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Measurement and Relevance of the Shadow Economy in the European Union

Symposium at the University of Wuhan/China April 1 – 4, 2009

Agenda: Shadow (= second) Economy (SE)

1. Definition (concepts) and theories
   - **Shadow economy (SE) and underground economy**
   - **Theories (why an issue? causes and consequences etc.)**
2. Measurement (with focus on underground economy)
   - **Overview of methods**
   - **Criteria for an acceptable measurement (axioms)**
   - **Indirect methods and stochastic models**
3. Empirical results (size of the SE)
   - **Data for the EU (OECD) and other countries**
   - **Plausibility checks**

Part 1: Definition: Classification of second economy activities

(Dual) Economy

1. Official Economy (first, formal, recorded)

2. **Shadow** Economy SE (second, parallel, informal, unrecorded)

2a) **Underground** Ec. ("**black**", legal /illegal,) ***intentionally*** concealed production → not (only partly) measured

⇒ Examples

Activities to avoid

- payment of taxes and social security contributions
- having to meet certain legal standards
- complying with certain administrative procedures (regulation!)

2b) **Subsistence** Ec., household (+NPISH) production for own use domestic (self)services; do-it-yourself activities (perhaps surrogate of 2a)

Confusion: shadow (2) = under-ground (2a)

⇒ SNA **Production boundary**: 1 + 2a + only parts of 2b

Examples of shadow economy activity

- **moonlighting** (self-employment)

  (second job in the evening and on weekends) eg moonlight carpenters, amateur (freelance) auto mechanics

  misuse of the social security system (no production)

  Weekend-work (within family/for friends = 2b; paid/for others = 2a)

- **illegal** (alien) employment (enterprises construction sector)

- not declared **tips** & sales (agriculture)
  estimated and included in official statistics
- undeclared **wages in kind**
  maybe resulting from self service: (**pilferage**) theft by employees, padding expense accounts, using office equipment for own use, …

  narcotics, smuggling, prostitution, bribery, fraud, receiving, forgery of documents, reciprocity of services, corruption

  black market purchases of alcohol etc. (illicit trade)

  do-it-yourself, neighbour help

SNA production boundary (SNA § 6.18 ff)

- production of individual or collective goods … for units other than their producers income in kind included (market/non-market production; prices!) legal **and** illegal
- own account production of all goods … retained by their producers
  for own final consumption or capital formation
- … of housing (owner occupation) and of domestic and personal services (employing **paid** domestic staff)

Out of production boundary: Explicitly and traditionally **excluded**:

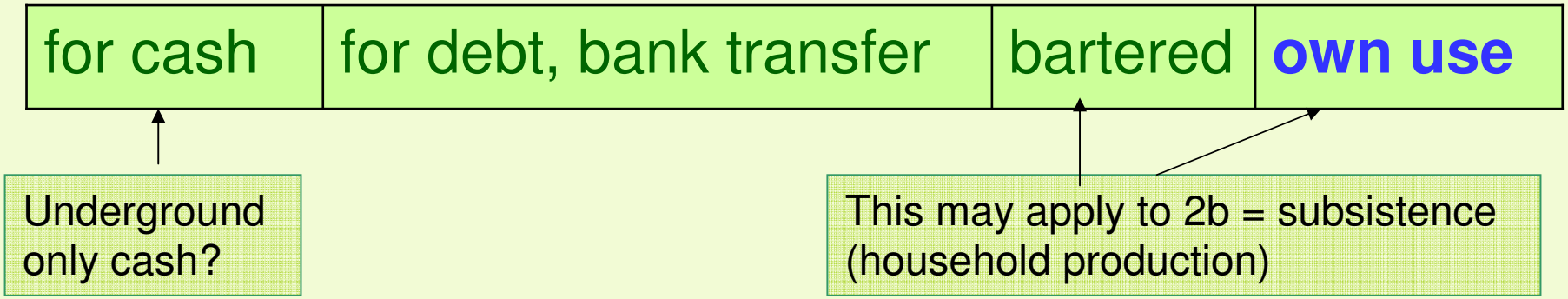
Own account domestic production **by members** of the household

(eg cleaning, decoration, maintenance, servicing of dwelling, preparation of meals , care of children, sick people etc, transportation of members of the household)

Criteria for the borderline between first and second economy

none of the following is necessary and sufficient

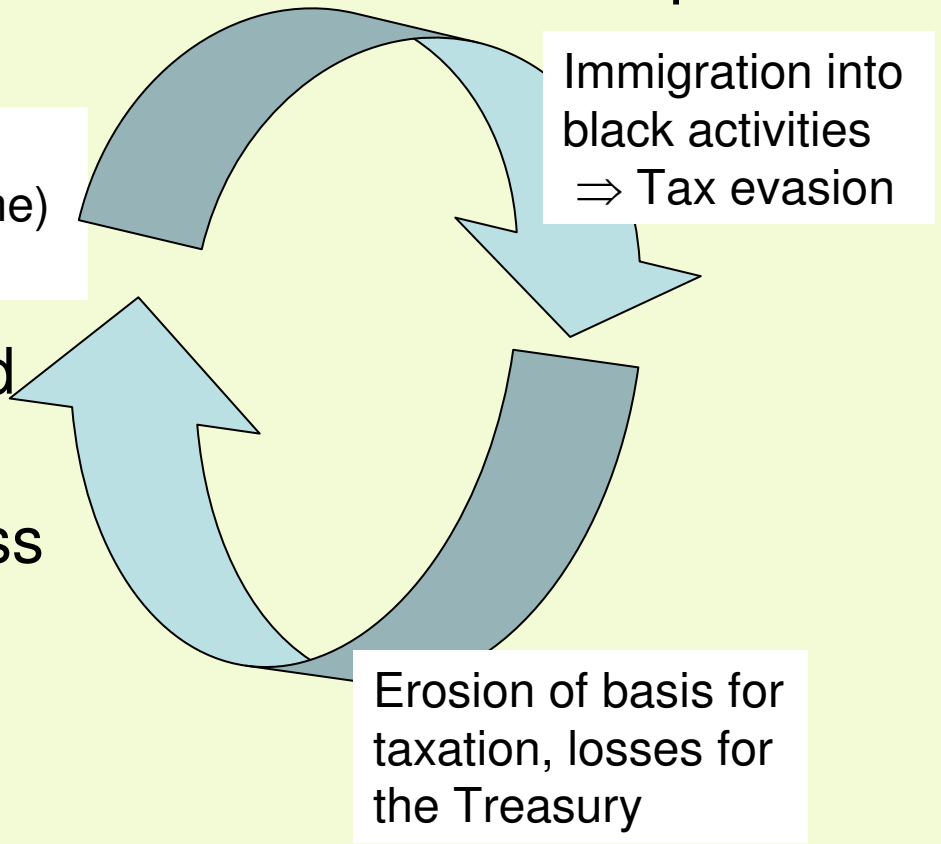
- **not covered by National Accounts (GDP)**
- **illegal** ("irregular" economy) changing morals!
- **motivated by tax evasion** (income without tax)
- **for own use vs. transaction**
- **transactions in cash vs. other transactions**



