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Even One is Too Much: The Economic Consequences of Being a Smoker

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Abstract: It is well known that smoking leads to lower wages. However, the mechanism of this negative relationship is not well understood. This analysis includes a decomposition of the wage gap between smokers and nonsmokers, with a variety of definitions of smoking status designed to reflect differences in smoking intensity. This paper finds that nearly two-thirds of the 24 percent selectivity-corrected smoking/nonsmoking wage differential derives from differences in characteristics between smokers and nonsmokers. These results suggest that it is not differences in productivity that drive the smoking wage gap. Rather, it is differences in the endowments smokers bring to the market along with unmeasured factors, such as baseline employer tolerance. In addition, we also determine that even one cigarette per day is enough to trigger the smoking wage gap and that this gap does not vary by smoking intensity.

JEL classification: J31, I19, C31

Key words: smoking wage penalty, wage decomposition, wage differentials

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Even One is Too Much: The Economic Consequences of Being a Smoker

I. Introduction and Background

The health consequences of smoking have been well documented (Chaloupka and Warner 2000). Cigarette smoking has been shown to decrease life expectancy and increase health care utilization and expenditures. The CDC estimates that health care expenditures attributable to smoking were over $95 billion per year in the period 2000-2004 (Adkihari et al. 2008). However, there are other costs associated with cigarette smoking besides poor health and smoking-attributable health care expenditures. This research explores the labor market costs associated with cigarette smoking, specifically the impact of cigarette smoking on wages.

There are several different mechanisms through which smoking could impact earnings. For example, it is reasonable to expect that any action that lowers a person's stock of health would have negative implications for wages, either through absenteeism (Weng et al. 2013) or lower productivity (Kristein 1983). In addition, there could also be a negative stigma associated with cigarette smoking independent of health status. Cigarette smoking could be viewed as negative in the work place due to the time cost associated with smoking breaks or simply because the employer does not tolerate cigarettes. Furthermore, individuals who smoke may have a higher rate of time preference and thus are less willing to invest in human capital (van Ours 2004).

Studies examining the relationship between smoking and wages have consistently found evidence of a negative relationship (for examples, see Levine et al 1997, Auld 1998, Lee 1999, Grafova and Stafford 2005, Braakman 2008, and Anger and Kvasnika

2010). However, when the estimation is performed separately for men and women, it appears that the wage penalty is driven by the negative effect on men's wages as no wage penalty was found for female smokers, at least in The Netherlands (van Ours 2004).

While it is generally accepted that smokers earn lower wages, the mechanism behind this wage differential is less clear. Levine et al. (1997) suggests that the lower wages for smokers is due to such issues as employer discrimination, increased costs of employing smokers, or lower productivity by smokers. In this paper, a decomposition of the wage differential between smokers and nonsmokers, across a range of criteria for smoking status, is used to gain a further understanding into the share of the wage differential that is attributed to selection into smoking, differences in endowments, and differences in the return to those endowments. A secondary goal of this research is to examine the impact of the choice of the smoking status criteria, including how to capture smoking intensity (i.e., number of cigarettes consumed as well as daily versus nondaily smoking status), as well as how to treat former smokers. Understanding the impact of smoking at different levels of intensity will aid in the interpretation of the results. For example, if the decomposition results indicate that the return to endowments decline with smoking intensity, this is suggestive of a productivity effect due to, perhaps, health issues associated with smoking or smoking breaks. If the decomposition results do not vary with smoking intensity, this is more suggestive of employer discrimination.

This analysis makes use of the Tobacco Use Supplement to the Current Population Survey over the period of 1992 to 2011. The results suggest that smoking intensity matters little in the measurement of the wage differential--just one cigarette is

enough for the wage penalty to kick in. In other words, it is simply the fact that an individual smokes, not the level of cigarette consumption that matters for the determination of the smoking wage penalty. Furthermore, the mechanism behind the wage differential does not change with smoking intensity.

II. Empirical Model

An individual is characterized as having his/her wage determined in one of two sectors, the "smoking" sector (S) or the "nonsmoking" sector (NS). Because smoking behavior is generally observable in the workplace, employers can likely differentiate smokers from nonsmokers, and penalize (or not) “smokers” with lower wages. A worker’s decision to be a smoker, or not, however, is not exogenous. If there are unobserved individual characteristics related to both the wage structure and smoking behavior, estimation of the wage penalty would be biased. If, for example, people with higher skills choose to smoke, naive estimation of the wage penalty would be biased downward, because it wouldn’t be taking into account that smokers are also high skill workers.

In the spirit of a Heckman selection model (see Heckman 1979 and Greene 1981), because workers make a conscious decision based on the pros and cons of smoking, the system that characterizes the wage determination in the labor market can be represented as a three-equation system:

(1) $W_{ns,i} = \beta'_{ns} X_i + \varepsilon_{ns,i} \quad if \;\; C^* \leq 0$;

(2) $W_{s,i} = \beta'_{s} X_i + \varepsilon_{s,i} \qquad if \; C^* > 0$; and

(3) $C_i^* = \delta' X_i + \gamma' Z_i + u_i$.

