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Does smoking really harm your earnings *so* much? Biases in current estimates of the smoking wage penalty

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Empirical studies on the earnings effects of tobacco use have found significant wage penalties attached to smoking. This paper produces evidence that suggests that these estimates are significantly upward biased. The bias arises from a general failure in the literature to control for past smoking behavior of individuals. 2SLS earnings estimates show that the smoking wage penalty is reduced by as much as third, if past smoking of individuals is controlled for.

Keywords: Smoking, wages, earnings regressions.

JEL classification: J31, I19, C51

I. Introduction

Empirical studies on the earnings effects of tobacco use have found significant wage penalties attached to smoking, ranging from 2% to 24% (Levine, Gustafson, and Velenchik, 1997; Heineck and Schwarze, 2003; van Ours, 2004; Auld, 2005). Existing analyses, however, focus exclusively on the current smoking status of individuals.[1] This is likely to be a major shortcoming, as the comparison group of current non-smokers includes not only individuals that have never smoked, but also former smokers. Unless the causal relationship between smoking and earnings is entirely contemporaneous and the selection into and out of smoking identical in terms of individual characteristics that also affect worker productivity, wage penalties calculated only with reference to current smoking status will not reflect the true wage costs of smoking. The magnitudes of wage penalty estimates in this case will depend also on the degree of contamination of the comparison group by past smokers, on intrinsic productivity differences between past, no-time, and current smokers, as well as on the strength of the effect of past smoking on current earnings. Based on German data, we show that not taking past smoking into account, as is the case in existing studies, severely biases estimates of the wage penalty attached to smoking.

II. Background: Smoking and Earnings

Several pathways have been noted in the literature why smoking may harm earnings, including reduced individual productivity of smokers due to higher rates of absenteeism and health problems, or potential discrimination of smokers by employers and co-workers (see, for example, the discussion in Levine et al., 1997). Health damage, however, may be irreversible and career setbacks irreparable. If so, then smoking affects adversely not only the current but also the future earnings capacity of individuals. Former smokers will still be affected and wage penalties of smoking calculated with reference to the current smoking status of individuals will be downward biased.

The failure to differentiate between past and current smokers, however, may also lead to two further biases in existing wage penalty estimates, albeit of opposite sign. The first is the result of a pure (two-stage) selection process. If smoking initiation is less positively correlated with productivity-relevant individual characteristics than is smoking cessation, past smokers may on average earn more not only than current smokers, but also more than no-time smokers. This possibility is quite plausible. Smoking initiation occurs largely at mid-teenage age before further and higher schooling decisions are taken. In addition, smoking is strongly addictive and success at quitting very demanding in terms

of drive and will power, attributes that are of great importance for worker productivity. The second bias arises if smoking cessation has a (causal) positive effect on earnings. Individuals who manage to quit smoking might become more motivated both in life and on the job, positively affecting their performance at work.

III. Data, Methods, and Summary Statistics

We use data from the German Socio-Economic Panel (SOEP), a representative longitudinal survey of individuals in Germany conducted annually since 1984 (see Haisken-DeNew and Frick, 2005 for a description of this dataset). In the 2002 wave of the SOEP, extensive information on the current and past smoking behavior of individuals was sampled, including whether or not individuals had smoked regularly in the past and at what age they had started to smoke. Unlike previous studies, we may hence distinguish between three groups of workers in our data: current smokers, past smokers, and individuals that have never smoked.

We restrict the estimation sample to male workers in 2002 that are of German nationality, aged 27-55, work between 10 and 60 hours a week, earn a gross hourly wage of at least €4, and live in West Germany. These restrictions are imposed to ensure comparability with estimation samples used in the existing literature. Our results, however, do not hinge on these restrictions (see Section IV).

As a benchmark, we run ordinary least squares (OLS) earnings regressions, including standard human capital variables as controls. To account for potential unobservable factors that might affect both smoking behavior and individual earnings, we in addition instrument current and past smoking status by applying two stage least squares regressions (2SLS). OLS and 2SLS are the two most commonly used methods in the literature on smoking and wages (cf. van Ours, 2004; Heineck and Schwarze, 2003; Levine et al. 1997).

