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# **Shadow Economies of 145 Countries all over the World: What do we really know?**

- 1 Introduction: Statements about the Shadow Economy**
- 2 Some Theoretical Considerations about the Shadow Economy**
- 3 The Size of the Shadow Economies all over the World – Econometric Estimates and Findings for 145 Countries**
- 4 The Dynamic Effects of the Shadow Economy on Official Economy**
- 5 Summary and Conclusions**
- 6 Appendix: Methods to Estimate the Size of the Shadow Economy**

# **1 Introduction: Statements about the Shadow Economy**

- (i) Size and development of the shadow economies are „hot“ scientific and political topics around the world.**
- (ii) Numerous political statements, that the shadow economy causes severe damages of the „official“ economy and leads to tax losses.**
- (iii) „Unfair“ (Ruineous) competition between the entrepreneurs in the shadow economy and the official one.**
- (iv) Mostly only one common policy measure: increase effective punishment to get rid of the shadow economy.**

## 2.1. The Definition of the Shadow Economy

The *shadow economy* includes all *legal* production and provision of goods and services that are deliberately concealed from public authorities for the following reasons:

- (1) To avoid payment of income, value added or other taxes,
- (2) To avoid payment of social security contributions,
- (3) To avoid having to meet certain legal standards such as minimum wages, maximum hours, safety standards, etc., and
- (4) To avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

## **2.1. The Definition of the Underground and Informal Household Economy**

***Underground economic (classical crime) activities are all illegal actions that fit the characteristics of classical crime transactions like burglarly, robbery, drug dealing, etc.***

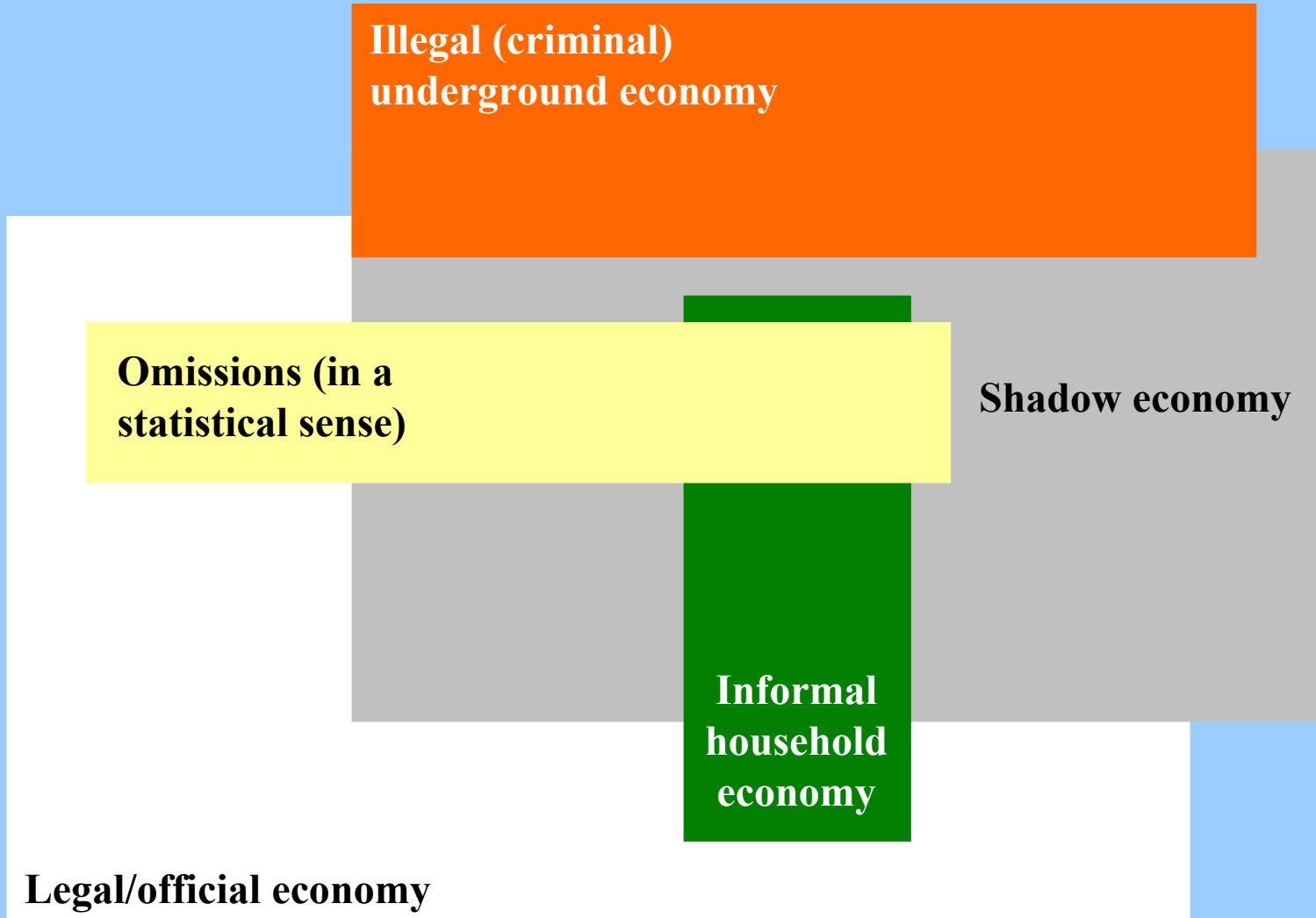
***Informal household economy consists of household enterprises that***

- (1) are small in terms of persons engaged, and**
- (2) are not registered officially under various specific forms of national legislation.**

***Omissions (in a statistical sense):***

**All other (remaining) transactions that should be included in the national accounts, but are not.**

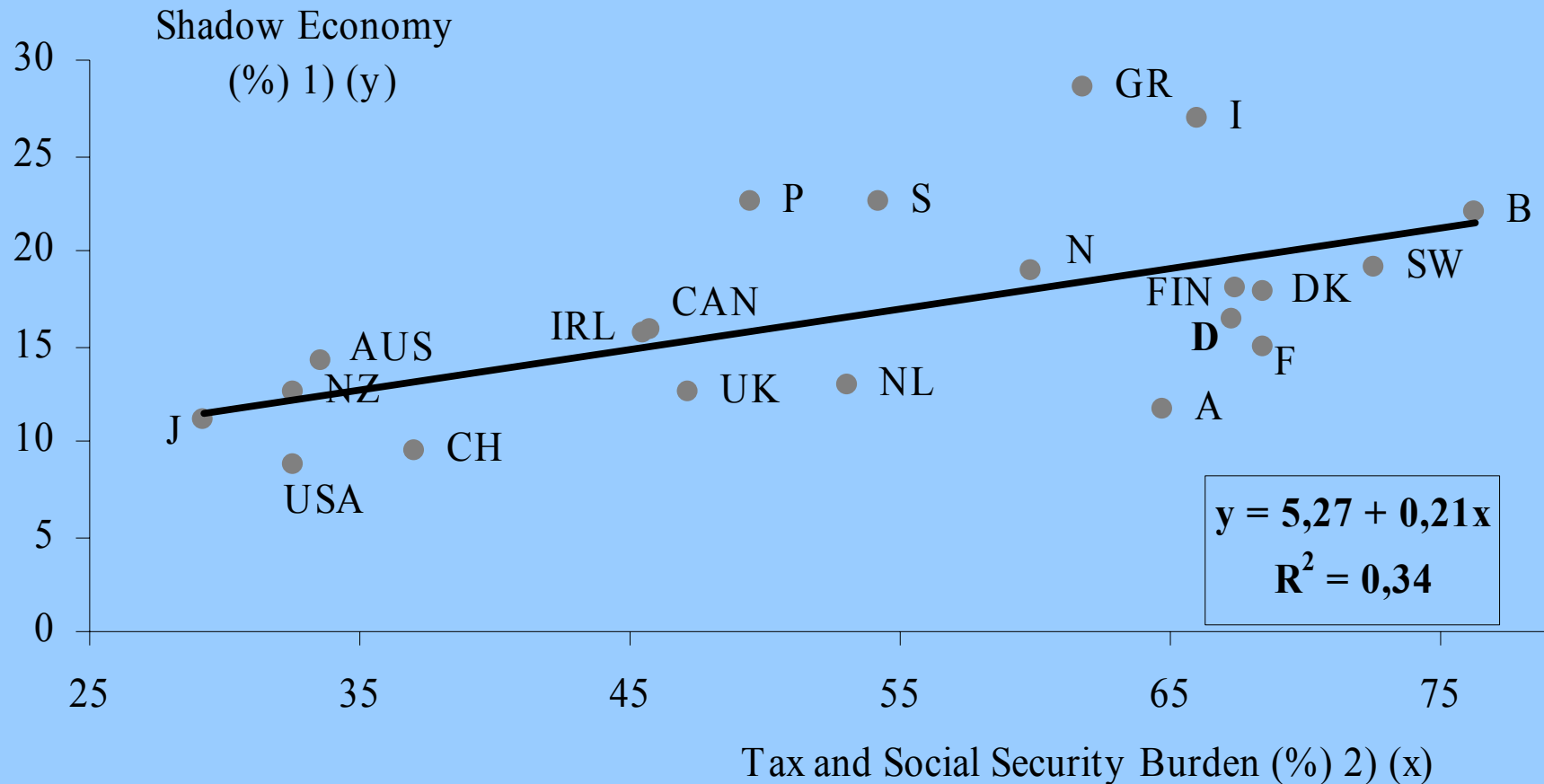
# Figur 2.1: Legal, shadow, illegal and informal economy