$W_{j,i}$ (j=*ns,s*) is the log of hourly wages, X are individual characteristics that are expected to influence both wages and a person's smoking decision and β_j are the returns to measured workers characteristics (j=*ns* for nonsmokers and j=*s* for smokers). Although the market is able to differentiate smokers from non-smokers, employers cannot observe the latent propensity C^* that workers have to smoke. A person's propensity to smoke is determined by the same characteristics that determine that person's wage, X, as well as some characteristics, Z, that affect the decision to smoke but do not determine wages. $\varepsilon_{j,i}$ (j=*ns,s*) and u_i are random error terms that are assumed to be distributed as a tri-variate normal. Estimation is performed in multiple stages.

A. Selection into Smoking and Nonsmoking

Since a person's smoking propensity, C_i^*, is unobserved, equation (3) cannot be directly estimated. Instead, under the assumption of normality the decision of smoking can be estimated via maximum likelihood probit, where a worker is considered a smoker if the latent variable $C_i^* > 0$, and a nonsmoker if $C_i^* \leq 0$:

(4) $\Pr(Smoker = 1|X_i, Z_i) = \Phi(\Omega' \mathrm{K}_i),\ \Omega = [\delta, \gamma],\ \mathrm{K} = [X_i, Z_i]$.

Using the estimated parameter coefficients, inverse mill's ratios are constructed for each observation:

$$\hat{\lambda}_{s,i} = \frac{\phi(\hat{\Omega}' \mathrm{K}_i)}{\Phi(\hat{\Omega}' \mathrm{K}_i)} \ and \ \hat{\lambda}_{ns,i} = \frac{\phi(\hat{\Omega}' \mathrm{K}_i)}{1-\Phi(\hat{\Omega}' \mathrm{K}_i)} \ ,$$

where ϕ (·) and Φ(·) are the standard normal density and cumulative distribution functions, respectively.

The inverse mill's ratios are then included as additional regressors in the

wage equations such that:

(1') $E\left(W_{ns,i}|X_i, Smoker = 0\right) = \beta'_{ns}X_i + \theta_{ns}\hat{\lambda}_{ns,i} + \varepsilon_{ns,i} \quad for\ nonsmokers$

(2') $E\left(W_{s,i}|X_i, Smoker = 1\right) = \beta'_{s}X_i + \theta_{s}\hat{\lambda}_{s,i} + \varepsilon_{s,i} \quad for\ smokers$

Estimation of this specification of the wage equations produces unbiased estimates of the βs, since, basically, self-selection into smoking has been removed from the error term.

B. Decomposition of the Smoking Wage Differential

The observed wage differential between smokers and nonsmokers can be expressed as:

(5) $$\bar{W}_{ns} - \bar{W}_s = \hat{\beta}'_{ns}\bar{X}_{ns} + \hat{\theta}_{ns}\bar{\hat{\lambda}}_{ns} - \left[\hat{\beta}'_s\bar{X}_s + \hat{\theta}_s\bar{\hat{\lambda}}_s\right]$$

$$= \bar{X}_s\left(\hat{\beta}_{ns} - \hat{\beta}_s\right) + \hat{\beta}_{ns}(\bar{X}_{ns} - \bar{X}_s) + \left[\hat{\theta}_{ns}\bar{\lambda}_{ns} - \hat{\theta}_s\bar{\lambda}_s\right].$$

The first term on the right hand side of the equation is referred to as the coefficient effect and tells us how the different evaluation of a smoker's and nonsmokers characteristics contribute to the observed wage differential; the second term is the endowment effect and tells us how the differences in smoker and nonsmoker characteristics contribute to the observed wage differential; and the third term tells us how differences in selection into smoking and nonsmoking influence the differential wages we observe. The selectivity-corrected wage differential, then is given by:

(6) $$[\bar{W}_{ns} - \bar{W}_s] - \left[\hat{\theta}_{ns}\bar{\lambda}_{ns} - \hat{\theta}_s\bar{\lambda}_s\right] = \bar{X}_s\left(\hat{\beta}_{ns} - \hat{\beta}_s\right) + \hat{\beta}_{ns}(\bar{X}_{ns} - \bar{X}_s).$$

C. Impact of Smoking Intensity on the Selectivity-corrected Wage Differential

"Do you smoke cigarettes?" is a fairly easy question. The answer is either

"yes," or "no." However, from the perspective of the labor market, workers may be penalized more severely the more intensive their smoking habit. For example, smoking an occasional cigarette on the weekend could have very different implications for a person's health and/or productivity than, say, someone smoking a pack of cigarettes per day. The pack-a-day smoker may take time away from productive activities to feed his/her habit, thus lowering productivity, as well as exhibit a more visible smoking behavior, both of which may reduce the wage an employer is willing to pay.

To determine whether the intensity of smoking impacts the measured selectivity-corrected wage differential, the complete estimation process is repeated multiple times, changing the definition of a smoker based on the number of cigarettes a person smokes per month with the basis of comparison remaining current nonsmokers. A full decomposition of the results is also presented to determine whether endowment or coefficient differences play a different role at different levels of smoking intensity.

