Measuring and Integrating the Shadow Economy: A Sector-Specific Approach

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Overview

- Scope of shadow economic activity
- Size of shadow economy in the United States and other countries
- Why shadow economies exist
- Adding a shadow information sector to simplified version of the official economy
- Shadow-official economy interactions
- Benefits and burdens of shadow economic activity

The Scope of Shadow Economy Activity

	Monetary Transactions		Nonmonetary Transactions	
Illegal Activities	Trade in stolen goods; drug dealing and manufacturing; prostitution, gambling, smuggling (international and inter-state) and fraud. Counterfeiting. *Computer system hacking; trading stolen information; identity theft; spamming (?)*		Barter: 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 in the Shadow Economy	Income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal goods and services	All do-it-yourself work and neighbor help

Adapted from Schneider and Enste (2000).

Measuring the Shadow Economy

- Virtually all previous studies on measuring the size of the shadow economy focus on the aggregate shadow economy, usually expressed in terms of the size of the official economy.
- Little or no work attempting to estimate the size of specific shadow economy sectors *within the context of the rest of the legal economy.*

Shadow Economy in US

- Schneider and Enste (2000) estimate the total US shadow economy at between 8 and 10 percent of US GDP, or from $1 to $1.4 trillion.
- Evidence on the size of specific sectors of the shadow economy in the US is largely anecdotal, and does not attempt to analyze how the shadow economy is linked to the official economy.

International Comparisons

- Estimates of the aggregate shadow economies of different countries vary widely.
- Some examples:
  - The shadow economies of Thailand, Nigeria, and Egypt amount to about 70 percent of their respective GDP.
  - The shadow economies of Guatemala, Mexico, Panama, and Peru amount to 40 to 60 percent of their respective GDP.
  - The shadow economies of the Philippines, Sri Lanka, Malaysia, and South Korea amount to 30 to 50 percent of their respective GDP.

International Comparisons

Developing Countries	% of GDP	Transition Economies	% of GDP
Africa		**Central Europe**	
Nigeria, Egypt	68-76%	Hungary, Bulgaria, Poland	20-28%
Tunisia, Morocco	39-45%	Romania, Slovakia, Czech Republic	9-16%
Central and South America		**Former Soviet Union Countries**	
Guatemala, Mexico, Peru, Panama	40-60%	Georgia, Azerbaijan, Ukraine, Belarus	28-43%
Chile, Costa Rica, Venezuela, Brazil, Paraguay, Colombia	25-35%	Russia, Lithuania, Latvia, Estonia	20-27%
Asia		**OECD Countries**	
Thailand	70%	Greece, Italy, Spain, Portugal, Belgium	24-30%
Philippines, Sri Lanka, Malaysia, South Korea	38-50%	Sweden, Norway, Denmark, Ireland, France, Netherlands, Germany, Great Britain	13-23%
Hong Kong, Singapore	13%	Japan, United States, Austria, Switzerland	8-10%
Source: Schneider and Enste (2000)			

Why Shadow Economies Exist

- Analysis by Becker (1968) and others suggests that people engage in shadow economic activity for financial/economic gain, and weigh expected gains with expected costs (factoring in risk) in ways not inconsistent with the predictions of traditional economic theory.
- Some incentive areas include:
  - Burden of taxes and social insurance contributions
  - Intensity of regulation
  - Social transfers
  - Labor market regulation
  - Public Sector Services

Incentive Issues

- Burden of taxes and social insurance contributions
  - Differences between total cost of labor in the official economy and after-tax labor earnings provides an incentive to sell labor in the shadow economy.
  - Loayza (1997) estimated the size of the shadow economies of 14 Latin American countries and found that greater tax burdens and labor market restrictions increased the size of the shadow economies of those countries.
- Intensity of regulation
  - Increased regulation reduces individuals' choices in the official economy.
  - Shifting regulatory costs to employees provides incentives for workers to supply labor to the shadow economy.