## **2.2. The Main Causes of Determining the Shadow Economy**

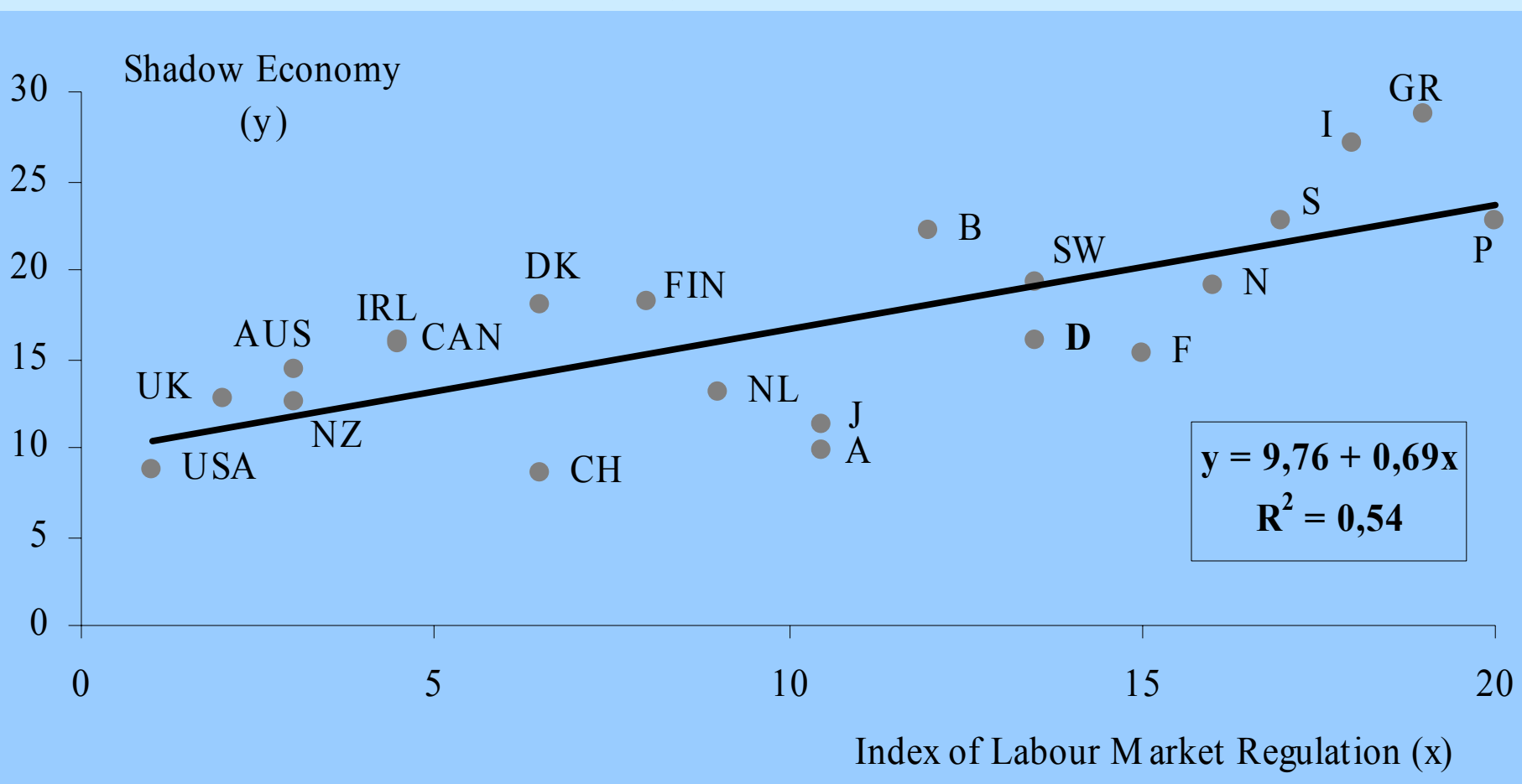
- 1 Tax and Social Security Contribution Burdens**
- 2 Intensity of Regulations**
- 3 Public Sector Services and Quality of State Institutions**

**Figure 2.1: Tax and Social Security Burden and the Size of the Shadow Economy in OECD-Countries (in percent of official GDP), Year 2002 1)**



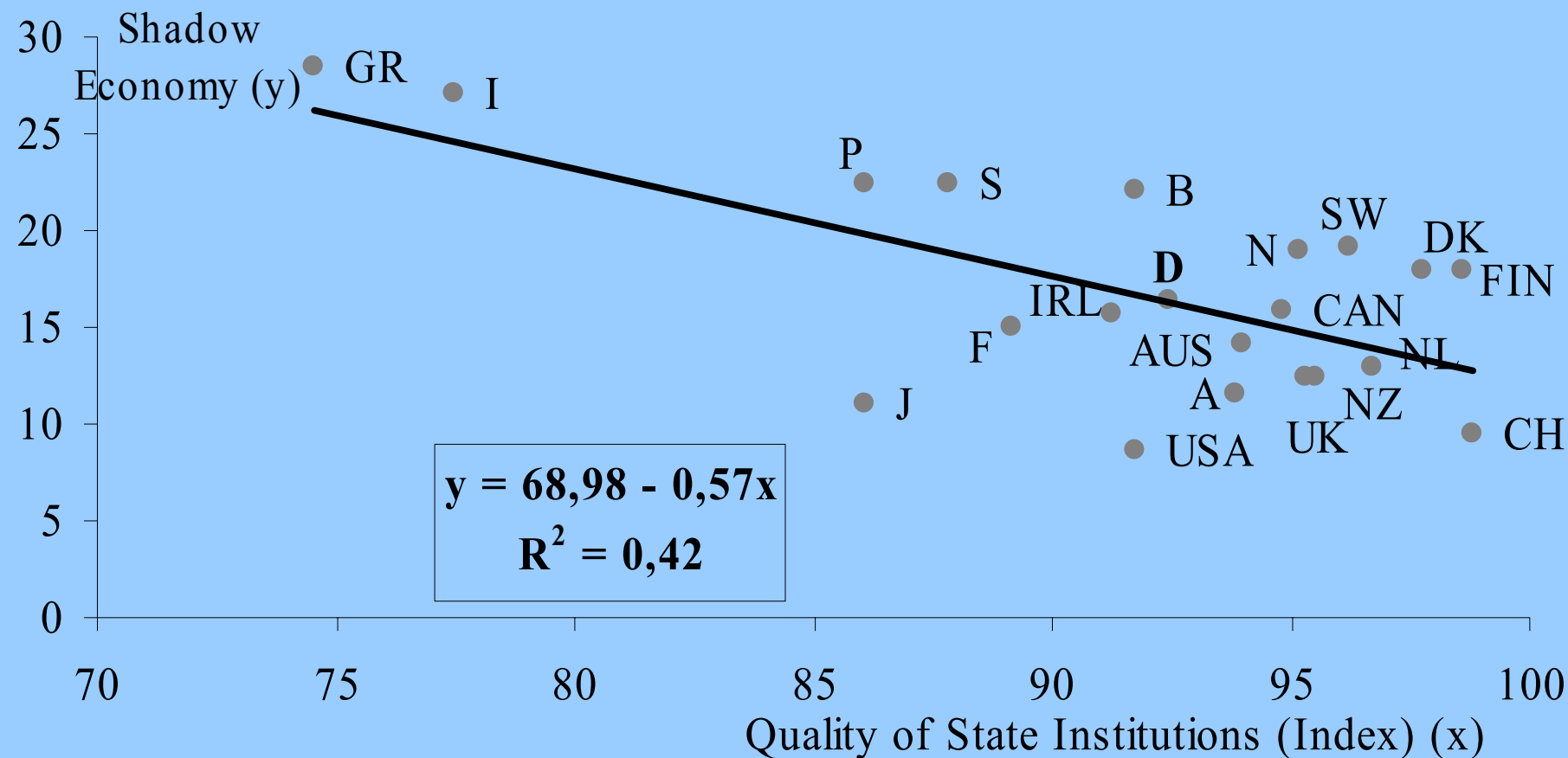
Size of the shadow economy, calculated with the DYMIMIC and currency demand method. 2) Total tax and social security burden of single average wage income earner (including social security payments from the employer) + value added tax. Source: OECD, Paris, 2003; Schneider, 2003. and Enste (2003) with own calculations

**Figure 2.2: Labour Market Regulation and the Size of the Shadow Economy: Rank of the Labour Market Regulations 1) and Size of the Economy in percent of official GDP, Years 1999 and 2000**



Labour Market Regulations on the basis of OECD calculations (OECD, Paris, 1999). The higher the rank number, the more is the labour market regulated.  
 Source: OECD, Paris, 1999; Schneider/Enste, 2000b. Quelle: Enste (2003) mit neuen Berechnungen.

**Figure 2.3: Quality of State Institutions and the Size of the Shadow Economy – Index Measuring the Quality of State Institutions 1) and Shadow Economy in percent of official GDP, Year 2002 2)**



1) Governance-Index of the Worldbank; 0=lowest quality and 100=highest quality of state institutions. Source: Worldbank, 2003; Schneider, 2003 and Enste (2003). 2) Size of the shadow economy, calculated with the help of the DYMIMC and currency demand method

## 2.2. The Main Causes of the Increase of the Shadow Economy

**Table 2.1: What are the Main Causes of the Increase of the Shadow Economy?**

### Factors Influencing the Shadow Economy

<b>The most important driving forces are:</b>	<b>Influence on the shadow economy (in%) <sup>1)</sup></b>	
(1) Increase of the Tax and Social Security Contribution Burdens	35-38%	45-52%
(2) Intensity of State Regulations	8-10%	10-15%
(3) Social Transfers	5-7%	5-8%
(4) Specific Labor Market Regulations	5-7%	5-8%
(5) Public Sector Services	5-7%	5-8%
(6) Tax Morale <sup>2)</sup>	22-25%	-
<b>Overall influence</b>	<b>76-94%</b>	<b>70-90%</b>

1) Average values of empirical results of 28 studies.

2) Average values of „only“ 15 studies.

## **3.1 The DYMIMIC estimations of the shadow economy for 110 countries**

### **3.1.1 Developing Countries**

### **3.1.2 Transition Countries**

### **3.1.3 OECD Countries**

Table 3.1.1: MIMIC estimations of the size of the shadow economy of 96 developing countries in middle and South America, Africa, Asia and South West Pacific Islands over 1999/00, 2001/02 and 2002/03

Cause Variables	Estimated Coefficients	
Share of direct taxation (in % of GDP)	$\lambda_1 =$	0.16(*) (1.77)
Share of indirect taxation and custom duties (in % of GDP)	$\lambda_2 =$	0.246** (3.34)
Burden of state regulation (share of public administrative employment in % of total employment)	$\lambda_3 =$	0.306** (3.01)
Unemployment quota	$\lambda_4 =$	0.296** (3.96)
GDP per capita	$\lambda_5 =$	-0.151* (2.56)
Indicator Variables	Estimated Coefficients	
Employment quota (in % of population 18-64)	$\lambda_6 =$	-0.651** (-3.45)
Annual rate of GDP	$\lambda_7 =$	-1
Change of currency per capita	$\lambda_8 =$	0.412** (4.99)
	RMSEA <sup>a)</sup> = 0.0004* (p-value = 0.952)	
<b>Test-statistics</b>	Chi-square <sup>b)</sup> = 7.53 (p-value = 0.904)	
	TMNCV <sup>c)</sup> = 0.042	
	AGFI <sup>d)</sup> = 0.774	
	N = 288	
	DF <sup>e)</sup> = 34	

Notes:  
 t-statistics are given in parentheses ( ); \* (\*) means | t-statistics | > 1.96 (| t-statistics | > 1.72).  
 a) Steigers Root Mean Square Error of Approximation (RMSEA) for test of close fit; RMSEA < 0.05; the RMSEA-value varies between 0.0 and 1.0.  
 b) If the structural equation model is asymptotically correct then the matrix S (sample covariance matrix) will be equal to  $\Sigma(\theta)$  (model implied covariance matrix). This test has a statistical validity with a large sample ( $N \geq 100$ ) and multinomial distributions; both given for a all three equations in tables 3.1.1-3.1.3 using a test of multi normal distributions.  
 c) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.  
 d) Test of Adjusted Goodness of Fit Index AGFI, varying between 0 and 1; 1 = perfect fit.  
 e) The degrees of freedom are determined by  $0.5(p + q)(p + q + 1) - t$ ; with p = number of indicators; q = number of cause variables; t = the number for free parameters.