III. Data and Sample Considerations

The data used in the analyses comes from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS). The TUS-CPS is sponsored by the National Cancer Institute and was administered in 1992-1993, 1995-1996, 1998-1999, 2000, 2001-2002, 2003, 2006-2007, and 2010-2011.[1] The goal of the TUS-CPS is to monitor tobacco use and to support both tobacco-related research and evaluation of tobacco control

[1] The Centers for Disease Control and Protection was a cosponsor in 2001-2002 through 2006-2007.

programs. The survey includes questions related to "smoking, use of tobacco products, and tobacco-related norms, attitudes, and policies" (NCI 2012). The CPS provides information on the employment and socio–economic characteristics of the individual, which, along with the TUS supplement, can be matched to information on other family members.

A. Who should be considered a Smoker?

While there seems to be agreement in the literature that smoking leads to lower wages, there does not appear to be agreement over how to define a smoker or how to capture the penalty. Levine et al. (1997) and Auld (1998) only consider daily smokers as smokers, with no regard for number of cigarettes. Anger and Kvasnika (2010) consider anyone a smoker if they indicate they are a current smoker. Braakman (2008) and van Ours (2004) use the number of cigarettes in order to capture intensity.

In this research, the impact of how the criteria used to define a smoker affects outcomes is examined by defining the status of "smoker" and "non-smoker" in different ways, taking into account current smoking status, the intensity of smoking consumption, and past smoking consumption. The broadest definition is that anyone who smokes at least one cigarette per month is a smoker, similar to Anger and Kvasnika (2010). Thresholds of 30, 150, 300, and 600 cigarettes per month are also evaluated.[2] As shown in Table 1, approximately 20 percent of the sample indicates that they smoke at least one cigarette per month, with slightly higher percentage of males (20.6 percent) and a slightly lower percentage of females (19.6

[2] These thresholds were chosen based upon the distribution of the number of cigarettes smoked per month. They also correspond to one cigarette per day, ¼ a pack per day, ½ a pack per day, and a pack per day.

percent). Approximately 83 percent of smokers are daily smokers while about one percent smokes less than 30 cigarettes per month. About one-half of smokers consume one pack of cigarettes per day, on average. Again, this share is higher for males, (56.3 percent of smokers) than for females (42.6 percent).

[Table 1 about here]

While all smokers who state that they are daily smokers also report smoking at least 30 cigarettes per month (consistent with smoking at least one per day), only 29 percent of nondaily smokers report smoking less than 30 cigarettes per month. In fact, almost half of nondaily smokers consume between 30 and 149 cigarettes per month, with approximately 15 percent smoking between 150 and 299 cigarettes per month.[3] This suggests that there may be bingeing of cigarette consumption. If this bingeing is not done at work, then there could be different implications for productivity or discrimination (and thus wages) than for daily smokers. In order to differentiate between these two types of smokers, all of the analysis is performed separately both for all smokers and for daily smokers only.

The decision to categorize an individual as a smoker is further complicated by how to handle former smokers. The implication of using current smoking status to classify a smoker is that the current non-smoker classification includes former smokers. If an individual only recently stopped smoking, suggesting that they still have a high propensity to smoke and could relapse at any time, this would create a bias toward zero of any measured wage penalty (by lowering the average nonsmoking wage through the

[3] This is significantly larger than the 4 percent of young adults (between the age of 26 to 33) that Levine et al. (1997) report who consume more than 30 cigarettes per day but are not daily smokers.

presence of former smokers). However, Blondal et al. (1999) find that the probability of relapse of a former smoker who quit more than one year ago is negligible. Thus, in order to abstract from any contamination of the nonsmoker group with the inclusion of newly minted former smokers, we eliminate from the analysis anyone who quit smoking within the previous year.[4]

However, this still leaves the complication of former smokers who quit more than a year ago. If the mechanism through which current smoking affects current wages is purely one of current productivity (e.g., taking smoking breaks or discrimination), then including former smokers with nonsmokers should not bias the estimation of a wage penalty. However, Anger and Kvasnicka (2010) find that smoking cessation is more positively correlated with labor market outcomes than smoking initiation; i.e. formers smokers earn more than current smokers. In fact, they found formers smokers also earned more than never smokers. Thus the analysis is repeated without any former smokers to determine this impact.

B. Sample Means

The means in Table 2 indicate that approximately 17 percent of the sample is a former smoker, with 18.54 percent of men and 15.7 percent of women (not shown) classifying themselves in this category. On average, smokers' wages are approximately 80 percent of the wages of nonsmokers. Former smokers have a slightly higher average wage than nonsmokers as a group, which is consistent with what Anger and Kvasnicka (1997) report. Nonsmokers are, on average, more educated and more likely to be married than smokers. A higher share of smokers'

[4] We also eliminate anyone who did not indicate how long ago they quit smoking.

spouses smoke relative to nonsmokers' spouses. In addition, nonsmokers face a slightly higher average cost per pack of cigarettes in their state of residence than smokers.

[Table 2 about here]

In addition to basic socioeconomic and demographic information, the TUS-CPS also includes information on whether a person works part-time as well as if they work indoors or outdoors. The majority of the sample (70 percent) work indoors, with the share slightly higher for smokers (77 percent) and slightly lower for nonsmokers (68 percent). For indoor workers, the survey has a follow up question regarding the existence of smoking restrictions on the job. For those workers who work indoors, a slightly greater share of smokers work in a facility with no restrictions (19 percent) compared to less than 15 percent of nonsmokers.