How can we estimate the whole SE and not only the underground economy using a money (currency) approach (like eg Schneider)?

Reasons for studying the underground economy

- distortion of official estimates → "unobserved income hypothesis" (stagflation, destabilization due to countercyclical policy)
- monitor activities to reduce tax burdens & escape regulation (**vicious cycle**)

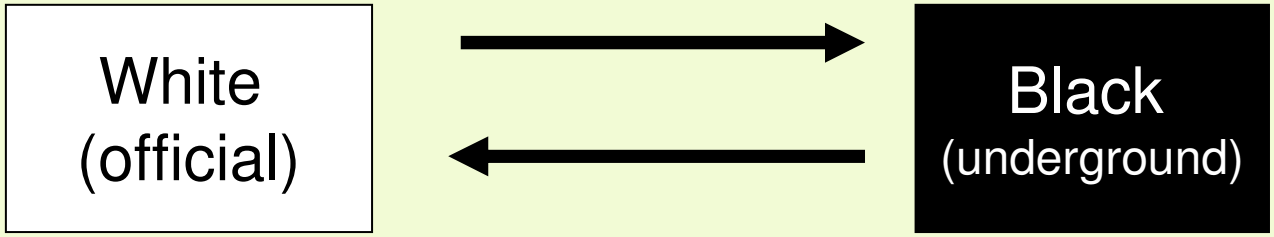


- different dynamic of 1st and 2nd economy
- money flow is becoming less predictable
- Laffer Curve, social justice, income distribution

Factors affecting the size of the SE sector

- tax (income, VAT), not only tax burden, but also complexity (and perceived fairness) of taxation, tax morale
- labour costs > net wages (social contributions, wage wedge) ⇒
- wages in official and nonofficial economy (wage gap) ⇒
- size of the public sector (SNA 13: government)
  if small then small SE (Japan, USA)
- increasing significance of services in advanced economy
  (self-employment very common, easy to conceal from the taxman)
- efficiency of state (eg in fighting "black" activities)
- regulation of working time, retirement age (reduction → more SE)
- regulation (product market, labour market)
  number of regulations, limitations for newcomers due to licence requirements
- unemployment rate (positively correlated)
- level of (net) income, wages

Immigration into underground economy; interdependencies (can be skipped over)



Immigration → as a "survival strategy"

Remunerations of employees (**gross**) cost for employer

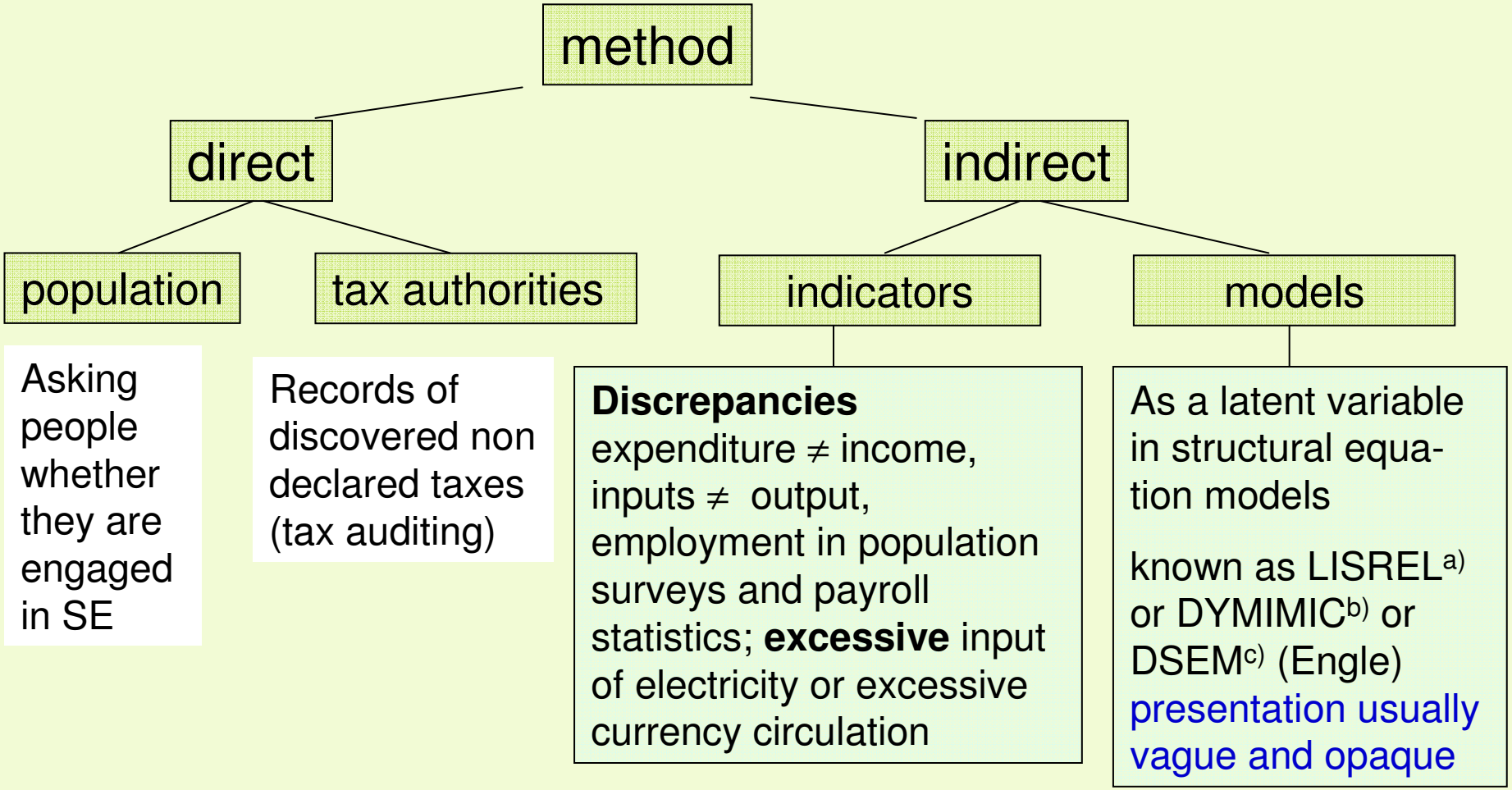
net what employee gets | Wedge (taxes, social contributions)

