—	—

Sources: Authors' calculations using values for developing countries in Africa and Asia from Lackó (1996, Table 18); for Central and South America from Loayza (1996). A dash means no value available. Other sources:

<sup>1</sup> For South Africa, G. M. Hartzburg and A. Leimann (1992); they used the currency demand approach.

<sup>2</sup> For Tanzania, M. S. D. Bagachwa and A. Naho (1995, p. 1394); they used the currency demand approach.

<sup>3</sup> For Mexico, Pozo (1996) estimates 33.0% (1989–90) and 35.1% (1990–93) using the currency demand approach.

<sup>4</sup> Authors' calculations using the absolute figures of Bhattacharyya (1999).

<sup>5</sup> For Taiwan, Yoo and Hyun (1998) used the income discrepancy method; also for South Korea for 1990–93.

TABLE 5  
SHADOW ECONOMIES IN TRANSITION COUNTRIES

Countries	Size of Shadow Economy (as % of GDP)					
	Physical Input Method using values from Johnson et al.* and from Lackó					
	Average 1989–90		Average 1990–93		Average 1994–95	
	Johnson	Lackó	Johnson	Lackó	Johnson	Lackó
Former Soviet Union <sup>1</sup>						
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 <sup>2</sup>	—	23.5 <sup>2</sup>	39.0	28.5 <sup>2</sup>	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: \* Authors' calculations using values from Johnson, Kaufmann, and Shleifer (1997, Table 1, p. 182–83), and Johnson, Kaufmann, and Zoido-Lobato (1998a, p. 351). Lackó values from Lackó (1999, Table 8).

<sup>1</sup> For the former Soviet Union states in the column 1989/90 only data for 1990 was available from Johnson, Kaufmann and Shleifer (1997).

<sup>2</sup> For Croatia see Sanja Madzarevic and Davor Milkulic (1997, Table 9, p. 17); they used the discrepancy method.

Panama, Peru, and Mexico. Using the model approach for a ranking of the South American countries, the biggest shadow economies for the period 1990–93 were in Bolivia with 65.6 percent of GDP; Panama with 62.1 percent; Peru with 57.4 percent; and Guatemala with 50.4 percent. The smallest can be found in Costa Rica with 23.2 percent; Argentina with 21.8 percent; and Chile with 18.2 percent. This ranking for Central

and South America is also 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 model approach and the currency demand method are in a similar range (27.1 percent and 35.1 percent), the physical input method provides a size of 49 percent, far above the other two.

TABLE 6  
SHADOW ECONOMIES IN OECD COUNTRIES

Countries	Size of Shadow Economy (as % of GDP) using:			
	Physical Input (Electricity) Method 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 <sup>1</sup>	—	9.2	9.0	9.0
Norway	9.3	14.8	16.7	5.9
Portugal	16.8	—	—	15.6
Spain <sup>2</sup>	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
USA	10.5	6.7	8.2	13.9
Average	15.1	11.9	13.5	11.3

Sources: Physical input method, Lackó (1996, 1997, 1998, 1999); currency demand approach, Schneider (1994a, 1998a), Johnson, Kaufmann, and Zoido-Lobatón (1998a,b), and Williams and Windebank (1995).

<sup>1</sup> Calculated using the MIMIC method and currency demand approach. Source Giles (1999b).

<sup>2</sup> Calculated from Ignacio Mauleon (1998).

In Asia, Thailand ranks first with 71.0 percent, followed by the Philippines with 50 percent and Sri Lanka with 40 percent. Hong Kong and Singapore rank lowest with a shadow economy of 13 percent of GNP.

### 7.1.2 Transition Countries

The physical input method was used for the transition countries in Central and Eastern Europe and the states of the former Soviet Union. The results are shown in Table 5; they cover the pe-

riods 1989–90, 1990–93 and 1994–95.<sup>27</sup> Considering the physical input method by Johnson, Kaufman, and Shleifer (1997) (and respectively, the Lackó values) and the countries of the former Soviet Union over the period 1990–93,<sup>28</sup> Georgia has the largest shadow economy

<sup>27</sup> 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.