IV. Results

A. First-stage Estimation of the Probability of Smoking

Results from the probability of smoking estimation are presented in Appendix A, Tables A1 and A2. Table A1 contains estimation results corresponding to classifying someone as a smoker if he/she smokes at least one cigarette per month. Table A2 presents estimates by different classification of smokers based on smoking intensity. In general, across both tables, older workers are more likely to smoke, at a decreasing rate, as are males, and the less educated. Married individuals are less likely to smoke (unless their spouse also smokes), as are blacks and Hispanics. Individuals who work outdoors or in environments with smoking

restrictions smoke less than those working indoors with no restrictions. However, this negative effect is diminished for part-time workers, as would be expected (fewer hours in which the worker is exposed to the restriction). Finally, the price of cigarettes is negatively correlated with smoking for all ages of women and for all but the youngest and oldest of the men in the sample.

These results are largely similar not only across gender but also across smoking intensity. Males appear to be more price sensitive than females and less sensitive to indoor smoking restrictions. Price matters more when the threshold for classifying someone as a smoker is less than or equal to 150 cigarettes per month.[5] The most important result is that the variables included to identify the smoking equation (i.e., spouse smoking, the price of cigarettes, and price interacted with age) are generally significant across all groups.

B. Estimation of Log Wage Equations

Results for the log wage regressions are reported in Appendix A, Table A3. In general, the result are as expected. Older workers earn higher hourly wages, at a diminishing rate, as do males, non-blacks, individuals who work full-time, individuals who are married, and those with higher levels of education. The selection term for the full sample presents a somewhat surprising result; there is no measurable selection effect for nonsmokers, although smokers are positively selecting into the smoking sector across the board. However, when the analysis is performed separately by gender, the selection criteria indicate that both smokers and nonsmokers positively select into their respective sectors. In other words,

[5] The different measures of smoking intensity are also estimated separately by gender. The results were similar to the total analysis.

characteristics that lead to higher wages in a particular sector are positively correlated with characteristics determining the worker's decision to smoke or not to smoke.

C. Decomposing the Smoking Wage Differential

Decomposition of the wage differential between smokers and nonsmokers for the full sample, as well as by gender, are presented in Table 3. In general, nonsmokers earn 17.5 percent more than smokers, with a selectivity-corrected wage gap of 23.6 percent. The selectivity-corrected wage gap is slightly higher for males at 24.2 percent, with the selectivity-corrected wage gap of 22.0 percent for females.

[Table 3 about here]

It is important to distinguish between a wage differential (or gap) and a wage *penalty* associated with smoking. The two concepts are fundamentally related, but differ in their construction. The gap in wages is the difference (corrected or not corrected for selection into smoking/nonsmoking) between the average nonsmoker's wage and the average smoker's wage. The wage *penalty* is typically estimated in other papers by the coefficient on a dummy variable indicating smoking status added to a single wage regression that includes both smokers and nonsmokers. This estimated coefficient is essentially the wage differential, after controlling for other covariates. van Ours (2004) reports a 10 percent wage penalty for men and no significant penalty for women. Auld (1998) found a wage penalty for smoking of 8 percent while Lee (1999) found a penalty of 5 percent. Graafova and Stafford (2008) report a wage penalty that increased over time from just over 4

percent in 1986 to almost 12 percent in 2001, depending on classification of nonsmoker. As a robustness check, a similar specification was estimated using these data, and the penalty associated with smoking is in the ballpark of what others have reported, ranging from 3.6 percent to 6.8 percent.

Individual selection into smoking (and nonsmoking) has the effect of reducing the observed wage gap, making it six percentage points lower than the wage gap that controls for individual self-selection into smoking (or not). The majority of the selectivity-corrected wage gap (61 percent for the full sample; 62 percent for men; and 68 percent for women) is accounted for by differences in the endowments of nonsmokers relative to smokers. The largest contributing factor to differences in endowments between smokers and nonsmokers is education. As was seen in the sample means, nonsmokers bring significantly greater levels of education to the labor market. This is consistent with the higher rate of time preference among smokers, as suggested by Levine et al. (1997). Overall, the contribution of differences in endowments suggests that smokers are different from nonsmokers in a way that leads to lower rewards in the labor market; in other words, smokers bring less to the table.

The largest difference in coefficients between smokers and nonsmokers comes from the differences in the constant terms, not from the returns to the specific endowments they bring to the market. This suggests that the labor market values the endowments of smokers and nonsmokers similarly. In fact, it appears that smokers get higher rewards from being in certain occupations than do nonsmokers, as the total difference in occupation coefficients is negative, which has

the result of *reducing* the wage gap. However, the relatively large and significant (except for males) difference in the constant terms suggests that there is something fundamentally different (and unexplained by the included regressors) about the labor markets in which smokers and nonsmokers find themselves (also see Braakman 2008). Of course, two of the unmeasured characteristics of the labor markets is tolerance of employers for employees who smoke and on-the-job productivity. The next set of results will help get us disentangle the role of employer preferences and productivity differences in the determination of the wage gap.