YMIMIC  
estimation  
of the  
Shadow  
economy of  
5 Central  
and East  
European  
and Former  
viet Union  
Countries  
and 3  
Communist  
Countries,  
Years  
1999/00,  
2001/02 and  
2002/03

Cause Variables	Estimated Coefficients	
Share of direct taxation + share of social security payments (in % of GDP)	$\lambda_1 =$	0.461** (3.71)
Share of indirect taxation + custom duties (in % of GDP)	$\lambda_2 =$	0.361** (3.31)
Burden of state regulation (share of public administrative employment in % of total employment)	$\lambda_3 =$	0.131* (2.22)
Unemployment quota	$\lambda_4 =$	0.391** (3.91)
GDP per capita	$\lambda_5 =$	-0.221** (-3.77)
<b>Indicator Variables</b>	<b>Estimated Coefficients</b>	
Employment quota (as % of population 18-64)	$\lambda_6 =$	-0.729** (-5.49)
Annual rate of GDP	$\lambda_7 =$	-1.00 (Residuum)
Change of currency per capita	$\lambda_8 =$	0.432** (3.88)
	RMSEA <sup>a</sup> ) = 0.0003* (p-value = 0.914)	
	Chi-square <sup>2</sup> ) = 403.41 (p-value = 0.762)	
<b>Test-statistics</b>	TMCV <sup>c</sup> ) = 0.091	
	AGFI <sup>d</sup> ) = 0.661	
	N = 84	

Notes:  
t-statistics are given in  
parentheses ( ); \* (\*) means | t-  
statistics | > 1.96 (| t-statistics |  
1.72).  
a) Steigers Root Mean Square  
Error of Approximation  
(RMSEA) for test of close fit;  
RMSEA < 0.05; the RMSEA-  
value varies between 0.0 and 1.  
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c) Test of Multivariate Normality  
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d) Test of Adjusted Goodness of  
Fit Index AGFI), varying  
between 0 and 1; 1 = perfect fit  
e) The degrees of freedom are  
determined by  $0.5(p + q)(p + q + 1) - t$ ; with p = number of  
indicators; q = number of cause  
t = the number for free  
parameters.

**Table 3.1.3: DYMIMIC Estimation of the Shadow Economy of 21 highly developed OECD Countries, years 1990/91, 1994/95, 1997/98, 1999/2000, 2001/02 and 2002/03- PART 1**

<b>Cause Variables</b>	<b>Estimated Coefficients</b>	
Share of direct taxation (in % of GDP)	$\lambda_1 =$	0.410* (3.41)
Share of indirect taxation (in % of GDP)	$\lambda_2 =$	0.213(*) (1.92)
Share of social security contribution (in % of GDP)	$\lambda_3 =$	0.523** (4.59)
Burden of state regulation (index of labour market regulation)	$\lambda_4 =$	0.203(*) (1.84)
Quality of state institutions (index)	$\lambda_5 =$	0.346** (2.76)
Tax morale	$\lambda_6 =$	0.614** (4.06)
Unemployment quota	$\lambda_7 =$	0.399** (3.41)
GDP per capita	$\lambda_8 =$	-0.134** (-3.64)

**Table 3.1.3: DYMIMIC Estimation of the Shadow Economy of 21 highly developed OECD Countries, years 1990/91, 1994/95, 1997/98, 1999/2000, 2001/02 and 2002/03- PART 2**

Indicator Variables	Estimated Coefficients
Employment quota (in % of population 18-64)	$\lambda_9 =$ -0.713** (-3.49)
Average working time (per week)	$\lambda_{10} =$ -1.00 (Residuum)
Annual rate of GDP (adjusted for the mean of all 22 OECD countries)	$\lambda_{11} =$ -0.345** (-3.513)
Change of currency per capita	$\lambda_{12} =$ 0.384** (4.71)
	RMSEA <sup>a)</sup> = 0.0002* (p-value = 0.981)
	Chi-square <sup>b)</sup> = 6.54 (p-value = 0.921)
<b>Test-statistics</b>	TMCV <sup>c)</sup> = 0.038
	AGFI <sup>d)</sup> = 0.814
	N = 126
	D.F. <sup>e)</sup> = 61

Notes:

t-statistics are given in parentheses ( ); \* (\*) means | t-statistics | > 1.96 (| t-statistics | > 1.72).

a) Steigers Root Mean Square Error of Approximation (RMSEA) for test of close fit; RMSEA < 0.05; the RMSEA-value varies between 0.0 and 1.0.

b) If the structural equation model is asymptotically correct then the matrix S (sample covariance matrix) will be equal to  $\Sigma(\theta)$  (model implied covariance matrix). This test has a statistical validity with a large sample ( $N \geq 100$ ) and multinomial distributions; both given for a all three equations in tables 3.1.1-3.1.3 using a test of multi normal distributions.

c) Test of Multivariate Normality for Continuous Variables (TMNCV); p-values of skewness and kurtosis.

d) Test of Adjusted Goodness of Fit Index (AGFI), varying between 0 and 1; 1 = perfect fit.

e) The degrees of freedom are determined by  $0.5(p + q)(p + q + 1) - t$ ; with p = number of indicators; q = number of cause variables; t = the number for free

## **3.2 The Size of the Shadow Economies all over the World - Findings for 145 Countries**

**3.2.1 Developing Countries (Africa, Asia, South and Middle America)**

**3.2.2 Transition Countries (European and Former Sowjet Union Nations)**

**3.2.3 Highly Developed OECD Countries**

**3.2.4 South West Pacific Islands**

**3.2.5 Communist Countries**

Table 3.2.1: The Size of the Shadow Economy in 37 African Countries – Part 1

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Algeria	34,1	35,0	35,6
2	Angola	43,2	44,1	45,2
3	Benin	47,3	48,2	49,1
4	Botswana	33,4	33,9	34,6
5	Burkina Faso	41,4	42,6	43,3
6	Burundi	36,9	37,6	38,7
7	Cameroon	32,8	33,7	34,9
8	Central African Republic	44,3	45,4	46,1
9	Chad	46,2	47,1	48,0
10	Congo, Dem. Rep.	48,0	48,8	49,7
11	Congo, Rep.	48,2	49,1	50,1
12	Cote d'Ivoire	43,2	44,3	45,2
13	Egypt, Arab Rep.	35,1	36,0	36,9
14	Ethiopia	40,3	41,4	42,1
15	Ghana	41,9	42,7	43,6
16	Guinea	39,6	40,8	41,3
17	Kenya	34,3	35,1	36,0
18	Lesotho	31,3	32,4	33,3
19	Madagascar	39,6	40,4	41,6
20	Malawi	40,3	41,2	42,1

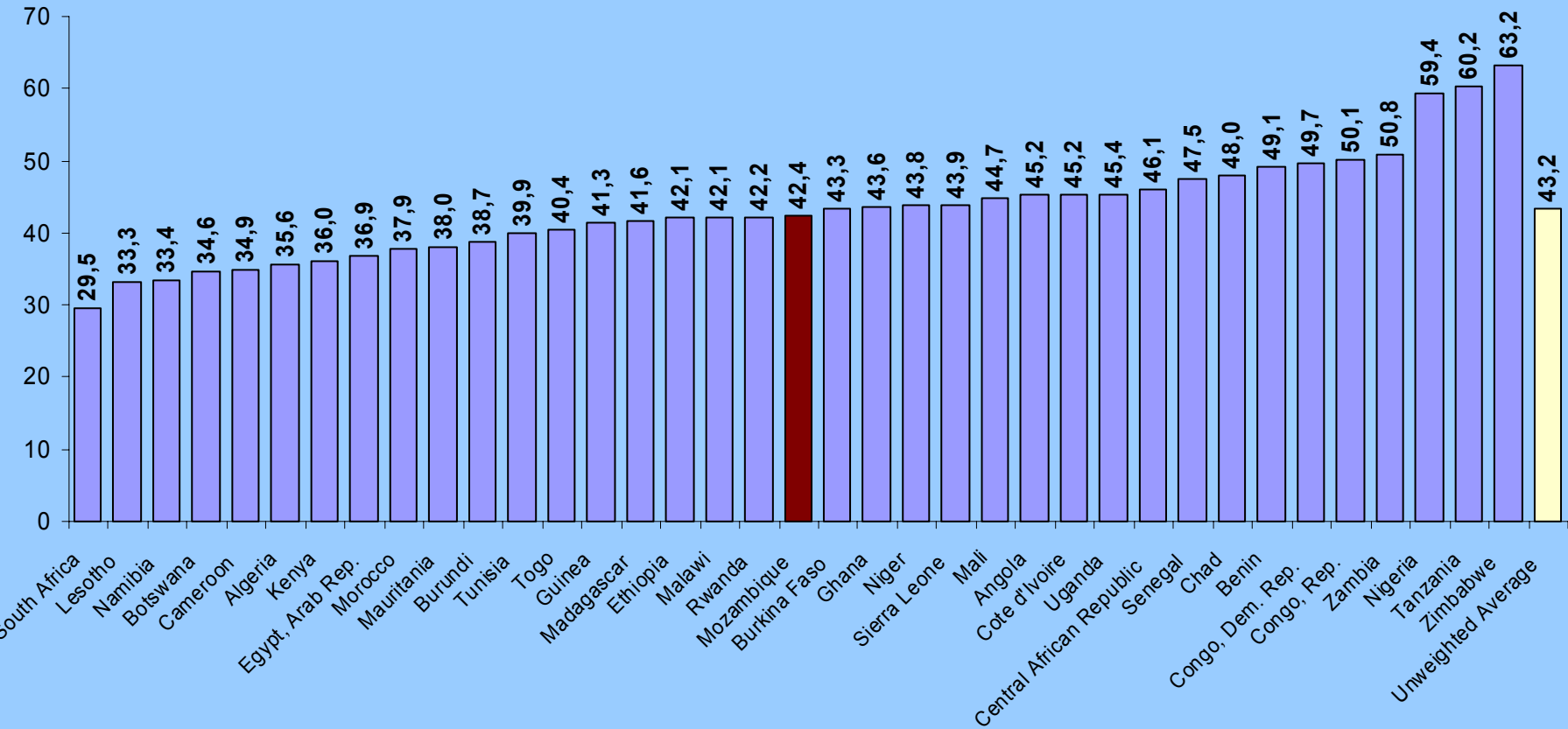
Source: Own calculations.