opportunity for **mutually beneficial** trade

Seller's income including risk premium → ← **Buyer's** lower price

Disincentives: Moral qualms and risk aversion; penalty risk
(product of detection probability and amount of fine to be expected)

Part 2: Methods overview (again confusion as regards terminology)



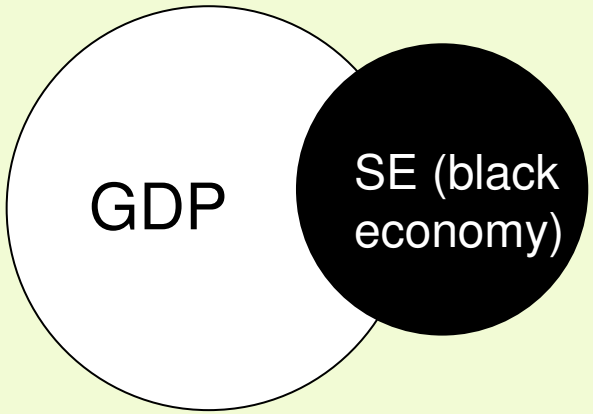
[a)] Linear Independent Structural Relationships [b)] Dynamic multiple-indicators multiple-causes [c)] Dynamic Structural Equation Model

Part 2 The Agenda

1. Axioms
2. Direct Methods (surveys)
3. Indicators
   1. Discrepancies and some general remarks on National Accounts, 2. Employment/unemployment (participation rate ↓)
4. Physical input (electricity)
5. Transaction approach (Feige)
6. Monetary indicators
   1. Naïve: Fixed (cash-deposits) ratios (Cagan, Gutmann)
   2. currency demand functions (Tanzi)
7. Model approach

Excluded: methods of estimating household production for own use

Size of SE in per cent of GDP (or national income) only for illustrative purposes



2.1 Assessment of Methods: Seven criteria (Axioms)

- Validity (method primarily based on observations or imputations, need for few/many assumptions, plausible/ implausible assumptions)
- Data basis (is it reliable, readily available, sufficiently detailed, conceptually adequate?)
- Method allows for distinctions between different types of SE activities (separation of "black" activities or isolation of unpaid work of household members)
- Results are analytically useful (not only size of SE but also structural information, correlation with other variables)
- Theoretical foundation (derived from micro-/ macroeconomic model)
- Method allows for cross check with other methods and for plausibility checks The method should give numerical indications of the goodness of fit (something like R squared)
- Good statistical procedures Professional integrity, method should be well documented/ results reproducible

Surveys Rockwool Foundation

- Method
  - **time diary studies (home production)**
  - **asking people whether they hold more than one job**
  - **whether they are engaged in underground activities (on the supply and on the demand side)**
  - **tax auditing**
- Problems
  - **depending on co-operation (outing)**
  - **sensitive to wording of questionnaire**
  - **strategic answers of respondents**
  - **only lower bound and point estimate of size**
  - **(no) structural information for in depth analysis (?)**

2.3.1 Methods using "indicators": Discrepancies in NA statistics

- Indicators
  - **discrepancies in National Accounts between income (compensation of employees, …) and expenditure approach (private consumption, …)**
  - **between various statistics of employment (labour force, participation-/unemployment rate)**
    SE rising to the extent that official employment is declining
- Problems ⇒ details next page
  - **in published data discrepancies are already removed (adjusted)**
    no exploiting of macroeconomic identities and (alleged) in-consistencies in statistics possible
  - **method tacitly assumes no measurement errors in all NA aggregates**

2.3.1: Cross-checks between different independent methods

Balancing principle in National Accounts

The fundamental method of estimation of aggregates

Three independent ways of estimating the GDP

Production
Income generation + distribution and
Expenditure (consumption, investment, net exports)