Our dependent variable is the log of gross hourly wages (calculated from gross monthly earnings and actual weekly hours of work). Covariates included in all regressions are age and two sets of indicator variables for the respectively highest schooling and professional degree obtained. Instruments in 2SLS regressions include a dummy for early age of smoking initiation (< 16 years), used also by van Ours (2004), and dummies for co-residing with at least one no-time smoker (NS), respectively one past smoker (PS). Current smoking status (smoker, no-time smoker, past smoker) is determined by both past and current factors influencing respectively the probabilities of smoking initiation and (successful) smoking cessation. Our first instrument intends to capture systematic differences between individuals at young age that affect their probability of early smoking initiation when still residing with parents, such as parental smoking behavior (see, for example,

Bantle and Haisken-DeNew, 2002). The co-resident variables, in turn, are used to capture potential influences on current smoking behavior and (successful) smoking cessation probabilities of current co-residing household members (Clark and Etilé, 2006 provide evidence on spousal correlation in smoking behavior). Our instruments are strong (F-tests) and valid (overidentification test[2]), i.e. uncorrelated with the error term in the wage equations.

Summary statistics on workers in our estimation sample are provided in Table 1. As is evident, past smokers not only represent a significant share of current non-smokers (39.2%), they also differ markedly from no-time smokers in productivity-related characteristics (age, educational/ professional qualifications). Current, past, and no-time smokers furthermore exhibit substantially different likelihoods of co-residing with either a no-time smoker or a past smoker, a feature we exploit in our 2SLS regressions. Finally, note that average hourly wages of past smokers exceed not only those of current but indeed also those of no-time smokers.

- Table 1 about here –

IV. Regression Results

Table 2 contains the output of our regression analyses. Models 1 (OLS) and 3 (2SLS) replicate existing studies in that both only

include an indicator for current smoking status. Models 2 (OLS) and 4 (2SLS) control in addition also for the “past smoking” status of individuals. In line with previous studies, a simple OLS regression (Model 1) shows that current smokers experience a sizeable wage penalty relative to current non-smokers (4.5%), a wage discount that increases more than twofold to 9.9% if one controls for the endogeneity of current smoking by 2SLS (Model 3). When controlling also for past smoker status of individuals (Model 2), however, the OLS estimate of the wage penalty of (current) smoking drops by as much as a third, to 3.1%. Moreover, and in contrast to current smoking, former smoking is associated with a wage premium of similar magnitude (3.5%) relative to no-time smoking. Instrumenting both current and past smoker status in Model 4 to account for potential endogeneity confirms these findings: a wage penalty (albeit now statistically insignificant) for current smokers, and a wage premium for past smokers. Wage penalties calculated with respect to current smoking status only, as in the existing literature (Models 1 and 3), therefore tend to overestimate the true wage costs of smoking.

As a first robustness check, Model 5 restricts the estimation sample to individuals that have ever smoked, i.e. to current and past regular smokers only. Rerunning our 2SLS earnings regression for this more homogenous group of individuals (all have at some time

initiated smoking) confirms that past smokers earn significantly more than current smokers. Our findings are also robust to various other changes of the estimation sample, among others, the expansion of the age cohort to older workers, the omission of the minimum hourly wage restriction, and the increase of the lower threshold for weekly hours of work.[3]

- Table 2 about here -

V. Discussion and Conclusion

Previous studies on the wage penalty attached to smoking have focused only on the current smoking status of individuals. We showed with German data that past smokers represent a sizeable share of current non-smokers and that a failure to differentiate between current, past and no-time smokers leads to upward biased estimates of the wage penalty attached to smoking. Former smokers appear to earn significantly more not only than smokers but also than no-time smokers. The latter wage differential, as argued, can be explained as the result of a two-stage selection process where smoking initiation is less positively correlated with productivity-relevant individual characteristics than is smoking cessation. Future complementary research is required to explore in greater detail the importance of this selection effect for observed wage differences between current, past, and no-time smokers.