D. Smoking Intensity

As mentioned earlier, there are several hypotheses about why smokers earn lower wages than nonsmokers. One hypothesis is that smokers are less productive, either because they are more frequently absent from the labor market (due to health reasons, see Mucha et al. 2004) or they spend less working time in productive activities (due to having to take smoking breaks, see Halpern et al. 2001). Since both of these side effects of smoking are increasing in smoking intensity, support for this hypothesis might be found in a selectivity-corrected smoking wage gap that increases with smoking intensity.

On the other hand, if the smoking penalty does not vary by intensity, this is suggestive that simply being a smoker dooms one to earning less -- it's that first cigarette that triggers the wage penalty. This could result from a combination of systematic differences in endowments of smokers and nonsmokers (such as differences in educational attainment) and employer preferences against smokers

(perhaps because of higher health care costs, etc.).

Smoking intensity is not typically addressed; an individual is seen generally as a smoker or a non-smoker. Levine et al (1997) utilized daily smoker status and Braakman (2008) included a count of the number of cigarettes consumed per day. These approaches, however, do not allow one to identify a threshold of cigarette consumption at which an employer considers someone a "smoker." A threshold approach also allows for intensity to play a role in determining the contribution of endowments and coefficients to the wage differential between smoker and nonsmokers. Van Ours (2004) also takes a threshold approach but includes the thresholds in a single regression, which does not allow the contribution of the other regressors to vary by threshold. In this research, the above analysis is repeated for smokers of varying degrees of smoking intensity -- at least 30, 150, 300, and 600 cigarettes per month. Smoking 600 cigarettes per month amounts to roughly one pack per day. The comparison group, for all analysis, is those that do not currently smoke, thus allowing the contributions of the regressors to vary. Table 4 contains the resulting decomposition of the estimated wage equations by smoking intensity and the log wage regression results by intensity are in Appendix A, Table A4.

[Table 4 about here]

The most striking result from the decompositions in Table 4 is the consistency of the size of the observed wage gap across all levels of smoking intensity, ranging from 18.2 percent to 19.0 percent. The selection of smokers and nonsmokers is also remarkably consistent across levels of intensity, making the largest difference in the selectivity-corrected wage gaps about one percentage point

across intensity. In addition, the share of the selectivity corrected wage gap accounted for by differences in endowments between smokers and nonsmokers are all roughly 60 percent. All in all, there is very little difference in the decomposition results across levels of smoking intensity. This suggests that the smoking wage penalty is not being driven by differences in productivity, but, rather, by the endowments they bring to the market (e.g., educational attainment) and by unmeasured factors, such as baseline employer tolerance, which show up in differences in the estimated constant term.

The analysis was also repeated for daily smokers only in order to determine if binge smokers, who would presumably have less smoking intensity during work hours, were reducing the size of the wage penalty.[6] It does appear to be the case that daily smoking has a greater impact on wages than when all smokers are included, with a difference of almost two percentage points for men and exactly two percentage points for women. However, once an individual smokes more than 150 cigarettes per month, which is 85 percent of all smokers, the penalty and the share of the selectivity corrected wage penalty attributed to differences in endowments is the same. Thus, the inclusion of nondaily smokers lowers the penalty but does not substantially affect the mechanism of the determination of the gap.

E. Former Smokers

The presence of former smokers poses a unique challenge – they are currently nonsmokers but for a portion of their labor market experience (or human capital development) they were smokers. Anger and Kvasnicka (2010) and Grafova

[6] Results available from the authors.

and Stafford (2009) find that former smokers are fundamentally different from current smokers, and this difference leads to differences in wages.

In order to determine the robustness of the results to the exclusion of former smokers, the above analysis was repeated comparing former smokers to never smokers as well as comparing never smokers to current smokers.[7] In this first case, former smokers actually earn a seven percent wage premium over individuals that never smoked. Thus, including the former smokers with the nonsmokers increases the observed wage penalty for smokers. Since approximately 21 percent of nonsmokers are former smoker, their exclusion has the potential of being nontrivial. However, repeating the full analysis excluding former smokers results in only a slightly lower selectivity-corrected wage differential (21.3 percent versus 23.6 percent when former smokers are included) and a slightly higher share of the wage penalty being attributed to endowments (66.7 percent versus 61 percent when former smokers are included). In the end, the inclusion or exclusion of former smokers does not fundamentally change any conclusions -- the selectivity-corrected wage differential is larger than the observed wage differential, differences in endowments explain the overwhelming majority of that wage gap, and the largest contributor to the differences in coefficients is unexplained (through differences in the estimated constant terms).

V. Conclusion

Smokers, on average, earn lower wages than nonsmokers. The analysis in

[7] Results available from the authors.

this paper tells us that roughly 60 percent of the wage differential between smokers and nonsmokers comes from differences in the characteristics these workers bring to the labor market, especially educational attainment. These results confirm what is found in the earlier literature.