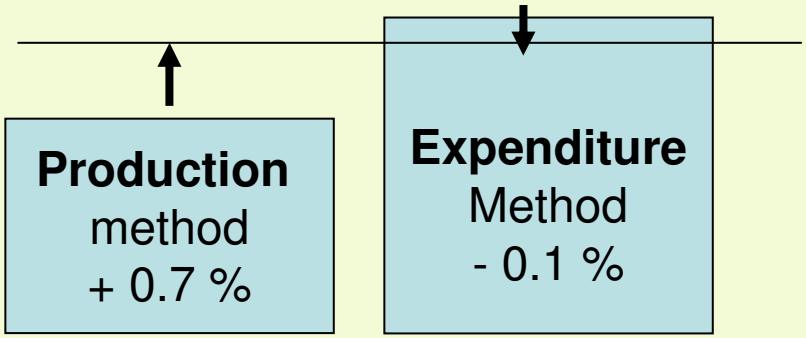
They (ideally) should end up with the same result (each of them is acting as a cross-check of the other approaches)

Initial discrepancies (of eg income and expenditure) are

- **not published** but "reconciled" ("adjusted")
- **not necessarily reflecting underground activity**
- they are rather resulting from using different statistics, not fully compatible concepts etc.

2.3.2: National Accounts (ctd.), Inconsistencies + decline in employment

Example for balancing Germany 1995
the initial discrepancy was 0.8% (Braakmann)



Employment method (unreliable)

- Decline of employment rate in official economy
  - **decline in participation rate, or low participation rate compared to other countries**
  - **decline compared to base year**
- Objections
  - **other reasons for the decline**
  - **parallel employment possible (moonlighting)**
  - **base year (golden age) required**

2.4: Physical inputs (electric energy etc. as indicator)

- Input indicators
  - **discrepancy between perishable inputs eg electricity consumption in households and output (home production)**
  - **purchases of assets, supplies etc. (inputs) and output**
- Objections
  - **technical progress, SE activities require labour rather than energy**
  - **total energy consumption best single indicator of total transactions (or production) ??**

2.5: Transaction method (Feige)

- The approach

$$M_t V_t / Y_t > M_0 V_0 / Y_0$$

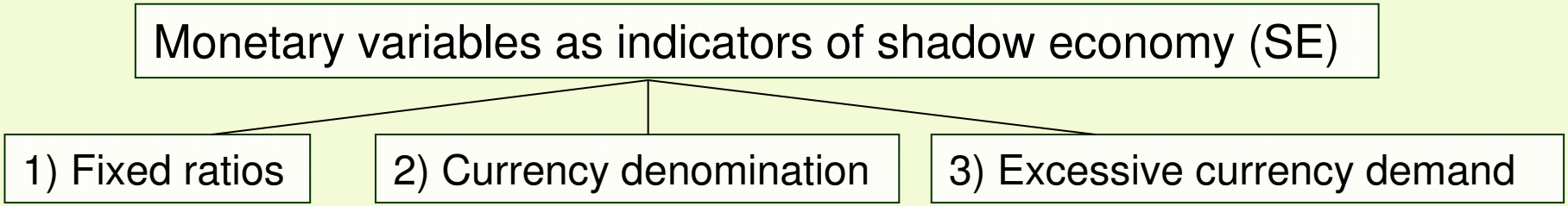
V transaction velocity of money
Y (nominal) GDP

assuming a "*golden age*" base period 0 (with *no SE*)

- Objections
  - **difficulties to estimate transaction volume**
  - **golden age required (difficult to establish)**
  - **the same (income) velocity in official and shadow economy**
  - **transactions – BIP = SE + intermediate consumption + financial transactions + …**
    (SE a subset of transactions?)

2.6: Monetary approaches

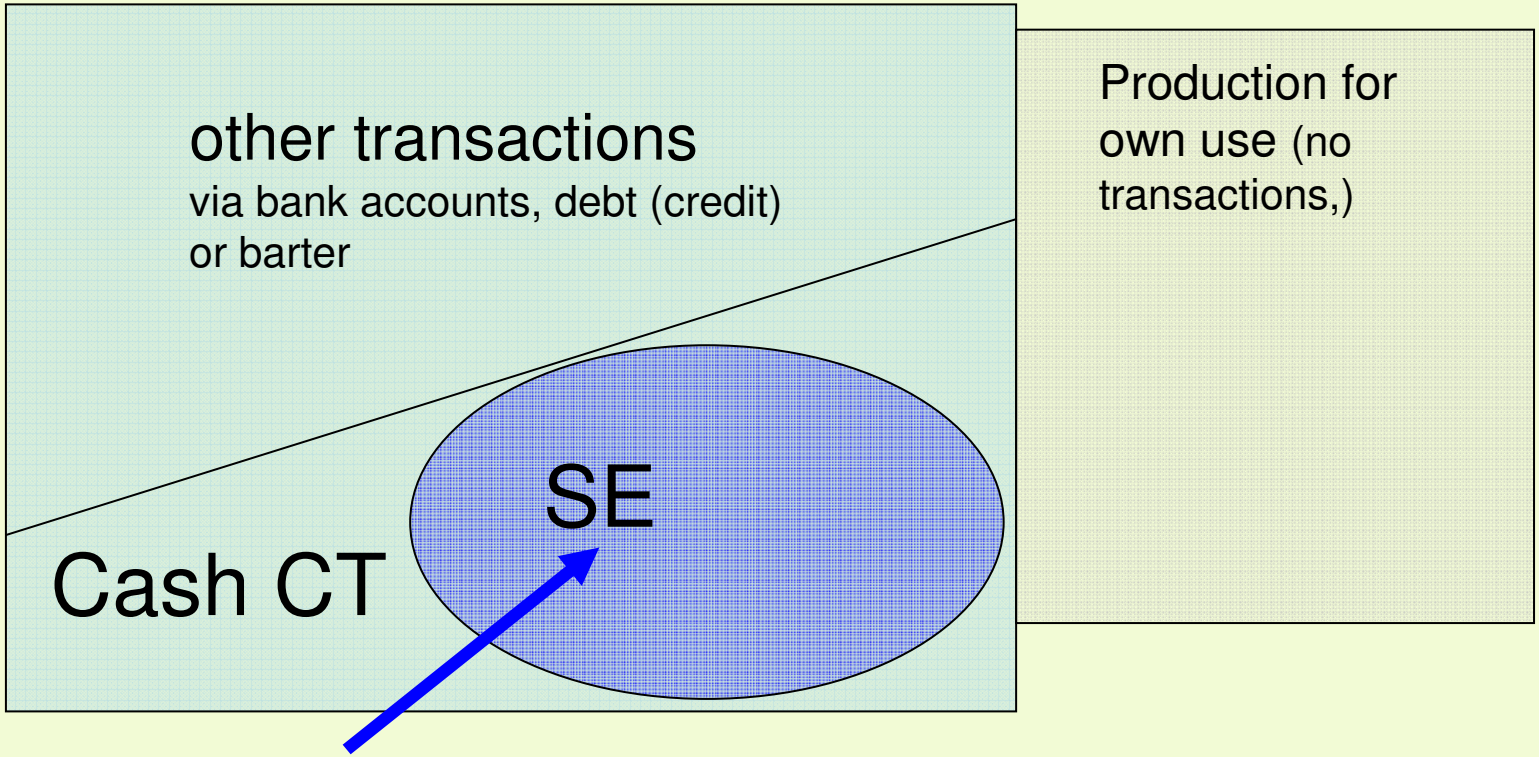
- Methods (Variants) perhaps the most frequently used approach