**Table 3.2.1: The Size of the Shadow Economy in 37 African Countries – Part 2**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
21	Mali	42,3	43,9	44,7
22	Mauritania	36,1	37,2	38,0
23	Morocco	36,4	37,1	37,9
24	Mozambique	40,3	41,3	42,4
25	Namibia	31,4	32,6	33,4
26	Niger	41,9	42,6	43,8
27	Nigeria	57,9	58,6	59,4
28	Rwanda	40,3	41,4	42,2
29	Senegal	45,1	46,8	47,5
30	Sierra Leone	41,7	42,8	43,9
31	South Africa	28,4	29,1	29,5
32	Tanzania	58,3	59,4	60,2
33	Togo	35,1	39,2	40,4
34	Tunisia	38,4	39,1	39,9
35	Uganda	43,1	44,6	45,4
36	Zambia	48,9	49,7	50,8
37	Zimbabwe	59,4	61,0	63,2
<b>Unweighted Average</b>		<b>41,3</b>	<b>42,3</b>	<b>43,2</b>

Source: Own calculations.

**Figur 3.2.1: The Size of the Shadow Economy in 37 African Countries - in % of official GDP - in 2002/03**



**Table 3.2.2: The Size of the Shadow Economy in 28 Asian Countries – Part 1**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Bangladesh	35,6	36,5	37,7
2	Bhutan	29,4	30,5	31,7
3	Cambodia	50,1	51,3	52,4
4	Hong Kong, China	16,6	17,1	17,2
5	India	23,1	24,2	25,6
6	Indonesia	19,4	21,8	22,9
7	Iran, Islamic Rep.	18,9	19,4	19,9
8	Israel	21,9	22,8	23,9
9	Jordan	19,4	20,5	21,6
10	Korea, Rep.	27,5	28,1	28,8
11	Kuwait	20,1	20,7	21,6
12	Lebanon	34,1	35,6	36,2
13	Malaysia	31,1	31,6	32,2
14	Mongolia	18,4	19,6	20,4
15	Nepal	38,4	39,7	40,8

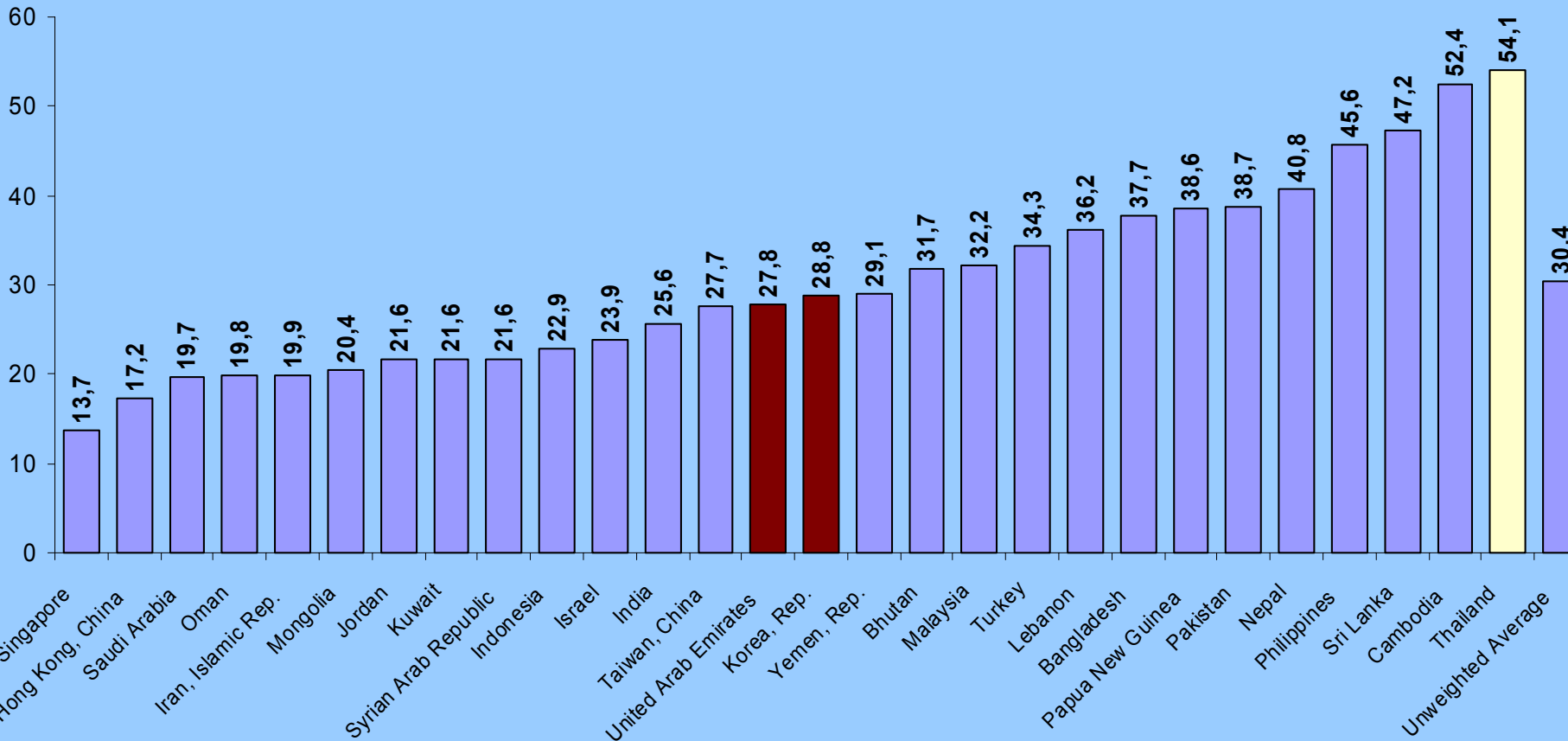
Source: Own calculations.

**Table 3.2.2: The Size of the Shadow Economy in 28 Asian Countries – Part 2**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
16	Oman	18,9	19,4	19,8
17	Pakistan	36,8	37,9	38,7
18	Papua New Guinea	36,1	37,3	38,6
19	Philippines	43,4	44,5	45,6
20	Saudi Arabia	18,4	19,1	19,7
21	Singapore	13,1	13,4	13,7
22	Sri Lanka	44,6	45,9	47,2
23	Syrian Arab Republic	19,3	20,4	21,6
24	Taiwan, China	25,4	26,6	27,7
25	Thailand	52,6	53,4	54,1
26	Turkey	32,1	33,2	34,3
27	United Arab Emirates	26,4	27,1	27,8
28	Yemen, Rep.	27,4	28,4	29,1
<b>Unweighted Average</b>		<b>28,5</b>	<b>29,5</b>	<b>30,4</b>

Source: Own calculations.