<sup>28</sup> The period 1989–90 is not discussed here because in this period the former Soviet Union was breaking up.

with 43.6 (50.8) percent of GDP, followed by Azerbaijan with 33.8 (41.0) percent and Moldova 29.1 percent. Russia is in the middle with a shadow economy of 27 (36.9) percent. According to the Johnson, Kaufmann, and Zoido-Lobaton (1998b) figures, Belarus with 14 percent and Uzbekistan with 10.3 percent 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 (Lackó value: 34.9 percent) for 1990–93, to 35.3 percent (Lackó value: 43.6 percent) for 1994–95, calculated over all twelve countries of the former Soviet Union. A more detailed analysis of the situation in the Ukraine is given by Kaufmann (1997).

Turning to the transition countries of Central and Eastern Europe, and considering the period 1990–93 and the Johnson, Kaufmann, and Zoido-Lobaton (1998b) figures, Hungary has the largest shadow economy with 30.7 percent of GNP, followed by Bulgaria with 26.3 percent. The lowest two are the Czech Republic with 13.4 percent and Slovakia with 14.2 percent. Considering the Lackó figures, Macedonia has the largest shadow economy with 40.4 percent, followed by Croatia with 39.0 percent. Whereas for the former Soviet Union countries a strong increase over the two periods 1990–93 and 1994–95 was observed, the average size of the shadow economy of Central and Eastern European states was almost stable over these two periods. The Johnson, Kaufmann, and Zoido-Lobaton (1998b) figures show an average shadow economy of the Central and Eastern European states of 20.6 percent (Lackó 32.4) over 1990–93; and over the period 1994–95 Johnson, Kaufmann, and Zoido-Lobaton (1998b) show an average size for the

Central and Eastern European states of 20.9 percent (Lackó 31.6).

Lackó estimates larger shadow economies for the transition countries than do Johnson, Kaufmann, and Zoido-Lobaton (1998b), perhaps because Lackó uses an estimate of household electricity consumption, whereas Johnson, Kaufmann, and Zoido-Lobaton use overall electricity consumption.

### 7.1.3 *OECD Countries*

For the twenty-one 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 from Johnson, Kaufmann, and Zoido-Lobaton (1998a,b). The main difference between the two is that Johnson, Kaufmann, and Zoido-Lobaton (1998a,b) 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 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.

Considering the period 1990–93 and using the series by Johnson, Kaufmann, and Zoido-Lobaton (Table 6), 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), Italy (20.4 percent), Spain (16.1 percent), and Portugal (15.6 percent). A similar result can be found when using figures of Schneider, and to a much lesser extent the ones achieved

TABLE 7  
SHADOW ECONOMIES OF OECD COUNTRIES  
1994–97

	Size of Shadow Economy as % of GDP 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	11.3 <sup>1</sup>	—
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
USA	9.2	8.8
Average	16.0	16.9

Sources: Authors' calculations using the data by Schneider (1998a) and Schneider and Pöll (1999).

<sup>1</sup> 1994 only, source Giles (1999b).

by the physical input (electricity) method by Lackó (1997). At the lower end, Johnson, Kaufmann, and Zoido-Lobaton rank Switzerland (6.9 percent), Norway (5.9 percent), and Austria (5.8 percent); whereas Schneider finds the USA (8.2 percent), Switzerland (6.9 percent), and Austria (6.1 percent). In general, this ranking of the size of the shadow economies of the OECD countries calculated by Schneider is supported by other studies. Frey and Pommerehne (1984), Frey and Weck-Hannemann (1984), Williams and Windebank (1995), Thomas (1992), and Lippert and Walker (1997) reach quite similar rankings.

In Table 7, the latest results are shown

for OECD countries over the period 1994–95, and for the period 1996–97. The ranking of the sizes of the shadow economies of the results are similar to the ones in Table 6. However, the shadow economy has increased compared to 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 16.0 percent of GDP in the years 1994–95. A further increase can be observed for the investigated OECD countries to 16.9 percent for the period 1996–97. Even in the late 1990s, the shadow economy is still growing in most OECD countries.