  - **SE to the extent that monetary data reveal deviate significantly from the 0-period (without SE)**
  - **all variants based on the assumption that SE activities are settled in cash**

- Objections
  - **cash transaction neither necessary nor sufficient**
  - **other factors influencing money aggregates**
  - **international currencies ($, €)**

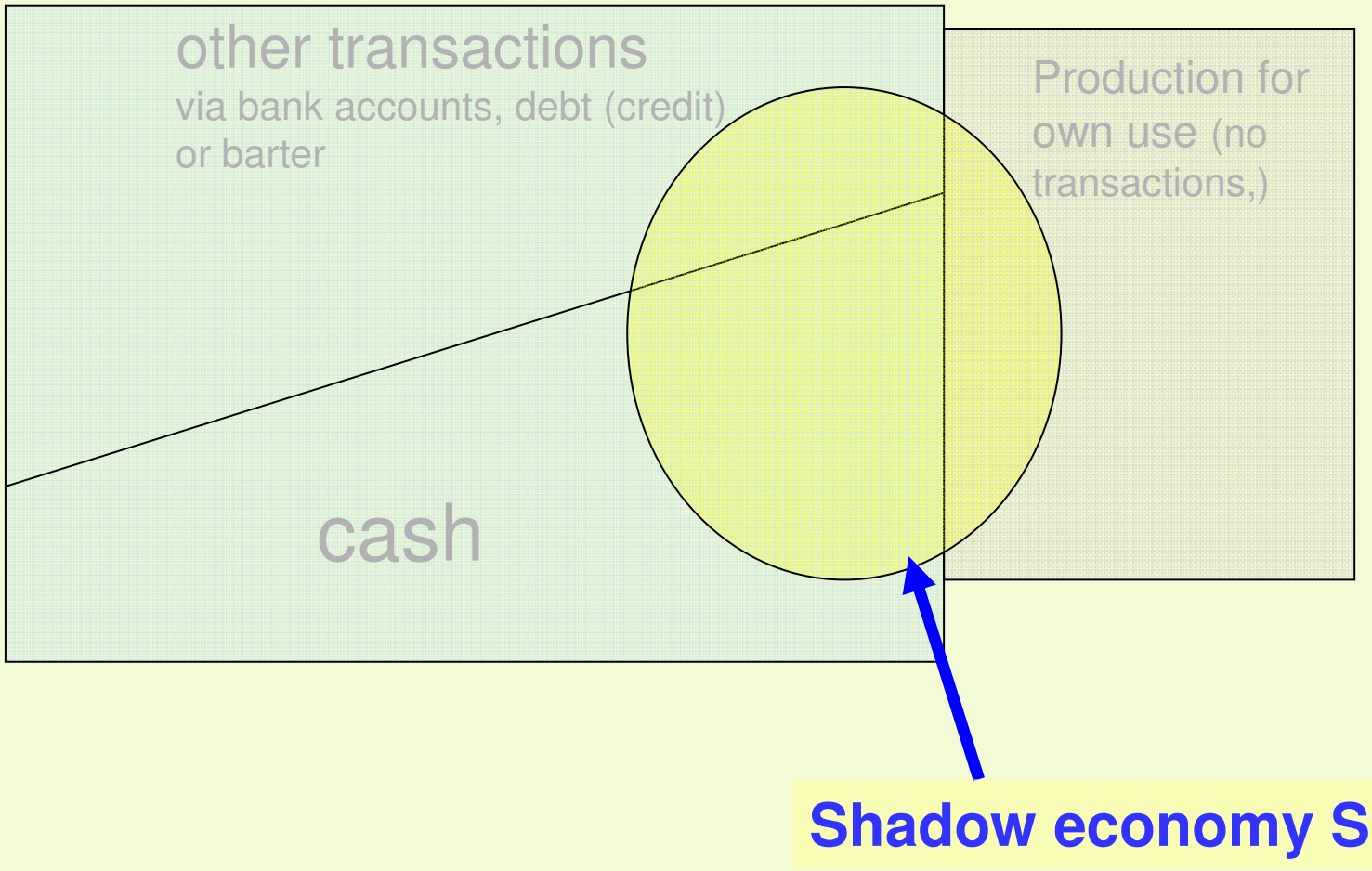
(2.6 ctd.) SE is not a subset of transactions in cash



