



**mea**

# The Welfare Costs of Addiction

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# The social costs of smoking

- Financial costs
  - direct medical costs – health care expenditures (diagnosis and treatment)
  - indirect morbidity costs – early retirement, lost workdays, etc.
  - indirect mortality costs – productivity loss from premature deaths
- Germany: 43.7 billion €per year (Welte et al. 2000)



# The social costs of smoking

- ... but there are also economic "benefits"
  - social security system gains from premature deaths (6 to 9 percent; Warschburger 2001)
  - non-smokers might have higher lifetime health costs (4 to 7 percent; Barendregt 1997)



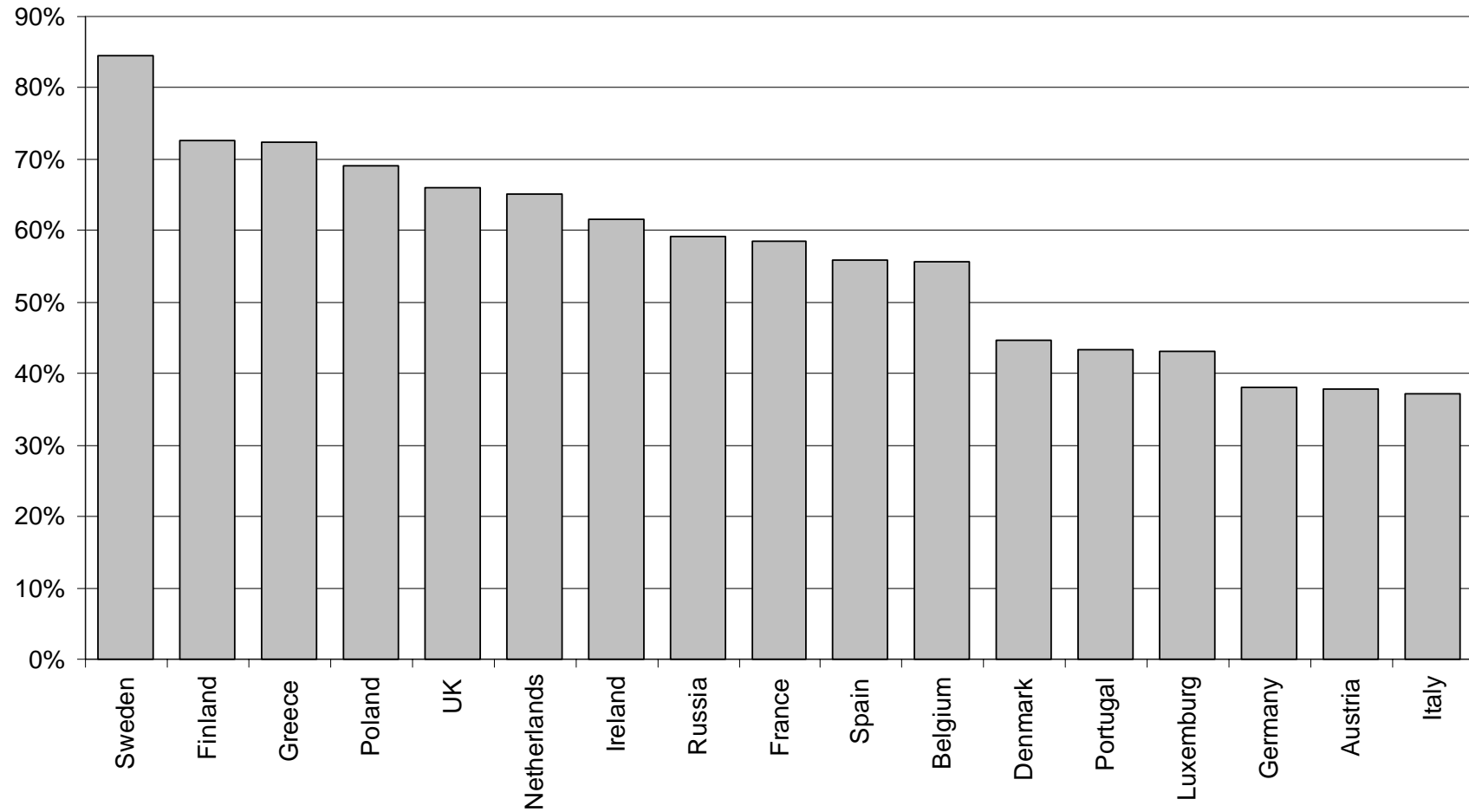
# The social costs of smoking

- Non-financial (welfare) costs – losses in quality of life
  - "better health, freedom from a habit, cleaner teeth and cleaner ashtrays" (Schelling 1978)
  - experience of lack of self-control, weakness of will
  - stigmatisation through anti-smoking campaigns
- Aims of the paper:
  - to provide evidence for the existence of non-financial costs (causality)
  - to calculate a monetary value of non-financial costs



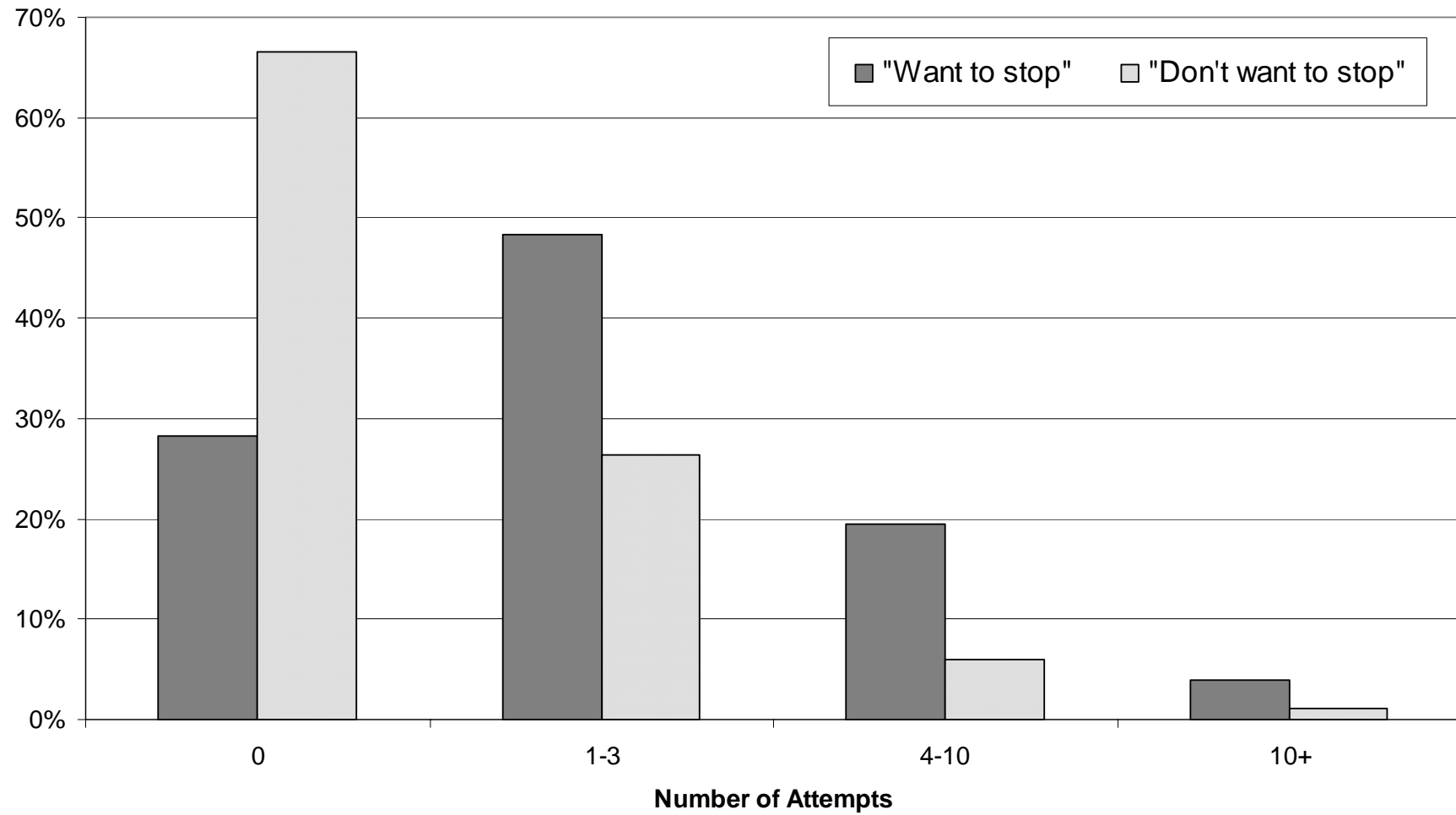
### Proportion of Smokers who "Want to Stop"