New insights from the analysis in this paper tell us that even one cigarette is enough to trigger a smoking wage differential, that the wage differential does not change when considering low and high intensity smokers, and that, regardless of intensity, roughly the same amount of the smoking penalty is accounted for by differences in endowments. In addition, the largest factor contributing to the difference in the coefficients in the determination of the wage differential comes from the estimated constant terms of the wage equation -- the portion that is truly unexplained by regressors included in the model. These results suggest that the smoking wage gap is not being driven by differences in productivity, but, rather, by the endowments smokers bring to the market (e.g., educational attainment) and by unmeasured factors, such as baseline employer tolerance, which shows up in the difference in the estimated constant term. However, the share of the contribution of endowments to the wage differential does not differ with intensity of cigarette consumption, suggesting once again that it is simply the fact that someone smokes that matters in the labor market, not the level of intensity. We also find that while the decomposition of the penalty is not affected by whether a smoker is a daily or less frequent smoker, the size of the wage gap is about two percentage points larger for daily smokers. This suggests that smoking during work hours, which exposes the smoker's behavior to the scrutiny of the employer, does make a difference.

Similar to earlier research, we also find that former smokers have attributes that are more highly rewarded in the labor market than either current smokers or never smokers, thus biasing upward the penalty for smokers. Taken conversely, this implies that the penalty for not quitting is higher than the penalty for smoking initiation.

The lack of difference across intensity suggests that simply classifying an individual as a smoker should be a sufficient control for smoking status. However, it is important to separate out daily and former smokers in order to get an accurate point estimate for the penalty for current smoking.

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Table 1: Distribution of Smoking Intensity

Total	Never Smoker	Every day Smoker	Some day Smoker	Former Smoker	Total
Non Smokers	76,321	0	0	20,673	96,994
1-29 cig per month	0	0	1,161	0	1,161
30-149 cig per month	0	574	1,972	0	2,546
150-299 cig per month	0	1,416	615	0	2,031
300-599 cig per month	0	6,217	263	0	6,480
600+ cig per month	0	12,070	52	0	12,122
Total	76,321	20,277	4,063	20,673	121,334

Table 2: Sample Means

Variable	Full	Smoker	Nonsmoker	Former Smoker	Males	Females
Hourly Wage	15.627	13.101	16.261	16.892	17.7	13.588
	(0.048)	(0.133)	(0.049)	(0.122)	(0.083)	(0.046)
Smoke (=1)	0.201	-	-	-	0.206	0.196
	(0.001)				(0.002)	(0.002)
Age	42.076	41.094	42.322	46.914	41.755	42.392
	(0.032)	(0.067)	(0.037)	(0.079)	(0.046)	(0.046)
Female(=1)	0.504	0.492	0.507	0.464	-	-
	(0.001)	(0.003)	(0.002)	(0.003)		
Black(=1)	0.095	0.085	0.098	0.059	0.079	0.112
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Hispanic(=1)	0.070	0.076	0.044	0.036	0.076	0.063
	(0.254)	(0.265)	(0.205)	(0.186)	(0.265)	(0.243)
Married(=1)	0.613	0.500	0.641	0.665	0.664	0.562
	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Less than High school(=1)	0.091	0.135	0.08	0.077	0.101	0.081
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Some College(=1)	0.278	0.296	0.273	0.3	0.262	0.294
	(0.001)	(0.003)	(0.001)	(0.003)	(0.002)	(0.002)
BA or Graduate degree(=1)	0.314	0.144	0.357	0.306	0.329	0.3
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Part time (=1)	0.394	0.439	0.383	0.426	0.335	0.453
	[0.001]	[0.003]	[0.002]	[0.003]	[0.002]	[0.002]
Outdoor Work(=1)	0.304	0.226	0.323	0.201	0.423	0.186
	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Works indoor with Smoking Restrictions	0.589	0.627	0.579	0.686	0.48	0.696
	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Works indoor with No Smoking Restrictions	0.107	0.098	0.147	0.149	0.096	0.118
	(0.310)	(0.297)	(0.354)	(0.356)	(0.295)	(0.323)
Spouse Smokes	0.11	0.248	0.075	0.097	0.102	0.118
	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)
Avg. Price of Cigarette	1.643	1.567	1.662	1.629	1.643	1.643
	(0.001)	(0.003)	(0.001)	(0.003)	(0.002)	(0.002)
Sample Size	121,334	24,340	96,994	20,673	60,168	61,166

Notes: Standard deviations are in parentheses.