### 7.2 Comparing the Results of the Different Methods

As discussed in Section 6, there are at least nine different methods used to estimate the shadow economy. In Table 8, the empirical results of the methods applied to Canada, Germany, Great Britain, Italy and the United States are shown.

The survey method, which was 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, ranging from 2.9 percent to 8.2 percent for 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). They do not show a consistent time pattern. The physical input (electricity) method, for which only values for 1986–90 are available for all five countries, shows values in the middle size range

for all countries (average value of 12.7 percent over all countries and all periods). If one compares the three monetary approaches (currency demand, cash-deposit ratio, and transactions approach), a clear pattern appears. The largest size of the shadow economies for all five countries resulted using the transactions approach (Feige method) ranging from 15 to 35 percent of GNP (average value of 21.9 percent over all countries and periods). Somewhat lower results are achieved with the cash-deposit ratio (Gutmann method), ranging between 10 percent and 30 percent for all countries (average value of 15.5 percent over all countries and all periods).

Considerably lower values were achieved using the currency demand approach, ranging from 4 percent to 20 percent of GNP over the period 1970–90 for all five countries (average value of 8.9 percent 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 for the period 1976–80 (average value of 7.9 percent for all countries over all periods). In general, these results demonstrate what a huge range of estimates of the shadow economy for a country in a given time span are achievable using different calculation methods. Hence one should be very careful when interpreting the size of the shadow economy in a country using only one method.

### *7.3 The Shadow Economy Labor Force*

We now discuss the labor market in the shadow economy.<sup>29</sup> On the official

<sup>29</sup>Work in this area has been done by L. Frey (1972, 1975, 1978, 1980); M. A. Cappiello (1986); Lubell (1991); Pozo (1996); Bruce Bartlett (1998); and Tanzi (1999).

labor market, the costs that firms (and individuals) have to pay when “officially” hiring someone are tremendously increased by the burden of tax and social security contributions on wages, as well as the legal administrative regulation to control economic activity. In various OECD countries, these costs are greater than the wage effectively earned by the worker—providing a strong incentive to work in the shadow economy. 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 effectively earned (see section 4.2, and for Italy see Dallago 1985, 1990).

Working in the shadow economy may consist of a second job after (or even during) regular working hours; a second form is work by individuals who do not participate in the official labor market; a third form is work by people (e.g. clandestine, social fraud, or illegal immigrants) who are not allowed to work in the official economy.

The few existing results on the shadow economy labor force are shown in Table 9,<sup>30</sup> which provides rough estimates of the size of the labor force in the shadow economy for some OECD countries. The estimations are based either on the survey or discrepancy method (e.g. for Denmark, Italy, France) or on a calculation using the value added of the shadow economies, subtracting all material inputs and assuming certain average values of earnings paid per hour. The results for Denmark show that the population of adult Danes engaged in the shadow economy ranged from 8.3 percent (of the total labor force) in 1980 to 22.5 percent in

<sup>30</sup>For developing countries, some literature about the shadow labor market exists, e.g. Dallago (1990), Pozo (1996), Loayza (1996), and especially Chickering and Salahdine (1991).