For currency methods to be valid the Shadow economy (SE) should be the cash transactions (CT) set or a subset of it, that is SE $\subset$ CT

(2.6 ctd.) SE is not a subset of transactions in cash

But this is not true:



(2.6 ctd.) Monetary approaches (naive methods {1 and 2})

1) Fixed ratios

More SE to the extent that $C_t/D_t > C_0/D_0$ where C currency, D demand deposits, M money supply (= C+D)

C/D "cash - deposits ratio" method (Gutman)

2) Currency denomination

SE associated with use of bills of certain (higher) denomination (eg 100 $ or 100 €, 200 €)

3) Excessive currency demand

Requires estimation of a money demand function to determine the "normal" cash money demand

(when tax burden and other influences are held constant [as in period 0])

(2.6 ctd.) Monetary approaches

Tanzi's regression

$$\ln (C/M_2) = \alpha_0 + \alpha_1 \ln(1+T) + \alpha_2 \ln(W/NI) + \alpha_3 \ln(R) + \alpha_4 \ln(Y) + \varepsilon$$

$\alpha_3 < 0$ (other α's > 0)

where T (weighted) average tax rate, C currency, M_2 money (C+D*)
W/NI ratio of wages and salaries in national income (proxy of wealth), R interest paid on time deposits, Y real national income per capita
(other / additional regressors possible) * D = demand deposits

Given M_2 the **expected** C (= C_e) can be calculated, with T at its lowest level or T = 0 ($\alpha_1 > 0$) $\rightarrow$ C_z (= C zero tax increase)
$C_e - C_z > 0$ if $\alpha_1 > 0$ = tax induced currency holding (= **illegal** money) multiplied by **income velocity** $\rightarrow$ indicator of **size of SE**

(2.6 ctd.) Schneider's equation

He rarely published details such as his **currency demand equation**

Austria 1956 - 91 (T = 36) and 1956 - 85 (T = 30)

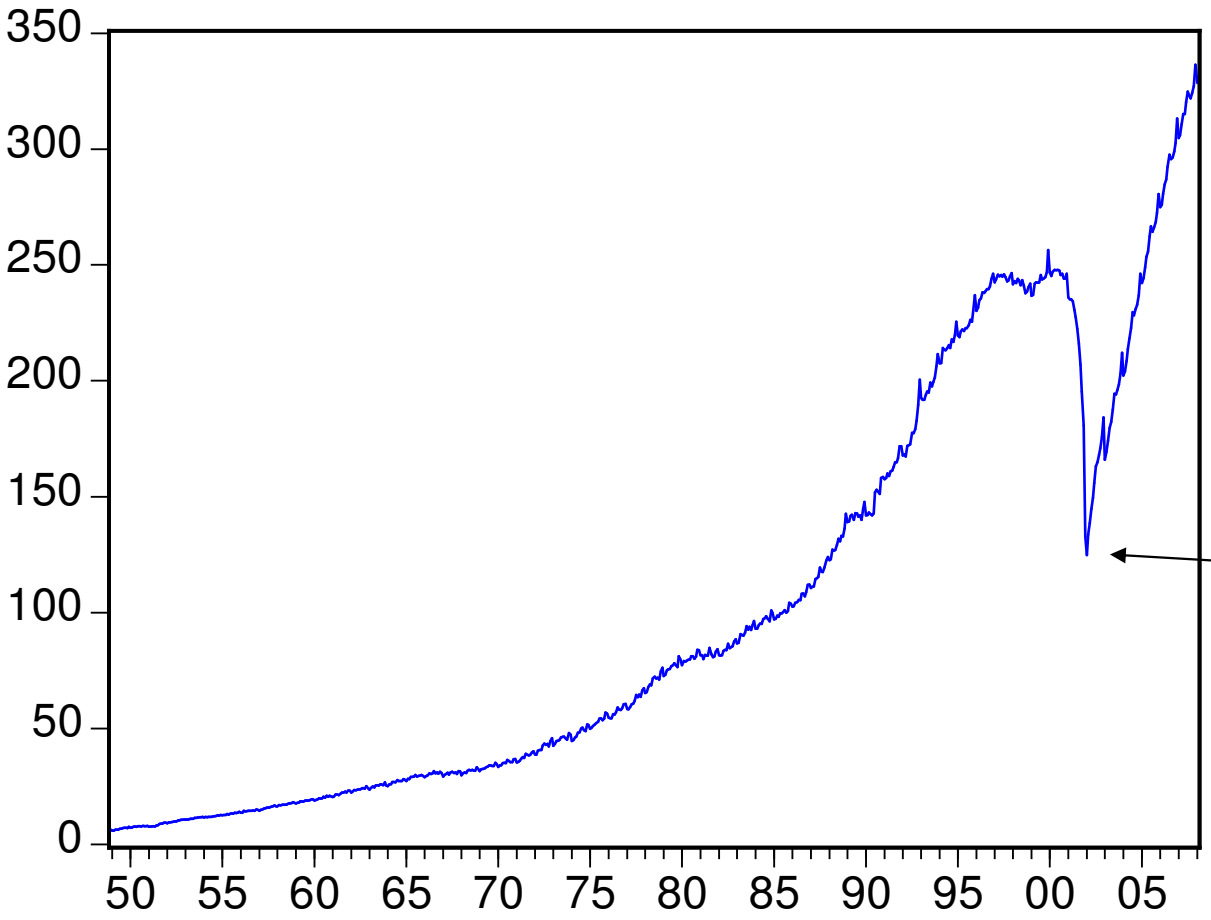
Dependent variable $y_t = \ln(C/P)$ ln of real currency in circulation per capita

Regressors (explanators)
all transformed in ln(…), in the order of t-values

x_1 = real private consumption expenditure per captia, $x_2 = y_{t-1}$ (lagged y), x_3 = tax burden (direct taxes), x_4 = complexity of the system of taxation, x_5 = intensity of regulation, x_6 = € cheques per capita ($\beta < 0$), x_7 = interest rate ($\beta < 0$), x_8 = tax burden (indirect taxes)