Table 3: Wage Decomposition

	Full Sample	Male	Female
Total Wage gap	0.175***	0.188***	0.171***
	[0.007]	[0.011]	[0.010]
Wage gap	0.236***	0.242***	0.220***
Selectivity corrected	[0.014]	[0.019]	[0.019]
Differences in	0.144***	0.150***	0.150***
endowments	[0.003]	[0.004]	[0.004]
Differences in	0.092***	0.092***	0.070***
Coefficients	[0.013]	[0.018]	[0.019]
Selection	-0.061***	-0.054***	-0.049***
	[0.013]	[0.017]	[0.018]
Differences in endowments	0.144***	0.150***	0.150***
Occupation	0.044***	0.043***	0.049***
	[0.001]	[0.002]	[0.002]
Industry	0.005***	0.002	0.008***
	[0.001]	[0.001]	[0.001]
Work Characteristics	0.004***	0.005***	0.003***
	[0.001]	[0.001]	[0.001]
Education	0.077***	0.075***	0.076***
	[0.002]	[0.002]	[0.002]
Demographics	-0.001	0.009***	-0.002*
	[0.001]	[0.002]	[0.001]
State FE	0.011***	0.010***	0.011***
	[0.001]	[0.001]	[0.001]
Time FE	0.006***	0.006***	0.006***
	[0.000]	[0.001]	[0.001]
Differences in Coefficients	0.092***	0.092***	0.070***
Occupation	-0.050***	-0.042***	-0.061***
	[0.011]	[0.015]	[0.015]
Industry	-0.053*	-0.044	-0.037
	[0.028]	[0.033]	[0.057]
Work Characteristics	-0.010**	-0.022***	0.000
	[0.004]	[0.006]	[0.006]
Education	0.007*	0.003	0.010*
	[0.004]	[0.006]	[0.006]
Demographics	0.06	0.108	-0.002
	[0.047]	[0.068]	[0.063]
State FE	-0.022	-0.011	-0.03
	[0.026]	[0.038]	[0.036]
Time FE	-0.019	-0.027	-0.02
	[0.012]	[0.018]	[0.016]
Constant	0.178***	0.127	0.210**
	[0.066]	[0.094]	[0.098]
Sample Size	121,334	60,168	61,166

Notes: Standard errors are in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Wage Decomposition by Smoking Intensity

	Smokes>=30	Smokes>=150	Smokes>=300	Smokes>=600
Total Wage gap	0.182***	0.190***	0.188***	0.183***
	[0.007]	[0.007]	[0.007]	[0.008]
Wage gap	0.240***	0.243***	0.244***	0.252***
Selectivity corrected	[0.014]	[0.015]	[0.015]	[0.020]
Differences in endowments	0.148***	0.152***	0.151***	0.145***
	[0.003]	[0.003]	[0.003]	[0.004]
Differences in Coefficients	0.093***	0.091***	0.094***	0.107***
	[0.014]	[0.014]	[0.015]	[0.019]
Selection	-0.059***	-0.053***	-0.057***	-0.069***
	[0.013]	[0.013]	[0.014]	[0.018]
Differences in endowments	0.148***	0.152***	0.151***	0.145***
Occupation	0.045***	0.048***	0.049***	0.053***
	[0.001]	[0.001]	[0.002]	[0.002]
Industry	0.005***	0.005***	0.004***	0.001
	[0.001]	[0.001]	[0.001]	[0.001]
Work Characteristics	0.004***	0.004***	0.004***	0.005***
	[0.001]	[0.001]	[0.001]	[0.001]
Education	0.079***	0.084***	0.086***	0.095***
	[0.002]	[0.002]	[0.002]	[0.002]
Demographics	-0.003**	-0.008***	-0.013***	-0.033***
	[0.001]	[0.001]	[0.001]	[0.002]
State FE	0.012***	0.013***	0.014***	0.016***
	[0.001]	[0.001]	[0.001]	[0.001]
Time FE	0.006***	0.006***	0.007***	0.009***
	[0.001]	[0.001]	[0.001]	[0.001]
Differences in Coefficients	0.093***	0.091***	0.094***	0.107***
Occupation	-0.052***	-0.068***	-0.073***	-0.078***
	[0.011]	[0.012]	[0.012]	[0.015]
Industry	-0.039	-0.043	-0.054*	-0.047
	[0.029]	[0.030]	[0.031]	[0.035]
Work Characteristics	-0.010**	-0.012***	-0.012**	-0.012*
	[0.004]	[0.005]	[0.005]	[0.006]
Education	0.006	0.005	0.006	0.005
	[0.004]	[0.004]	[0.004]	[0.005]
Demographics	0.054	0.042	0.073	0.071
	[0.048]	[0.051]	[0.053]	[0.068]
State FE	-0.025	-0.018	-0.02	-0.016
	[0.027]	[0.027]	[0.028]	[0.032]
Time FE	-0.019	-0.022*	-0.025*	-0.016
	[0.012]	[0.013]	[0.013]	[0.015]
Constant	0.176***	0.208***	0.200***	0.201**
	[0.068]	[0.071]	[0.074]	[0.092]
Sample Size	120,173	117,627	115,596	109,116

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Appendix A: Supplemental Tables