Incentive Issues (continued)

- Social transfers
  - The social welfare system can increase the marginal tax rate, thereby reducing incentives to work in the official economy.
  - This system can also provide disincentives for individuals receiving welfare payments to seek work in the official economy.
- Labor market regulation
  - Overregulation and labor costs in the official labor market are driving forces for the shadow economy (Schneider and Enste, 2000).
  - Forced reductions in working hours contrary to employee preferences increases the potential hours they can work in the shadow economy.

Incentive Issues (continued)

- Public Sector Services
  - An increase in the shadow economy decreases government revenues, which can reduce the quantity and quality of public services.
  - This can lead to increased taxes in the official sector which, along with the deterioration in the quality of public goods, can provide additional incentives to participate in the shadow economy.
  - Johnson, Kaufmann, and Zoido-Lobatón (1998) show that smaller shadow economies appear in countries with higher tax revenues, if achieved by lower tax rates, fewer laws and regulations, and less bribery facing enterprises.
  - They also find that countries with a better rule of law which is financed by tax revenues also have smaller shadow economies.

Shadow-Official Economy Links

- Previous work that attempts to link the official and shadow economies are macroeconomic.
- For example:
  - Houston (1987) develops a business cycle model that includes tax and monetary policy linkages.
  - Adam and Ginsburg (1985) focus on the implications of the shadow economy on official growth.

Focus on Information Sector

- The shadow information sector is composed of individuals and organizations engaged in:
  - Computer system hacking
  - Trading stolen information
  - Identity theft
  - Spamming
  - Other activities

Shadow Information Sector and Rest of Economy

- Input-Output (IO) models have long been used to examine inter-industry linkages and how, among other things, changes in final demand affect the demand for goods and services in specific industries.
- A preliminary input-output formulation of the US economy with an added shadow information sector is developed and presented.

Simplified 3-Sector Official Economy

- Consider a 3-sector economy with manufacturing, services and other, and information sectors. The economy is aggregated into these three sectors to simplify presentation.
- The following input-output table illustrates how these industries interact in the production of goods and services for our hypothetical economy.
- The figures are based on 2002 US economic statistics and are expressed in billions of dollars.
- Table shows 2002 GDP of approximately $10.7 trillion.

Input-Output Representation of Hypothetical Official Economy

(Billions of Dollars)

	Manufacturing	Services and Other	Information	Total intermediate use	Total final uses (GDP)	Total commodity output
Manufacturing	1,337.3	1,018.3	54.4	2,410.0	1,392.6	3,802.6
Services and Other	1,201.0	4,279.1	238.8	5,718.9	8,879.1	14,598.0
Information	32.0	215.9	131.3	379.2	400.2	779.4
Total Intermediate Inputs	2,570.3	5,513.3	424.5	8,508.1	10,671.9	19,180.0
Value Added	1,280.2	8,860.8	530.8	-	-	-
Total Industry Output	3,850.5	14,374.1	955.4	-	10,671.9	19,180.0

Simplified 4-Sector Economy with Shadow Information Sector

- Now consider two versions of the economy with an additional shadow information sector that accounts for either 1 or 3 percent of official information sector output.
- In constructing this table, we do not change the other inter-industry transactions, even though these would likely change given the overall reconstitution of economic activity that would occur.
- The 1 to 3 percent range comes from the OECD report *Measuring the Non-Observed Economy: A Handbook* (2002) and are based on their lower- and upper-bound estimates of the size of the hacker economy in developed countries.
- For the 1-percent case, the following input-output table illustrates how industries interact in the production of goods and services.