**Figur 3.2.2.: The Size of the Shadow Economy in 28 Asian Countries - in % of official GDP - in 2002/03**

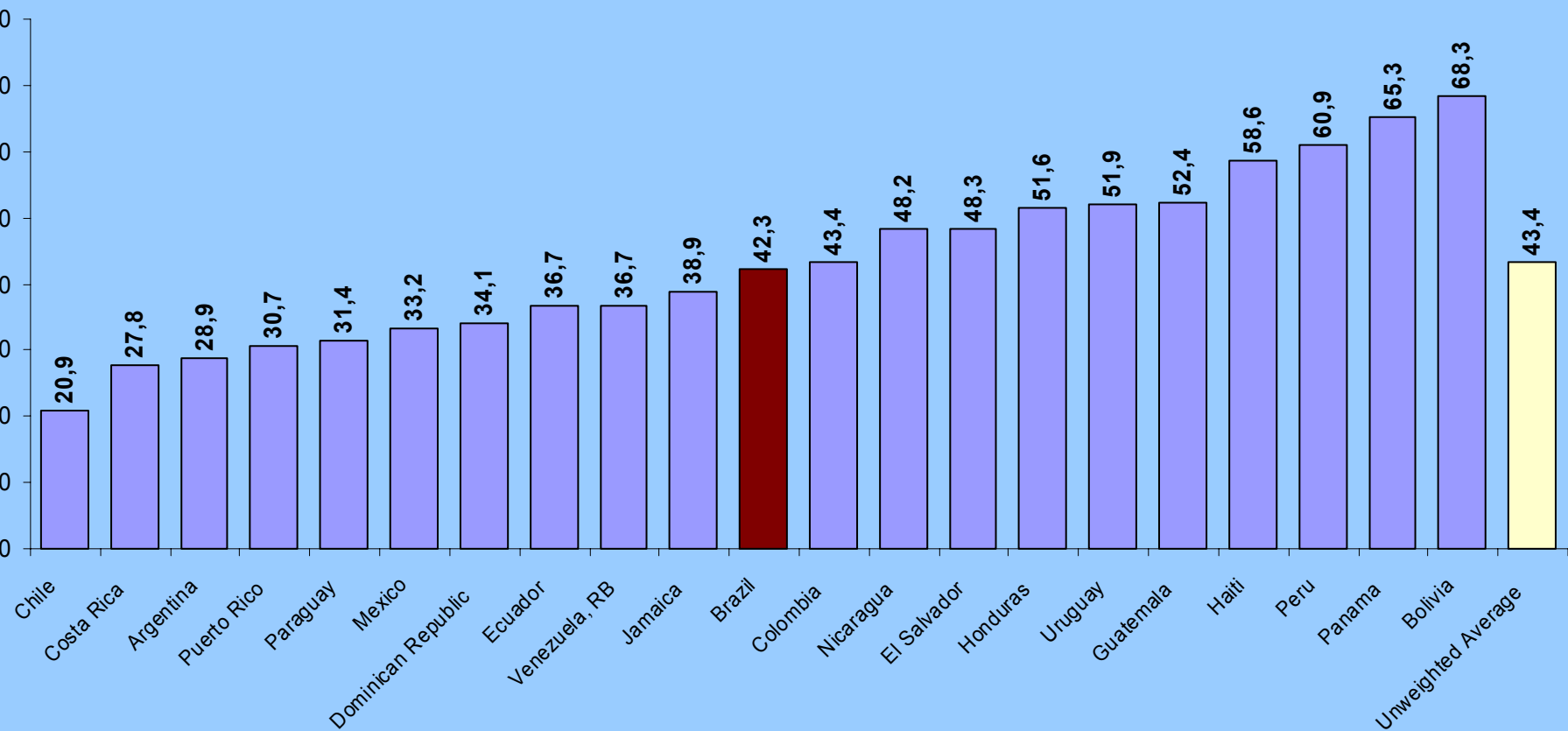


**Table 3.2.3: The Size of the Shadow Economy in 21 Central and South American Countries**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Argentina	25,4	27,1	28,9
2	Bolivia	67,1	68,1	68,3
3	Brazil	39,8	40,9	42,3
4	Chile	19,8	20,3	20,9
5	Colombia	39,1	41,3	43,4
6	Costa Rica	26,2	27,0	27,8
7	Dominican Republic	32,1	33,4	34,1
8	Ecuador	34,4	35,1	36,7
9	El Salvador	46,3	47,1	48,3
10	Guatemala	51,5	51,9	52,4
11	Haiti	55,4	57,1	58,6
12	Honduras	49,6	50,8	51,6
13	Jamaica	36,4	37,8	38,9
14	Mexico	30,1	31,8	33,2
15	Nicaragua	45,2	46,9	48,2
16	Panama	64,1	65,1	65,3
17	Paraguay	27,4	29,2	31,4
18	Peru	59,9	60,3	60,9
19	Puerto Rico	28,4	29,4	30,7
20	Uruguay	51,1	51,4	51,9
21	Venezuela, RB	33,6	35,1	36,7

Source: Own calculations.

**Figur 3.2.3: The Size of the Shadow Economy in 21 Central and South American Countries - in % of official GDP - in 2002/03**

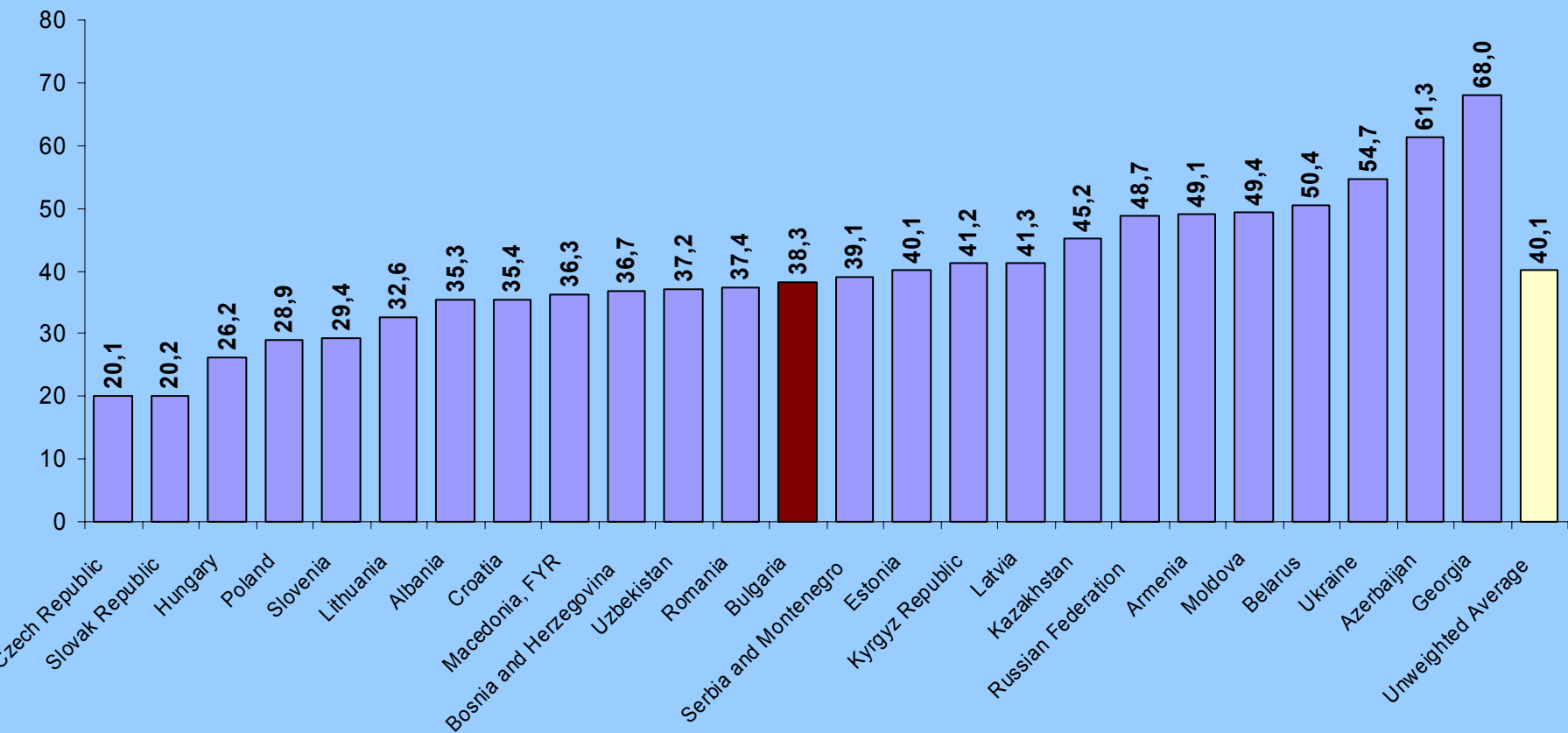


**of the Shadow  
Economy in 25 East  
and Central European  
and Former Soviet  
Union Countries**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Albania	33,4	34,6	35,3
2	Armenia	46,3	47,8	49,1
3	Azerbaijan	60,6	61,1	61,3
4	Belarus	48,1	49,3	50,4
5	Bosnia and Herzegovina	34,1	35,4	36,7
6	Bulgaria	36,9	37,1	38,3
7	Croatia	33,4	34,2	35,4
8	Czech Republic	19,1	19,6	20,1
9	Estonia	38,4	39,2	40,1
10	Georgia	67,3	67,6	68,0
11	Hungary	25,1	25,7	26,2
12	Kazakhstan	43,2	44,1	45,2
13	Kyrgyz Republic	39,8	40,3	41,2
14	Latvia	39,9	40,7	41,3
15	Lithuania	30,3	31,4	32,6
16	Macedonia, FYR	34,1	35,1	36,3
17	Moldova	45,1	47,3	49,4
18	Poland	27,6	28,2	28,9
19	Romania	34,4	36,1	37,4
20	Russian Federation	46,1	47,5	48,7
21	Serbia and Montenegro	36,4	37,3	39,1
22	Slovak Republic	18,9	19,3	20,2
23	Slovenia	27,1	28,3	29,4
24	Ukraine	52,2	53,6	54,7
25	Uzbekistan	34,1	35,7	37,2
<b>Unweighted Average</b>		<b>38.1</b>	<b>39.1</b>	<b>40.1</b>

Source: Own  
calculations.

**Figur 3.2.4: The Size of the Shadow Economy in 25 East and Central European and Former Soviet Union Countries - in % of official GDP - in 2002/03**



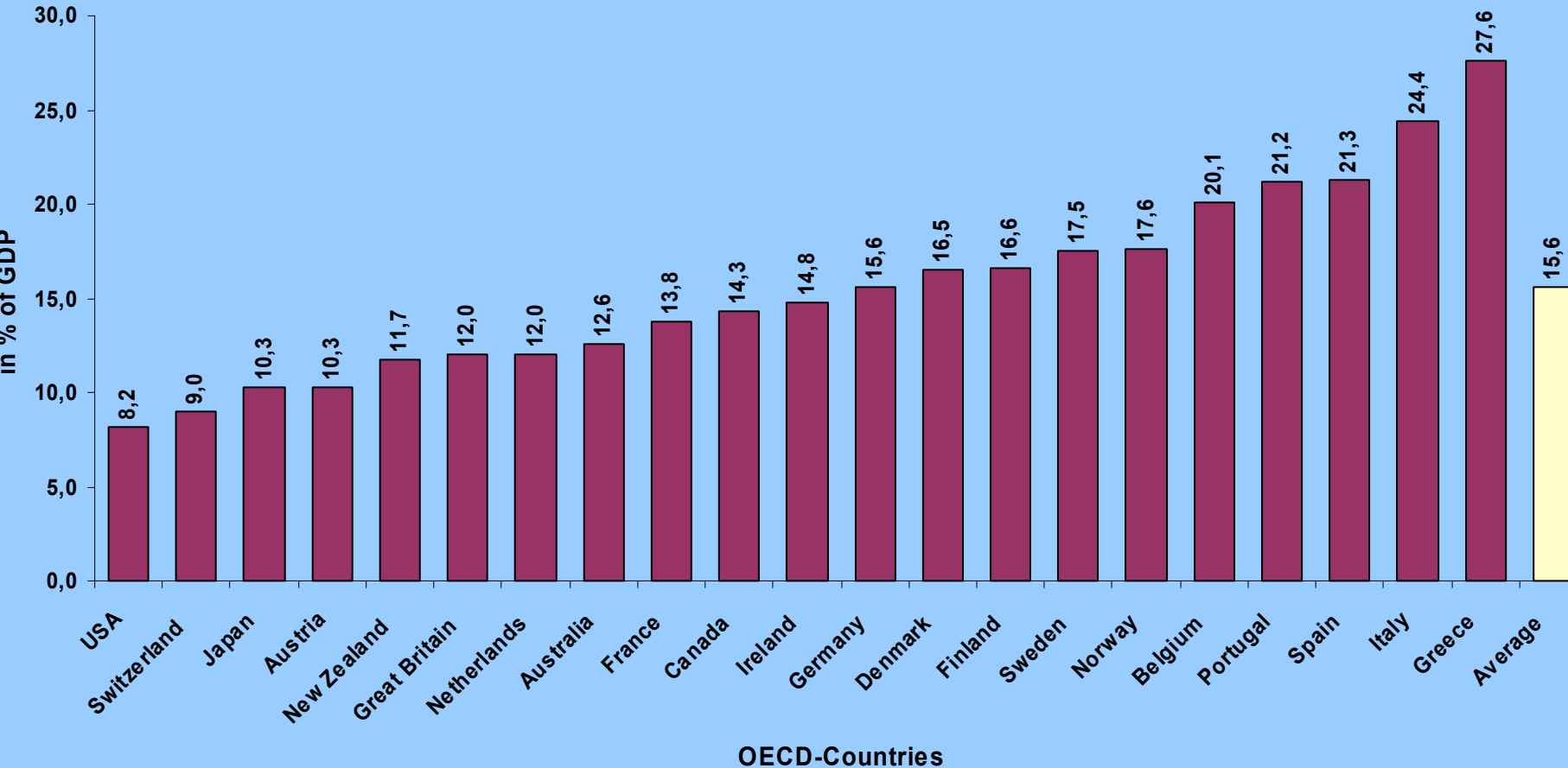
### 3.2. The Size of the Shadow Economies all over the World – Findings for 145 Countries