R squared adj.> 0.99, df 21 or 27, residuals mildly positively autocorrelated

(2.6 ctd.) Currency and the move from DM to € (Jan. 2002)



Monthly data
Germany
bn (= Mrd) DM

Stocks of cash were dramatically reduced in expectation of the Euro currency in Jan. 2002

month	2001-10	01-11	01-12	02-01	02-02	02-03	02-04
Mrd. DM	**195,4**	**180,7**	**132,9**	**124,8**	**133,6**	**138,7**	**144,7**
Mrd. €	99,90	92,41	67,97	63,83	68,32	70,90	74,01

However, Schneider's estimates were not affected

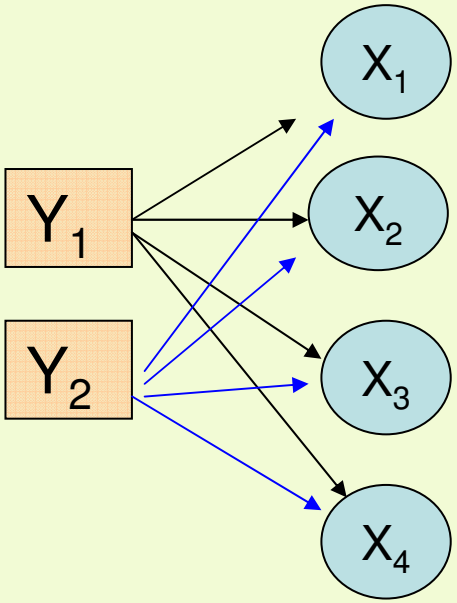
2.7: SE as unobserved (latent) variable (causal method)

LISREL Models

The notion of a **latent variable**

Method very demanding as regards variables (validity and timeliness of data)

Factor analysis

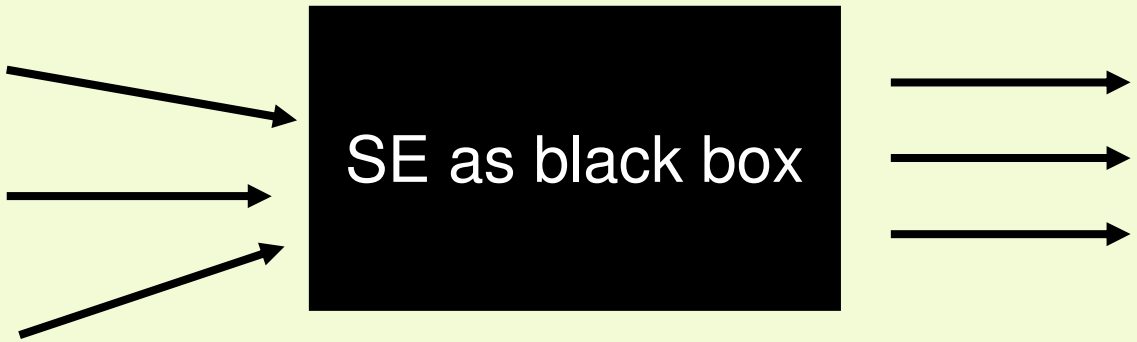


latent manifest

The usual presentation of MIMIC (or DYMIMIC)

causes

indicators



Causes
tax burden (actual and perceived), regulation, wages and prices in official economy relative to SE, unemployment rate etc.

Indicators
currency, less employment in official sector, less tax revenue etc.

It is said that method can only /not provide figures for the size of SE

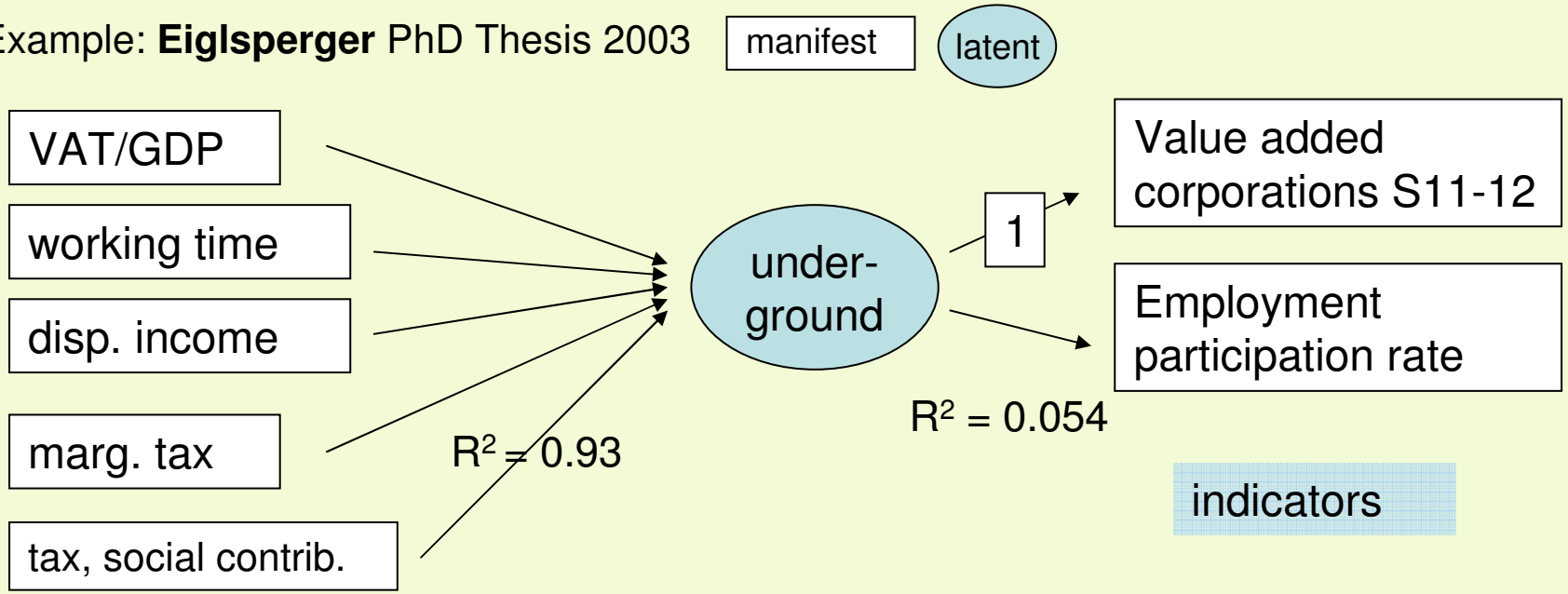
Time series analysis as part of structural models/ comparison of methods