Economy with Hacker Sector: 1-Percent Case

(Billions of Dollars)

	Manufacturing	Services and Other	Information	Shadow Information Sector	Total intermediate use	Total final uses (GDP)	Total commodity output
Manufacturing	1,337.3	1,018.3	54.4	0.5	2,410.6	1,406.5	3,817.1
Services and Other	1,201.0	4,279.1	238.8	2.4	5,721.3	8,967.9	14,689.2
Information	32.0	215.9	131.3	1.3	380.5	404.2	784.7
Shadow Information Sector	0.3	2.2	1.3	2.0	5.8	6.2	11.9
Total Intermediate Inputs	2,570.6	5,515.5	425.9	6.2	8,518.2	10,784.8	19,302.9
Value Added	1,293.0	8,949.5	536.1	5.3	742.8		
Total Industry Output	3,863.6	14,464.9	962.0	11.5	9,261.0	10,784.8	19,302.9

Discussion: 1-Percent Case

- This hypothetical example shows possible interactions between the official and shadow economies.
- 2002 GDP is higher by a little over one percent ($10.75 trillion) since we now include an an additional sector in the GDP calculation which were are now measuring.
- This example only shows addition of shadow information sector. Other shadow sectors could be added.
- This example does not show other kinds of burdens imposed on the economy, such as additional spending by firms to monitor and prevent hacking activity.
- Spending by firms to offset hacking would show up as higher expenditures by industries on output produced by the official information sector and possibly on other sectors.

Economy with Hacker Sector: 3-Percent Case

(Billions of Dollars)

	Manufacturing	Services and Other	Information	Shadow Information Sector	Total intermediate use	Total final uses (GDP)	Total commodity output
Manufacturing	1,337.3	1,018.3	54.4	1.6	2,411.6	1,434.4	3,846.1
Services and Other	1,201.0	4,279.1	238.8	7.2	5,726.0	9,145.5	14,871.5
Information	32.0	215.9	131.3	3.9	383.2	412.2	795.4
Shadow Information Sector	1.0	6.5	3.9	6.0	17.4	18.7	36.1
Total Intermediate Inputs	2,571.2	5,519.8	428.5	18.7	8,538.2	11,010.7	19,549.0
Value Added	1,318.6	9,126.7	546.8	15.9	753.5		
Total Industry Output	3,889.9	14,646.4	975.3	34.6	9,291.7	11,010.7	19,549.0

Discussion: 3-Percent Case

- 2002 GDP is higher by a little over three percent ($11.01 trillion) since we now include an an additional sector in the GDP calculation which were are now measuring.
- These examples, though largely hypothetical, give us some sense of how adding a shadow information sector would affect the national income and product accounts using the IO framework.
- We could also add additional shadow components of other industries. Illegal drug manufacturing would, for example require additional shadow agricultural and shadow manufacturing sectors (as well as possible wholesale and retail sectors).

Employment in the Hacker Economy

- According to the US Bureau of Labor Statistics (BLS), 2007 employment in the entire information industry was a little over 3 million persons, which is somewhat less than the 3.4 million employed in 2002.
- If we apply the one percent figure that was used above to estimate the size of the shadow economy, we get an estimate of 2002-shadow information industry employment of 33,950 persons.
- The higher-end estimate of 3 percent of information industry output to estimate employment in the shadow information sector yields a 2002 estimate of a 101,850 persons, but the same caveats apply.
- However, this estimate must be treated with caution; a better method of estimating employment might be to develop estimates from the bottom-up, i.e., based on estimates of employment in each of part of the shadow information sector and then combining these estimates.

Summary and Conclusions

- One complication associated with developing reliable and stable estimates of the size of the hacker economy is that it is a sector that is in a continual state of flux; it changes as innovations occur in a highly innovative industry and the kinds of innovations that occur in the information sector are particularly difficult to forecast or foresee.
- More detailed information on the different hacker activities could be obtained with additional research and these estimates could be integrated into the broader economic framework discussed here.
- Progress on this front would also make measuring the burden that the various forms of hacking cause to the overall economy and to individual industries possible.
- Additional analysis can include applying using the methodology developed here and refined further to other countries and using those comparisons to adjust estimates of trade between countries. This is not only important for improving the quality of information about comparative economic activity between countries, but could also see application in analyzing vulnerabilities to the US economy that result from hacker activity in foreign countries.

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