**Table 3.2.5: The Size of the Shadow Economy of 21 OECD Countries over time**

	1989/90	1990/93	1994/95	1997/98	1999/2000	2001/2002	2002/2003	2004	2005
Australia	10.1	13.0	13.5	14.0	14,3	14,1	13,5	13,2	13,1
Austria	6.9	7.1	8.6	9.0	9,8	10,6	10,9	11,0	10,9
Belgium	19.3	20.8	21.5	22.5	22,2	22	21,0	20,7	20,6
Canada	12.8	13.5	14.8	16.2	16	15,8	15,2	15,1	14,9
Denmark	10.8	15.0	17.8	18.3	18	17,9	17,3	17,1	16,9
Finland	13.4	16.1	18.2	18.9	18,1	18	17,4	17,2	17,0
France	9.0	13.8	14.5	14.9	15,2	15	14,5	14,3	14,1
Germany	11.8	12.5	13.5	14.9	16	16,3	16,8	16,2	16,0
Great Britain	9.6	11.2	12.5	13.0	12,7	12,5	12,2	12,3	12,2
Greece	22.6	24.9	28.6	29.0	28,7	28,5	28,2	28,1	27,9
Ireland	11.0	14.2	15.4	16.2	15,9	15,7	15,3	15,2	14,9
Italy	22.8	24.0	26.0	27.3	27,1	27	25,7	25,2	24,9
Japan	8.8	9.5	10.6	11.1	11,2	11,1	10,8	10,7	10,6
Netherlands	11.9	12.7	13.7	13.5	13,1	13	12,6	12,5	12,4
New Zealand	9.2	9.0	11.3	11.9	12,8	12,6	12,3	12,2	12,1
Norway	14.8	16.7	18.2	19.6	19,1	19	18,4	18,2	18,0
Portugal	15.9	17.2	22.1	23.1	22,7	22,5	21,9	21,7	21,5
Spain	16.1	17.3	22.4	23.1	22,7	22,5	22,0	21,9	21,7
Sweden	15.8	17.0	19.5	19.9	19,2	19,1	18,3	18,1	17,9
Switzerland	6.7	6.9	7.8	8.1	8,6	9,4	9,4	9,4	9,3
USA	6.7	8.2	8.8	8.9	8,7	8,7	8,4	8,4	8,3
Average	13.2	14.3	15.7	16.7	16,8	16,7	16,3	16,1	15,9

### 3.2. The Size of the Shadow Economies all over the World – Findings for 145 Countries

Figure 3.2.5: Size of the Shadow Economy in *21 OECD COUNTRIES*, in % of GDP, 2005



**Table 3.2.6: The Size of the Shadow Economy in 10 South West Pacific Islands**

	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Fiji	33,6	34,3	35,1
2	Kiribati	34,1	35,0	35,3
3	Maldives	30,3	31,4	32,0
4	Marshall Islands	28,1	29,0	29,6
5	Micronesia, Fed. Sts.	31,3	32,1	33,2
6	Palau	28,4	29,2	30,0
7	Samoa	31,4	32,6	33,5
8	Solomon Islands	33,4	34,5	35,3
9	Tonga	35,1	36,3	37,4
10	Vanuatu	30,9	31,7	32,5
<b>Unweighted Average</b>		<b>31,7</b>	<b>32,6</b>	<b>33,4</b>

Source: Own  
calculations.

**Table 3.2.7: The Size of the Shadow Economy in 3 Communist Countries**

No.	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	China	13,1	14,4	15,6
2	Lao PDR	30,6	31,9	33,4
3	Vietnam	15,6	16,9	17,9
<b>Unweighted Average</b>		<b>19,8</b>	<b>21,1</b>	<b>22,3</b>

Source: Own calculations.

# **4 The Dynamic Effects of the Shadow Economy on the Official Economy**

## **4.1 Theoretical Background**

## **4.2 Empirical Results**

**4.2.1 66 Developing and Developed Countries**

**4.2.2 21 OECD countries**

**4.2.3 23 Transition and Developing Countries**

## 4. The Dynamic Effects of the Shadow Economy on Official Economy

### Hypothesis 1

Adam and Ginsburgh (1985), Schneider (2002) and Bhattacharaya (2000) focus on the interactions of the shadow economy with "official" economy in highly developed countries. They find a positive relationship between the growth of the shadow economy and the "official" one under certain assumptions (i.e. very low entry costs into the shadow economy due to a low probability of law enforcement).

### Hypothesis 2

A substantial reduction of the shadow economy in developing countries 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 (Loayza (1996)) found empirical evidence for this hypothesis.

**Conclusion → Hypothesis 3: (1) Considering both lines of theoretical argumentation, the effects of an increase of the shadow economy on “official” economic growth may be different with respect to the developing stage of a country.**

**(2) On the one side in highly developed countries individuals/entrepreneurs are overburdened by tax and state regulation so that a rising shadow economy increases the official one because additional value added is created and additional income (earned in the shadow economy) is spent in the official economy.**

**(3) On the other side in developing countries a rising shadow economy leads to a considerable erosion of the tax base with the consequence of a lower provision of public infrastructure and basic public services (e.g. an inefficient juridical system) and with the final consequence of lower official growth.**

### 4.2 Empirical Results

#### 4.2.1 109 Developing and Developed Countries

**“Official” economic growth = a1 (shadow economy industrialized countries) +  
a2 (shadow economy developing countries) +  
a3 (openness) +  
a4 (inflation rate industrialized countries) +  
a5 (inflation rate developed countries) +  
a6 (government consumption) +  
a7 (lagged GDP per capita growth rate) +  
a8 (total population) +  
a9 (capital accumulation rate) +  
a10 (constant) +  $\epsilon_{it}$**

**with the expected signs = a1 > 0, a2 < 0, a3 > 0, a4 < 0, a5 < 0, a6 < 0,  
a7 > 0, a8 > 0, a9 > 0**

**Table 4.1: Results of the Panel Regression; Time period 1990-2000, 104 developing, transition and industrialized countries**

<i>Dependent Variable</i>	<i>Annual GDP per capita Growth Rate</i>
<i>Independent Variables:</i>	<i>Estimated Coefficients:</i>
Shadow Economy Industrialized (Transition and OECD) Countries	0.077** (2.63)
Shadow Economy Developing Countries	-0.052** (2.37)
Openness	0.012** (2.14)
Inflation Rate Other Countries	0.023 (1.32)
Inflation Rate Transition Countries	-0.021** (4.10)
Government Consumption	-0.181** (3.23)
Lagged Annual GDP per Capita Growth Rate	0.154** (3.06)
Total Population	0.000036** (2.07)
Capital Accumulation Rate	0.019* (1.88)
Constant	0.062** (4.13)
Number of Countries	104
Overall R-Squared	0.347
Within R-Squared	0.266
Between R-Squared	0.417
Wald-CHI <sup>2</sup>	94.63 (0.000)

*Absolute value of z-statistics in parentheses \* significant at 10%; \*\* significant at 5%.  
Random effects GLS-regression: 104 countries, period 1990-2000; yearly data*

*Source: Own calculations*

### 4.2.2 21 OECD countries

**“Official” growth (annual GDP per capita) = a1 (trendvariable) +  
a2 (shadow economy) +  
a3 (openness) +  
a4 (capital accumulation rate) +  
a5 (annual FDY growth rate) +  
a6 (ann. labor force growth r.) +  
a7 (constant)  $\epsilon_{it}$**

**For the signs we expect  $a1 < 0, a2 > 0, a3 > 0, a4 > 0, a5 > 0, a6 > 0.$**

**Table 4.2: Growth equation for 21 OECD Countries 1990-2000; results of a Panel regression**

<i>Dependent Variables</i>	<i>Annual GDP per capita Growth Rate</i>
<i>Explanatory Variables:</i>	<i>Estimated coefficients</i>
Trend Variable	-0.003** (3.36)
Shadow Economy	0.078** (2.05)
Openness	0.016** (2.47)
Capital Accumulation Rate	0.127** (3.47)
Annual FDI Growth Rate	0.004** (2.49)
Annual Labour Force Growth Rate	0.951** (2.44)
Constant	6.206** (3.36)
Number of Countries	21
Overall R-Squared	0.370
Within R-Squared	0.213
Between R-Squared	0.716
Wald-Chi <sup>2</sup>	51.10 (0.000)
<i>Absolute value of z-statistics in parentheses</i>	
<i>* significant at 10%;</i>	
<i>** significant at 5%;</i>	
<i>Random effects GLS-regression; 21 countries, period 1990-2000; yearly data.</i>	
<i>Source: Own calculations.</i>	

### 4.2.3 21 Transition and Developing Countries

**“Official” growth (ann. GDP per capita) = a1 (shadow ec. transition countr.)**

**a2 (shadow economy developing countries)**

**a3 (foreign direct investment lagged)**

**a4 (inflation rate other countries)**

**a5 (inflation rate transition countries)**

**a6 (government consumption)**

**a7 (lagged annual GDP per capita)**

**a8 (growth rate)**

**a9 (population rate)**

**a10 (capital accumulation rate)**

**a11 (constant)**

**For the signs we expect:**

**a1 > 0, a2 < 0, a3 > 0, a4 < 0, a5 < 0, a6 < 0,  
a7 > 0, a8 > 0, a9 > 0, a10 > 0.**

**Table 4.3: Results of the Panel Regression; Time period 1990-2000, 75  
Transition and Developing Countries**

<i>Dependent Variable</i>	<i>Annual GDP per capita Growth Rate</i>
<i>Independent Variables:</i>	<i>Estimated Coefficients:</i>
Shadow Economy Transition Countries	0.099** (3.80)
Shadow Economy Developing Countries	-0.045** (-2.36)
FDI lagged	0.00049 (0.05)
Inflation Rate Other Countries	0.0263 (1.28)
Inflation Rate Transition Countries	-0.021** (-3.69)
Government Consumption	-0.184** (3.25)
Lagged Annual GDP per Capita Growth Rate	0.154** (3.06)
Total Population	0.000036* (1.80)
Capital Accumulation Rate	0.015 (1.42)
Constant	0.067** (5.00)
Number of Countries	75
Overall R-Squared	0.3211
Within R-Squared	0.263
Between R-Squared	0.443
Wald-CHI <sup>2</sup>	73.89 (0.000)