TABLE 8  
A COMPARISON OF ESTIMATES OF SHADOW ECONOMIES OF 5 OECD COUNTRIES USING 9 METHODS

Method	Canada average over				Germany average over				Great Britain average over			
	1970 -75	1976 -80	1981 -85	1986 -90	1970 -75	1976 -80	1981 -85	1986 -90	1970 -75	1976 -80	1981 -85	1986 -90
Surveys of households	—	—	1.3	1.4	3.6	—	—	—	1.5	—	—	—
Tax auditing	—	—	2.9	—	—	—	—	—	—	—	—	—
Discrepancy bet. expenditure and income	—	—	—	—	11.0	10.2	13.4	—	2.5	3.6	4.2	—
Discrepancy bet. official and actual employment	—	—	—	—	23.0	38.5	34.0	—	—	—	—	—
Physical input	—	—	—	11.2	—	—	—	14.5	—	—	—	13.2
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
Cash deposit ratio (Gutmann)	13.8	15.9	11.2	18.4	—	—	—	—	14.0	7.2	6.2	—
Transactions (Feige)	—	26.5	15.4	21.2	17.2	22.3	29.3	31.4	17.2	12.6	15.9	—
MIMIC (Frey and Weck-Hannemann)	—	8.7	—	—	5.8	6.1	8.2	—	—	8.0	—	—
Number of methods used	2	4	5	5	6	5	5	3	5	5	4	2

Notes: Values were grouped (when possible, averaged) in the time periods in order to undertake a rough comparison.

Sources: Authors' calculations using the following sources:

<sup>1</sup> For Canada: Lippert and Walker (1997), Thomas (1992), Hill and Kabir (1996), Schneider (1997), and Jacques B endelac and Pierre-Maurice Clair (1993).

<sup>2</sup> For Germany: Lippert and Walker (1997), Schneider (1994a,b) and Schneider (1997).

<sup>3</sup> Great Britain: Thomas (1992), Lippert and Walker (1997), Schneider (1994a,b, 1997), Pozo (1996).

1998. In Germany, this figure rose from 8–12 percent in 1974–82 to 22 percent in 1998. Both countries, then, show a strong increase.

In other countries, the shadow economy labor force is also quite large: in Italy 30–48 percent (1997–98); Spain 11.5–32.3 percent (1997–98); Sweden 19.8 percent (1997); and France 6–12 percent (1997–98). In the European Union at least 20 million workers and in OECD countries about 35 million (1997–98) work in the unofficial economy. Moreover, the amount doubled within twenty years. The labor market in the shadow economy is lively and may provide one explanation for such high and persistent unemployment measured in many countries.

## 8. Summary and Conclusions

Many obstacles must be overcome to measure the size of the shadow economy and to analyze its consequences on the official economy, although some progress has been made. In this survey we have shown that although it is difficult to estimate the size of the shadow economy, it is not impossible. We have demonstrated that with the various methods—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 the developing, transition, and OECD countries. There is no “best” or commonly accepted method. Each approach has its specific

TABLE 8 (Cont.)

Method	Italy average over				United States average over			
	1970	1976	1981	1986	1970	1976	1981	1986
	-75	-80	-85	-90	-75	-80	-85	-90
Survey of households	—	—	—	—	3.7	4.5	5.6	—
Tax auditing	3.0	3.9		10.0	4.9	6.3	8.2	10.0
Discrepancy bet. expenditure and income	3.2	4.3		9.3	3.2	4.9	6.1	10.2
Discrepancy bet. official and actual employment	—	18.4	—	—	—	—	—	—
Physical input	—	—	—	19.3	—	—	7.8	9.9
Currency demand (Tanzi)	11.3	13.2	17.5	21.3	3.5	4.6	5.3	6.2
Cash deposit ratio (Gutmann)	23.4	27.2	29.3	—	8.8	11.2	14.6	
Transactions (Feige)	19.5	26.4	34.3	—	17.3	24.9	21.2	19.4
MIMIC (Frey and Weck-Hannemann)	—	10.5	—	—	—	8.2	—	—
Number of methods used	5	7	3	4	6	7	7	5

<sup>4</sup> Italy: Thomas (1992), Lippert and Walker (1997), Pozo (1996), Schneider (1994a,b, 1997), Bendelac and Clair (1993).

<sup>5</sup> United States: Thomas (1992), Lippert and Walker (1997), Pozo (1996), Schneider (1994a,b, 1997), Bendelac and Clair (1993), Tanzi (1986), Feige (1986), Thomas (1986).

strengths and weaknesses and can provide specific insights and results. The general impression from the results of these estimates is that, for all countries investigated, the shadow economy has reached a remarkably large size. Although the different methods provide a rather wide range of estimates, there is a common finding that the shadow economies of most transition and all investigated OECD countries have been growing over the past decade. The same can be said for the labor market in the shadow economy, which is attracting growing attention due to high unemployment in European OECD countries.