(Source: Boyle et al. 2000)





### Number of Attempts to Stop Smoking (Source: Boyle et al. 2000)





# Conceptual Framework

- Estimate "reported well-being" function

$$RWB = f[u(\underset{-}{addict}, \underset{+}{y}, Z)] + \varepsilon$$

then solve

$$u(\underset{-}{addict} = 0, y, Z) = u(\underset{+}{addict} = 1, y + \Delta, Z)$$

for  $\Delta$ .

- Income in logs or linear:

– logs:  $u(\underset{-}{addict}, y, Z) = \beta \underset{-}{addict} + \gamma \ln y + \zeta Z \Rightarrow \Delta = \left[ \exp\left(-\frac{\beta}{\gamma}\right) - 1 \right] y$

– linear:  $u(\underset{-}{addict}, y, Z) = \beta \underset{-}{addict} + \gamma y + \zeta Z \Rightarrow \Delta = -\frac{\beta}{\gamma}$



## Related studies

- Clark (1996): Shadow wages for working overtime
- Winkelmann/Winkelmann (1998): Non-monetary costs of unemployment
- van Praag/Baarsma (2000): Shadow prices of aircraft noise nuisance
- Gruber/Mullainathan (2002): The effect of cigarette taxes on smokers' happiness.
- ... Conceptual framework applicable to a wide range of topics



# Identification

- Most important issue: identification of  $\beta$  (causal effect of smoking on well-being)
- Potential sources of bias
  - reverse causality
  - unobserved heterogeneity / personality traits
  - measurement error
- Identification strategies:
  - fixed effects
  - instrumental variables



# Data description

- GSOEP 1998 and 1999
- 28000 observations; 14000 individuals
- Overall life satisfaction measured on an 11-point scale from 0 (totally dissatisfied) to 10 (totally satisfied)



# Data description

**Table 2.** Smoking Behaviour and Life Satisfaction

	N	Percent	Mean Life Satisfaction	Percent Life Satisf. $\geq 8$
1998				
Non-smokers	9,959	68.0	7.06	47.2
Smokers	4,694	32.0	6.72	39.6
- 1/10 units	1,612	34.8	6.91	44.2
- 11/20 units	2,261	48.9	6.70	39.1
- 21/30 units	541	11.7	6.53	33.5
- 31+ units	213	4.6	5.97	29.6
1999				
Non-smokers	9,362	66.7	7.06	48.0
- never smoked	6,653	71.0	7.11	49.2
- formerly smoked	2,709	29.0	6.95	45.3
Smokers	4,672	33.3	6.79	42.5



[4] Cross-section regressions

	1998-1999		1998		1999	
	(1)	(2)	(3)	(4)	(5)	(6)
Smoker	-0.214 (10.30)	-0.218 (10.48)				
1/10 Cig			-0.110 (2.56)	-0.111 (2.58)		
11/20 Cig			-0.263 (6.91)	-0.266 (6.99)		
21/30 Cig			-0.447 (6.30)	-0.453 (6.37)		
30+ Cig			-0.735 (6.69)	-0.744 (6.75)		
Current smoker					-0.183 (5.84)	-0.187 (5.94)
Former smoker					-0.008 (0.21)	-0.002 (0.06)
Log per capita income	0.443 (21.21)		0.419 (14.14)		0.465 (15.78)	
Per capita income (in 1000€)		0.372 (17.31)		0.364 (11.72)		0.379 (12.69)