LISREL does not make use of absolute variables, but only of **residuals** ("innovations") of RegARIMA models of time series; account for **non-stationarity** and **cointegration**

⇒ Results: **no absolute size of SE**, only information about relative importance (relevance) of causes/effects (SE conceived as caused by innovations, has to be linked to an indicator ($\beta = 1$)

Many methodological decisions eg. treatment of outlayers (reproducibility of results?)

Example: **Eiglsperger** PhD Thesis 2003



Section 3: Results (sizes), empirical findings (determinants)

- very few comparisons of estimates derived from different methods applied to the same countries and the same period in time
- if there are such studies at all, results vary substantially

  eg Mexico 89/90

  49% (physical [electricity] input **33**% (currency)
  27 or **35**% (MIMIC for 90/93)

Method	%
Employment (labour force)	24.4
Transaction	21.9
Cash-deposit ratio	15.5
Physical input (electricity)	12.7
Currency demand	8.9
Model (latent variable)	7.9
Survey	3.1

Source: Schneider, Nov. 1998, data refer to average of 5 countries 1970 – 1990 (Canada, USA, D, UK, I)

More of Schneider's estimation results (monetary and causal method)

Selected estimates for OECD and FSU countries

Schneider June 99

Size of SE in % of GDP

Country	89/90	94/95	96/97	05
Greece		29.6		28
Italy	22.8	26.0	27.2	24
Spain	16.1	22.4	23.0	21
Belgium	19.3	21.5	22.2	20
Sweden	15.8	18.6	19.4	18
Germany	11.8	13.5	14.7	15
Austria	5.1	7.0	8.6	10
Switzerland	6.7	6.7	7.8	9

Georgia	89/90	24.9
	94/95	63.0
Russia	89/90	14.7
	94/95	41.0

Figures for 2000

Georgia	66.1
Azerbaijan	60.1
Ukraine	51.2

Schneider CeSifo DICE Report 1/2003

Shadow Economy in Asia (can be skipped over)

Estimates for Asia (Reference: Schneider)

Country	Method	Year(s)	Size (%)
India	Currency	89/90	**22.4**
Taiwan	MIMIC	90/93	**16.5**
Hongkong	Physical input	89/90	**13**
Thailand			**71**
South Korea			**38**
Philippines			**50**

Implausibility of Schneider's estimates for Germany

Schneider's estimate of the size of the shadow (underground?) economy in Germany in 2004 (plausible or grossly overstated?)

Results of the Survey method	2001	2004
1. worked black (%)	11.7	9.6
2. hours peer week	8.31	7.56
3. product 1*2	0.972	0.726
4. average hours (total labour force)	23.6	23.3
3 in per cent of 4*	**4.1%**	**3.1%**
In relation to GDP (bn.€)	86.6	68.4

* 0.972/23.6 = 0.041

Decline of 1/4 (Schneider's figures remained stable)

Schneider's estimates

2001: 329.8 bn € **(15.61%)**

2004: 345.5 bn € **(15.65%)**

1. Size plausible?
2. Where does the difference come from?

Doubts raised (by W. Koch) against Schneider's estimates

The incredibly large sum of 370 bn €
(in 2003) **would imply**

If every active person were engaged in SE with an average wage 10 € per hour

9250 € extra black income per year

925 hours in addition to the regular average working time of 1660 hours (55.5% extra)

If 5 mill unemployed persons were engaged in SE

74000 € extra black income per year

Given a share of 37% of construction in SE

another 66% turnover of this sector, undeclared and undetected by tax authorities

Underground (black) and shadow economy

To explain the difference between the Survey Results (≈ 70 bn € or 3 - 4%) and his estimates (≈ 350 – 370 bn € or 16 – 17%) Schneider points out

	% GDP a)	bn € a)	% SE b)
Black activity (Schwarzarb.)	6 - 7	140 - 160	**40** (43 – 49)
Intermediate Consumption* (Materialverbrauch)	3 - 4	70 - 90	**22**
Illegal goods /services	4 – 5	90 - 112	**28**
In GDP already **included**	1 - 2	23 - 45	**10** (7 -11)
Shadow Economy (SE)	**15**	**323 - 407**	**100**

* If acquired in the SE

a) Enste + Hardege, Regulierung und Schattenwirtschaft iw Trends March 2007

b) Schneider in Wirtschaftsdienst 3/2006 (in brackets % according to the white part of the table)

Dependent variable y: size of SE, units: n countries

regulation	0.526***	0.302***	0.276**
taxes and social contributions	0.390***	0.303***	0,285***
tax morale		0.112	0.114
per capita income		-0.443***	-0.412***
unemploy-ment rate			0.085
R^2 adj.	0.626	0.715	0.712

Significant * 10%, ** 5%, *** 1%

What can we learn from such studies if measurement of both, y and (some) x variables is questionable?

Tax morale is significant only in models without tax burden as regressor

http://www.von-der-lippe.org/downloads3.php