*Absolute value of z-statistics in parentheses \* significant at 10%; \*\* significant at 5%.*

## 5. Summary and Conclusions

**Table 5.1: Average Size of the Shadow Economy for Developing, Transition and OECD-Countries in % of official GDP**

Countries/Year	Average Size of the Shadow Economy – Value added in % of official GDP using DYMIMIC and Currency Demand method ( <i>Number of Countries</i> )		
	1999/2000	2000/2001	2002/2003
<b>Mostly developing countries:</b>			
<b>Africa</b>	<b>33.9</b> (24)	<b>37.4</b> (24)	<b>41.2</b> (24)
<b>Central and South America</b>	<b>34.2</b> (17)	<b>37.7</b> (17)	<b>41.5</b> (17)
<b>Asia</b>	<b>20.9</b> (25)	<b>23.4</b> (25)	<b>26.3</b> (25)
<b>Transition countries</b>	<b>31.5</b> (23)	<b>34.6</b> (23)	<b>37.9</b> (23)
<b>Highly developed OECD Countries</b>	<b>13.2</b> (21)	<b>15.7</b> (21)	<b>16.8</b> (21)
<b>South Pacific Islands</b>	<b>31.7</b> (10)	<b>32.6</b> (10)	<b>33.4</b> (10)
<b>Communist Countries</b>	<b>19.4</b> (4)	<b>20.7</b> (4)	<b>21.8</b> (4)
<b>Unweighted Average over 145 Countries</b>	<b>33.6</b>	<b>34.5</b>	<b>35.2</b>

Source: Own calculations.

## 5. Summary and Conclusions

**Finally to conclude:**

**(1) A shadow economy is a complex phenomenon, which is present to an important extent even in industrialized and developed economies.**

**(2) People engage in shadow economic activities for a variety of reasons among most important, are government actions, most notable taxation, social security contributions and regulation.**

**(3) A government aiming to decrease shadow economic activities has to first and foremost analyze the complex and frequently contradictory relationships among consequences of its own policy decisions.**

## 5. Summary and Conclusions

**(4) A government aiming to reduce the size of the shadow economy should also make great efforts to legalize shadow economy activities with the help of economic incentives.**

**(5) From a public choice perspective a government may not have an interest to reduce the shadow economy due to the facts, that**

**(i) tax losses may be moderate as at least  $2/3$  of the income earned in the shadow economy is immediately spend in the official economy,**

**(ii) income earned in the shadow economy increases the standard of living at least of  $1/3$  of the working population, and**

**(iii) people who work in the shadow economy have less time for other things like to go on demonstrations, etc.**

# **6 Methods to Estimate the Size of the Shadow Economy**

## **6.1 Direct Approaches**

## **6.2 Indirect Approaches**

## **6.3 The Model/Latent Estimation Approaches**

## **6. Methods to Estimate the Size of the Shadow Economy**

### **6.1 Direct Approaches**

#### **6.1.1 Survey-method**

#### **6.1.2 Tax-auditing-method**

*These micro approaches employ either well designed surveys and samples based on voluntary replies or tax auditing and other compliance methods.*

### 6.2 Indirect Approaches

*These approaches, which are also called “indicator” approaches, are mostly macroeconomic ones and use various (mostly economic) indicators that contain information about the development of the shadow economy (over time).*

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

**6.2.2 The Discrepancy between the Official and Actual Labor Force**

**6.2.3 The Transactions Approach**

**6.2.4 The Currency Demand Approach**

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

### 6.3 The Model/Latent Estimation Approach

### 6.2.4. The Currency Demand Approach

The basic regression equation for the currency demand, proposed by Tanzi (1983), is the following:

$$\ln (C / M2)_t = b_0 + b_1 \ln (1 + TW)_t + b_2 \ln (WS / Y)_t + b_3 \ln R_t + b_4 \ln (Y / N)_t + u_t$$

with  $b_1 > 0$ ,  $b_2 > 0$ ,  $b_3 < 0$ ,  $b_4 > 0$

where

$\ln$  denotes natural logarithms,

$C / M2$  is the ratio of cash holdings to current and deposit accounts,

$TW$  is a weighted average tax rate (as a 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.

## 6. Methods to Estimate the Size of the Shadow Economy – The Currency Demand Approach Cont.

Since the 90s the following four types of causes for working in the shadow economy are distinguished (e.g. Schneider (2000)):

**(i) *The burden of direct taxation (DIRT)*, both average and marginal with**

**$DIRT_t = TATRY_t + AMTRY_t$ , where**

**$TATRY_t$  = total average tax rate (including social security payments) on wage income in the year  $t$  and**

**$AMTRY_t$  = average marginal tax rate on wage income in the year  $t$ .**

**Expected sign +**

**(ii) *The burden of indirect taxation (INDT)*, which is defined as the percentage ratio of the sum of all indirect taxes to gross domestic production net of indirect taxes.**

**Expected sign +**

***(iii) Tradeoff between tax evasion and illegal tax avoidance***

The complexity of the tax system (**VIST**) is defined with the help of the Herfindahl-Hirschman concentration measure:

$$VIST_t = \sum_{i=1}^m (REV_{it})^2 + \sum_{j=1}^n (EXEM_{jt})^2$$

**REV<sub>it</sub>** equals the **i-th** revenue share of the total revenue amount for all **m** revenue items in a year **t**;

**EXEM<sub>jt</sub>** equals the **j-th** tax exemption of the total tax exemptions in a year **t**.

Thus **VIST** is equal to **2** if only one revenue source exists in a year **t** and if there is one tax exemption. In this case, the tax system is highly simple and every change will be immediately recognized by the taxpayer.

Expected sign +

***(iv) The intensity of regulations (REG)***, which follows the OECD labour market regulation index.

Expected sign +

**The most commonly raised objections (criticism) against the current demand approach are:**

- (1) Not all transactions in the shadow economy are paid in cash. The size of the total shadow economy (including barter) may thus be larger.**
- (2) Most studies consider only one particular factor, the tax burden, as a cause of the shadow economy. If other factors also have an impact on the extent of the hidden economy, the shadow economy may be higher.**
- (3) Blades and Feige, criticize Tanzi's studies on the grounds that the US dollar is used as an international currency, which has to be controlled.**
- (4) Another weak point is the assumption of the same velocity of money in both types of economies.**
- (5) Ahumada, Alvaredo, Canavese A. and P. Canavese (2004) show, that the currency approach together with the assumption of equal income velocity of money in both, the reported and the hidden transaction is only correct, if the income elasticity is 1. As this is for most countries not the case, the calculation has to be corrected.**
- (6) Finally, the assumption of no shadow economy in a base year is open to criticism.**

### **6.2.5. The physical input (electricity consumption) method:**

#### **The Kaufmann - Kaliberda Method**

- 1. To measure overall (official and unofficial) economic activity the authors assume that electric power consumption is regarded as the single best physical indicator of overall economic activity.**
- 2. Overall (official and unofficial) economic activities and electricity consumption have been empirically observed move in lockstep with an electricity/GDP elasticity usually close to one.**
- 3. 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 Kaufmann-Kaliberda-Method can be criticized on various grounds:**

- (i) Not all shadow economy activities require a considerable amount of electricity (e.g. personal services), and other energy sources (gas, oil, coal, etc.) can be used, so that only a part of the shadow economy will be captured.**
- (ii) Over time, there has been considerable technical progress. Both the production and use of electricity are more efficient than in the past, and that will apply in both official and unofficial uses.**
- (iii) There may be considerable differences or changes in the elasticity of electricity/GDP across countries and over time.**