# Data description

**Table 5.** Individual and Aggregate Welfare Costs of Addiction

	Log Specification (based on Table 4, Column 1)	Linear (based on Table 4, Column 2)
Mean Individual Monthly Loss in 1999 (€per smoker)	562.4	584.9
Median Individual Monthly Loss in 1999 (€per smoker)	474.8	
Aggregate Monthly Loss in 1999 (billion €)	10.38	11.41



# Instrumental variables

Variables	Marg. effects on Pr(smoke=1)
<b>Education dummies:</b> <ul style="list-style-type: none"><li>➤ "no degree"</li><li>➤ "less than high school"</li><li>➤ "high school"</li><li>➤ "more than high school"</li></ul>	baseline +6.9% +4.3% -3.9%
<b>Sports dummies:</b> <ul style="list-style-type: none"><li>➤ "every week"</li><li>➤ "every month"</li><li>➤ "less often"</li><li>➤ "never"</li></ul>	baseline +4.1% +10.3% +11.6%
<b>Savings dummies:</b> <ul style="list-style-type: none"><li>➤ "neither saves nor repays"</li><li>➤ "saves and repays"</li><li>➤ "only repays debt"</li><li>➤ "only saves"</li></ul>	baseline -0.1% +8.0% -7.9%



# Results

[6] OLS, Instrumental Variables (IV), Random Effects and Fixed Effects Estimates of Life Satisfaction

	Pooled OLS	Random Effects	FD 1	FD 2	Pooled IV	G2SLS	FD 1-IV (W2SLS)	FD 2-IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Smoker</b>	<b>-0.214</b> (10.30)	<b>-0.209</b> (9.09)	<b>-0.063</b> (1.24)		<b>-1.224</b> (6.44)	<b>-0.975</b> (5.03)	<b>-3.846</b> (3.06)	
<b>Quit</b>				<b>0.139</b> (1.82)				<b>3.071</b> (1.25)
<b>Start</b>				<b>0.002</b> (0.03)				<b>-4.247</b> (2.55)
<b>Log Income</b>	<b>0.443</b> (21.21)	<b>0.430</b> (18.55)	<b>0.274</b> (5.19)	<b>0.275</b> (5.21)	<b>0.412</b> (18.16)	<b>0.433</b> (17.21)	<b>0.293</b> (4.50)	<b>0.286</b> (4.25)
N	27059	27059	12174	12174	26833	23970	11628	11628
Instruments					S	ES	ESD	ESD
F-Test instr.					118.3**	63.1**	3.61**	2.20*
$\Delta R$ -sq 1 <sup>st</sup> st.					0.011	0.014	0.003	0.001
F-Test instr.								4.04**
$\Delta R$ -sq 1 <sup>st</sup> st.								0.004
Endog. t/F					5.60**	4.08**	2.31*	6.59**
Ov.id. $\chi^2$ (df)					0.60 (2)	7.76 (5)	8.00 (7)	7.99 (6)
FE v RE $\chi^2$ (df)		533.8 (19)**				463 (19)**		
<b>€month</b>	<b>476</b>	<b>480</b>	<b>198</b>	<b>504</b>	<b>14195</b>	<b>6522</b>	<b>...</b>	<b>...</b>



# Summary

- A comprehensive measure of the welfare costs of smoking should include non-financial costs
- Given smokers are „unhappy“, non-financial costs can be estimated using satisfaction data
- Empirical analyses for Germany suggests that smoking is likely to cause unhappiness
- However, finding reasonable estimates for the money value of unhappiness is difficult
- Still, conventional studies appear to grossly underestimate the welfare costs of addiction to tobacco