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[1] An exception is Lee (1999). However, the author uses only very crude earnings information (the average earnings in the occupational category of an individual). Furthermore, Levine et al. (1997) show, albeit descriptively, that workers in the U.S. who quit smoking between 1984 and 1991 exhibit higher wage growth than workers who did not change their smoking status in this period.

[2] Tests of overidentifying restrictions were carried out using the Stata ado file by Baum, Schaffer, and Stillman (2003).

[3] Results are available from the authors upon request.

Table 1: Summary statistics on workers by past and current smoking status

	Current Smokers:	**Current Non-Smokers:**		
		All	**No-time**	**Past**
	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)
Dependent variable				
Hourly gross wage (in €)	15.7 (5.9)	17.6 (6.6)	17.4 (6.8)	17.8 (6.2)
Controls				
Age (in years)	40.8 (7.3)	41.4 (7.4)	40.2 (7.3)	43.2 (7.2)
Education (share)				
No school degree	0.02	0.01	0.00	0.01
Primary	0.45	0.35	0.31	0.41
Secondary	0.27	0.26	0.26	0.26
Higher	0.22	0.36	0.40	0.30
Professional degree (share)				
No Professional degree	0.11	0.06	0.05	0.06
Vocational training	0.74	0.66	0.63	0.70
University	0.15	0.29	0.32	0.24
Instruments				
Co-residing with (share)				
No-time smoker	0.33	0.55	0.61	0.46
Past smoker	0.11	0.18	0.13	0.27
Starting age less 16 (share)	0.26	0.11	0.00	0.28
N (Total = 1,968)	819	1,149	699	450

Notes: Shares of categories may not sum to one due to rounding differences.
Sample: SOEP 2002, West German male workers of German nationality, aged 27 to 55.

Table 2: Regression results for the wages of current, past, and no-time smokers

	OLS		2SLS		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5 (ever smokers)**
Smoker	-0.045 (3.19)***	-0.031 (1.95)*	-0.099 (1.80)*	-0.064 (1.33)	
Past Smoker		0.035 (1.90)*		0.116 (1.70)*	0.162 (2.22)*
Age	0.010 (10.51)***	0.010 (10.13)***	0.010 (10.06)***	0.009 (7.66)***	0.007 (4.94)**
Education					
Primary	0.077 (2.14)**	0.075 (2.10)**	0.071 (1.95)*	0.065 (1.77)*	0.057 (1.29)
Secondary	0.193 (5.24)***	0.192 (5.22)***	0.185 (4.88)***	0.181 (4.72)***	0.168 (3.7)***
Higher	0.288 (7.61)***	0.288 (7.61)***	0.278 (7.05)***	0.276 (6.95)***	0.253 (5.32)***
Voc. Training	0.074 (2.89)***	0.075 (2.91)***	0.068 (2.59)***	0.069 (2.62)***	0.073 (2.41)*
University	0.266 (8.29)***	0.268 (8.35)***	0.254 (7.32)***	0.257 (7.49)***	0.252 (6.06)***
Instruments					
Early start				*yes*	*yes*
Co-resident PS			*yes*	*yes*	*yes*
Co-resident NS			*yes*	*yes*	*yes*
Constant	2.094 (38.06)***	2.091 (38.01)***	2.139 (30.28)***	2.137 (30.68)***	2.158 (31.13)***
R^2 adjusted	0.26	0.26	0.25	0.24	0.21
N	1,968	1,968	1,968	1,968	1,269

Notes: Dependent variable: log gross hourly wage. Absolute t-values in parentheses. F-tests of joint significance of instruments are highly significant in all models. P-values of the Sargan's test statistic: 0.322 (Model 3), 0.968 (Model 4), 0.528 (Model 5).

Sample: SOEP 2002, West German male workers of German nationality, aged 27 to 55.