The analysis of causes shows that an increasing burden of taxation and social security payments, combined with rising

state regulatory activities and labor market restrictions (e.g. forced reduction in working hours), are the major driving forces for the size and growth of the shadow economy. But an interdisciplinary approach seems to be necessary for a more comprehensive analysis, which would consider aspects like tax morale, perceived fairness of the tax system, and institutional aspects as well.

The results on the shadow economy's effects on the official economy (e.g. the official growth rate and tax revenue) are ambiguous. According to some studies, a growing shadow economy has a negative impact on official GDP growth. But other studies show the opposite effect. Hence, it is important to undertake further research to gain more precise

TABLE 9  
ESTIMATES OF THE SIZE OF THE SHADOW ECONOMY LABOR FORCE IN SOME OECD COUNTRIES

Countries	Years	Participants per 1000 people <sup>1</sup>	Participants as % of Labor Force <sup>2</sup>	Size of the Shadow Economy (as % of GDP) Currency Demand Approach <sup>3</sup>	Sources of Figures for Participants
Austria	1990–91	300	9.6	5.47	Schneider (1998)
	1997–98	500	16.0	8.93	
Denmark	1980	—	8.3	8.6	Mogensen, Kvist, Körmendi,
	1986	—	13.0	—	Pedersen
	1991	—	14.3	11.2	(1995)
	1994	—	15.4	17.6	Pedersen (1998)
	1998	—	22.5	18.4	
France	1975–82	800–1500	3.0–6.0	6.9	Raffaele De Grazia (1983) and own calculations
	1997–98	1400–3200	6.0–12.0	14.7	
Germany	1974–82	2000–3000	8.8–12.0	10.6	De Grazia (1983)
	1997–98	5000	22.0	14.7	Schneider (1998b)
Italy	1979	4000–7000	20.0–35.0	16.7	D. Gaetani and G. d'Aragona (1979); own calculations
	1997–98	6600–11400	30.0–48.0	27.3	
Spain	1979–80	1250–3500	9.6–26.5	19.0	Benito S. M.
	1997–98	1500–4200	11.5–32.3	23.1	Ruesga (1984); own calculations
Sweden	1978	750	13.0–14.0	13.0	De Grazia (1983)
	1997	1150	19.8	19.8	and own calculations
European Union	1978	10,000	—	14.5	De Grazia (1983)
	1997–98	20,000	—	—	and own calculations
OECD	1978	16,000	—	15.0	De Grazia (1983)
	1997–98	35,000	—	—	and own calculations

<sup>1</sup> Estimated full-time jobs, including unregistered workers, illegal immigrants, and second jobs.

<sup>2</sup> As percent of the population aged 20–69, survey method. Denmark: as percent of the population aged 20–69, survey method (% heavily engaged in shadow economy activities).

<sup>3</sup> Source of size of shadow economy: Schneider (1994a, 1998b, 1999).

knowledge. First studies on the interaction between the shadow economy and corruption find a positive impact on the level of corruption: the larger the corruption, the larger the shadow economy. But clearly, more research is needed here, too.

Most studies of the shadow economy focus on the influence on the allocation of resources and the loss of revenue for the state. But the impact on official institutions, norms, and rules is even more important. The shadow economy can be seen as an indicator of a deficit

of legitimacy of the present social order and the existing rules of official economic activities. The exit-option shadow economy is an important constraint on the Leviathan state and can help secure economic freedom.<sup>31</sup>

To conclude: we have provided some information on the size of the shadow economy, and on its causes and consequences. But more research is needed

<sup>31</sup> For the importance of institutions and the impact of the shadow economy, see Geoffrey Brennan and James M. Buchanan (1980, 1985).

to develop a comprehensive, interdisciplinary, theoretical and empirical approach to learning more about why people work in the shadow economy and what effect it has on the official economy.

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