## The Lackó Method

**Lackó assumes that a certain part of the shadow economy is associated with the household consumption of electricity.**

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

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

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

$$\text{with } \beta_1 > 0, \beta_2 < 0, \beta_3 > 0$$

where

**$i$** : the number of the country,

**$E_i$** : per capita household electricity consumption in country  $i$  in Mtoe,

**$C_i$** : per capita real consumption of households without the consumption of electricity,

**$PR_i$** : the real price of consumption of 1 kWh of residential electricity,

**$G_i$** : the relative frequency of months with the need of heating in houses in country  $i$ ,

**$Q_i$** : the ratio of energy sources other than electricity energy to all energy sources in,

**$H_i$** : the per capita output of the hidden economy,

**$T_i$** : the ratio of the sum of paid personal income, corporate profit and taxes on goods and services to GDP,

**$S_i$** : the ratio of public social welfare expenditures to GDP, and

**$D_i$** : the sum on number of dependants over 14 years and of inactive earners.

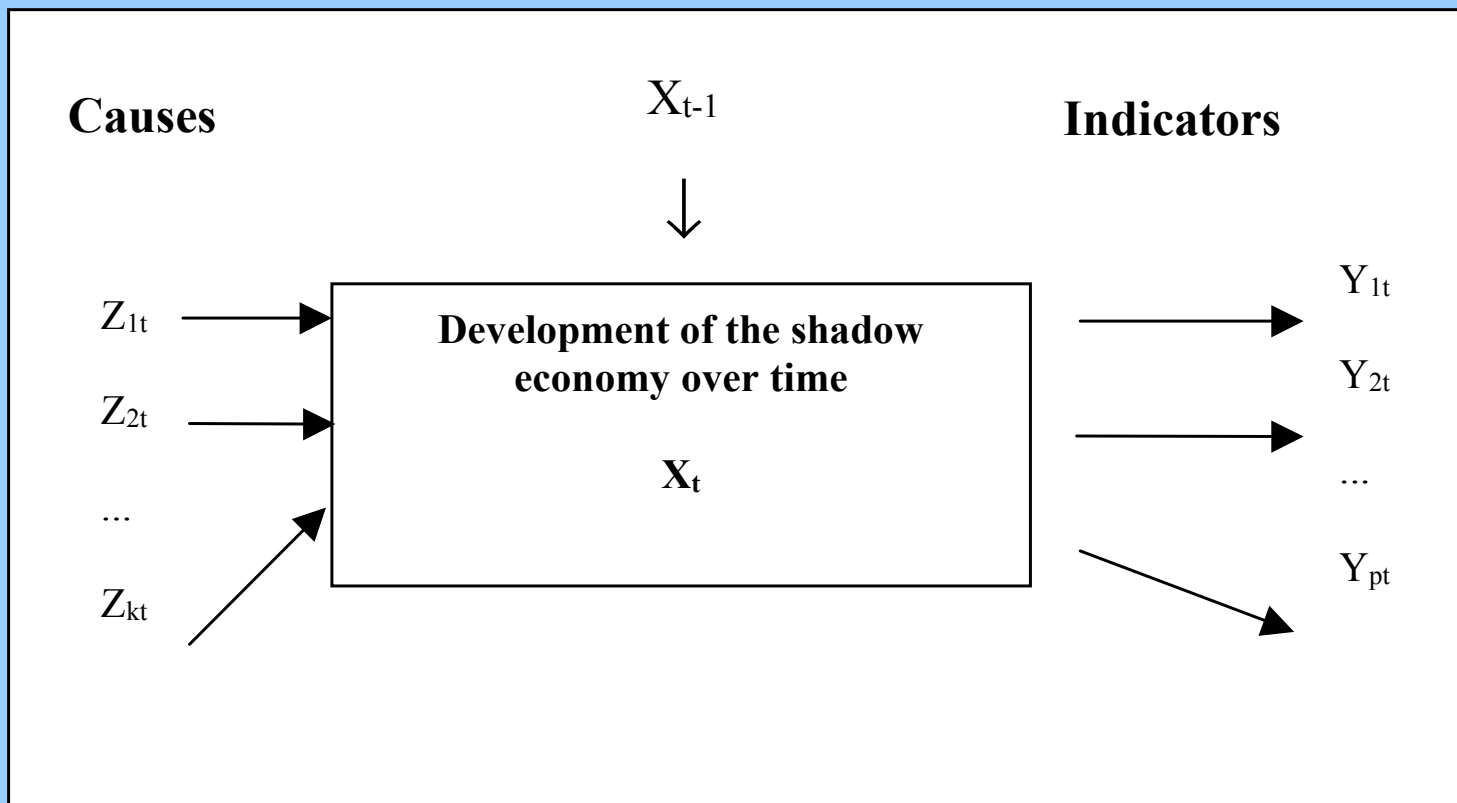
## **Lackó's method is also open to criticism:**

- (1) Not all shadow economy activities require a considerable amount of electricity and other energy sources can be used.**
- (2) Shadow economy activities do not take place only in the household sector.**
- (3) 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.**
- (4) It is questionable which is the most reliable base value of the shadow economy in order to calculate the size of the shadow economy for all other countries, especially, for transition countries.**

## 6.3. The Model Latent Estimation (DYMIMIC) approach

The DYMIMIC (dynamic multiple-indicators multiple-causes) model consists of two parts:

1. The **measurement model** links the unobserved variables to observed indicators.
2. The **structural equations model** specifies causal relationships among the unobserved variables.
3. In this case, there is only one unobserved variable, the size of the shadow economy. It is assumed to be influenced by a set of indicators for the shadow economy's size, thus capturing the structural dependence of the shadow economy on variables that may be useful in predicting its movement and size in the future.
4. 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 5.1.

**Figure 6.1: Development of the shadow economy over time**

### 6.3.1. The Model Approach: Causes of the Shadow Economy:

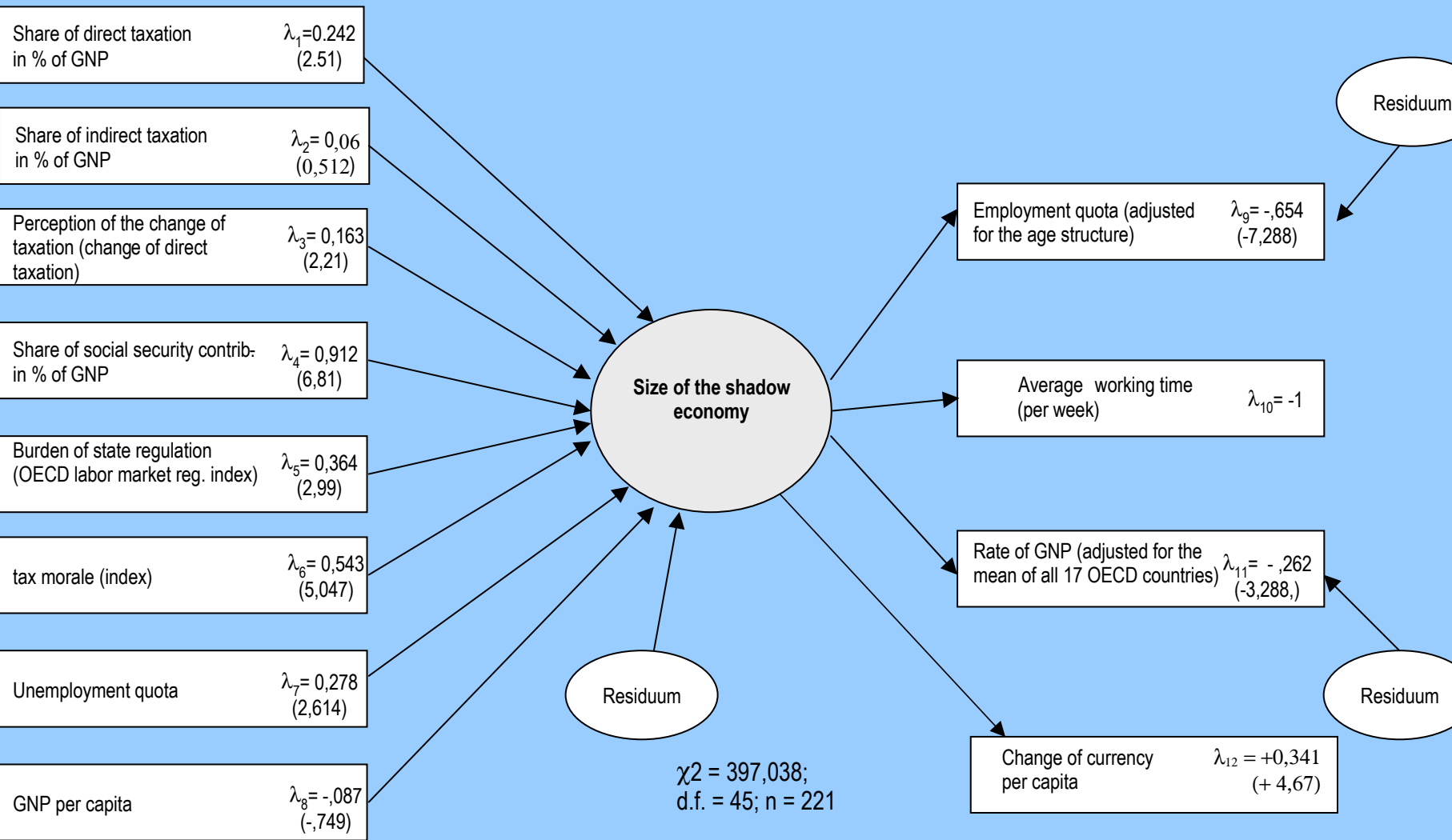
- (i) The **burden of direct and indirect taxation** (including social security payments), both actual and perceived: a rising burden of taxation provides a strong incentive to work in the shadow economy.
- (ii) The **burden of regulation** as proxy for all other state activities: increases in the burden of regulation give a strong incentive to enter the shadow economy.
- (iii) The **„tax morality“** (citizens' attitudes toward the state), which describes the readiness of individuals (at least partly) to leave their official occupations and enter the shadow economy: a declining tax morality increase the size of the shadow economy.

## 6.3.2. Indicators of the shadow economy:

A change in the size of the shadow economy is reflected in the following indicators:

- (i) Development of **monetary indicators**: if activities in the shadow economy rise, additional monetary transactions are required.
- (ii) Development of the **labor market**: increasing participation of workers in the hidden sector results in a decrease in participation in the official economy. Similarly, increased activities in the hidden sector may be expected to be reflected in shorter working hours in the official economy.
- (iii) Development of the **production market**: an increase in the shadow economy means that inputs (especially labor) move out of the official economy (at least partly); this displacement has a depressing effect on the official growth rate of the economy.

**Figur 6.2: Estimation (latent estimator approach) of the size of the shadow economy using causes (determinants) and traces (indicators), DYMIMIC estimation procedure, combined cross section and time series over 17 OECD countries and over 1984-1999**



## **The main objections against the DYMIMIC approach are:**

- (1) instability in the estimated coefficients with respect to sample size changes,**
- (2) instable estimated parameters with respect to alternative specifications,**
- (3) difficulty in obtaining reliable data on variables other than taxes, and**
- (4) the reliability of „causes“ and „indicators“ in explaining the variability of the shadow economy.**

**Table 6.1.: A comparison of the sizes of the shadow economy using the currency demand approach, the survey approach and the DYMIMIC model approach over the years 1996, 1998 and 2000 for Germany and Austria**

Year	Germany				Austria			
	Currency Demand Approach bill. €	Survey Approach bill. €	Difference between Currency Demand and Survey Approach	DYMI MIC Estimation bill. €	Currency Demand Approach bill. €	Survey Approach bill. €	Difference between Currency Demand and Survey Approach	DYMI MIC Estimation bill. €
1996	265	276	4,3%	286	15	16	8,5%	17
1998	289	315	9,3%	312	17	19	9,9%	20
2000	322	346	9,3%	339	20	22	10%	21

Source: Own calculations.

#### ***6.4. Some more general weaknesses of the different methods to estimate the shadow economy:***

##### **1. Surveys**

- (1) Quite often only households or only partly firms are considered**
- (2) Non-responses and/or incorrect responses**

##### **2. Estimations of national account statisticians (quite often the discrepancy method):**

- (1) Combination of meso estimates/assumptions**
- (2) Often not published**
- (3) Documentation and procedures often not public**

##### **3. Monetary and/or electricity methods:**

- (1) Some estimates are very high**
- (2) Are the assumptions plausible?**
- (3) Breakdown by sector or industry possible?**

##### **4. DYMIMIC method**

- (1) only relative coefficients, no absolute values**
- (2) estimations quite often highly sensitive with respect to changes in the data.**