Table A1: Probability of Smoking

Variables	Full Sample	Males	Females
Age	0.081***	0.102***	0.063***
	[0.011]	[0.015]	[0.015]
	(0.020)	(0.025)	(0.015)
Age Squared	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]
	(-0.000)	(-0.000)	(-0.000)
Female	-0.216***	-	-
	[0.009]		
	(-0.052)		
Black	-0.248***	-0.178***	-0.313***
	[0.016]	[0.024]	[0.023]
	(-0.060)	(-0.043)	(-0.074)
Hispanic	-0.416***	-0.305***	-0.573***
	[0.022]	[0.029]	[0.034]
	(-0.100)	(-0.074)	(-0.136)
Married	-0.662***	-0.624***	-0.723***
	[0.010]	[0.014]	[0.015]
	(-0.159)	(-0.151)	(-0.171)
Less than High School	0.203***	0.204***	0.185***
	[0.016]	[0.022]	[0.023]
	(0.049)	(0.049)	(0.044)
Some College	-0.178***	-0.177***	-0.187***
	[0.011]	[0.016]	[0.015]
	(-0.043)	(-0.043)	(-0.044)
BA or Grad degree	-0.677***	-0.702***	-0.658***
	[0.012]	[0.017]	[0.018]
	(-0.163)	(-0.170)	(-0.156)
Part-time Worker	-0.004	0.013	-0.028
	[0.027]	[0.041]	[0.036]
	(-0.001)	(0.003)	(-0.007)
Outdoor job	-0.470***	-0.398***	-0.645***
	[0.021]	[0.028]	[0.036]
	(-0.113)	(-0.096)	(-0.153)
Smoking Restriction - Indoor	-0.095***	-0.070***	-0.133***
	[0.019]	[0.027]	[0.028]
	(-0.023)	(-0.017)	(-0.032)
Part-time Worker * Outdoor Job	0.148***	0.136***	0.198***
	[0.031]	[0.043]	[0.049]
	(0.036)	(0.033)	(0.047)
Part-time Worker * Smoking Restriction Indoor	0.072***	0.051	0.098***
	[0.027]	[0.042]	[0.037]
	(0.017)	(0.012)	(0.023)
Spouses Smokes	1.048***	1.096***	1.024***
	[0.013]	[0.019]	[0.019]
	(0.252)	(0.265)	(0.242)

Avg Price of Cigarette	0.263*	0.540***	0.024
(real terms by State)	[0.141]	[0.197]	[0.201]
	(0.063)	(0.131)	(0.006)
Price * Age	-0.019***	-0.028***	-0.011
	[0.006]	[0.009]	[0.009]
	(-0.004)	(-0.007)	(-0.003)
Price * Age Squared	0.000***	0.000***	0.000
	[0.000]	[0.000]	[0.000]
	(0.000)	(0.000)	(0.000)
Constant	-1.401***	-2.111***	-0.946***
	[0.238]	[0.339]	[0.336]
Sample Size	121,334	60,168	61,166
Log Likelihood	-52238	-26079	-25914

Notes: Standard errors are in brackets, marginal effect are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Indicators for year and state were also included in the model.

Table A2: Probability of Smoking by Intensity

Variables	Smokes>=30	Smokes>=150	Smokes>=300	Smokes>=600
Age	0.085***	0.086***	0.085***	0.096***
	[0.011]	[0.011]	[0.012]	[0.014]
	(0.020)	(0.019)	(0.017)	(0.015)
Age Squared	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]
	(-0.000)	(-0.000)	(-0.000)	(-0.000)
Female	-0.216***	-0.229***	-0.248***	-0.342***
	[0.010]	[0.010]	[0.010]	[0.012]
	(-0.050)	(-0.050)	(-0.051)	(-0.053)
Black	-0.254***	-0.314***	-0.400***	-0.600***
	[0.017]	[0.018]	[0.019]	[0.025]
	(-0.059)	(-0.068)	(-0.082)	(-0.093)
Hispanic	-0.481***	-0.594***	-0.667***	-0.817***
	[0.023]	[0.025]	[0.027]	[0.035]
	(-0.112)	(-0.129)	(-0.136)	(-0.127)
Married	-0.671***	-0.682***	-0.686***	-0.688***
	[0.010]	[0.011]	[0.011]	[0.013]
	(-0.156)	(-0.148)	(-0.140)	(-0.107)
Less than High School	0.205***	0.207***	0.210***	0.238***
	[0.016]	[0.017]	[0.017]	[0.019]
	(0.048)	(0.045)	(0.043)	(0.037)
Some College	-0.187***	-0.200***	-0.201***	-0.227***
	[0.011]	[0.011]	[0.012]	[0.014]
	(-0.044)	(-0.044)	(-0.041)	(-0.035)
BA or Grad degree	-0.710***	-0.765***	-0.785***	-0.834***
	[0.013]	[0.014]	[0.014]	[0.017]
	(-0.165)	(-0.166)	(-0.160)	(-0.129)
Part-time Worker	-0.011	-0.004	-0.006	-0.035
	[0.027]	[0.028]	[0.029]	[0.033]
	(-0.003)	(-0.001)	(-0.001)	(-0.005)
Outdoor job	-0.466***	-0.455***	-0.445***	-0.418***
	[0.021]	[0.022]	[0.023]	[0.026]
	(-0.109)	(-0.099)	(-0.091)	(-0.065)
Smoking Restriction - Indoor	-0.097***	-0.098***	-0.110***	-0.163***
	[0.020]	[0.021]	[0.021]	[0.024]
	(-0.023)	(-0.021)	(-0.023)	(-0.025)
Part-time Worker * Outdoor Job	0.152***	0.141***	0.135***	0.140***
	[0.031]	[0.032]	[0.033]	[0.038]
	(0.035)	(0.031)	(0.028)	(0.022)
Part-time Worker * Smoking Rest. Indoor	0.075***	0.068**	0.068**	0.105***
	[0.028]	[0.029]	[0.030]	[0.034]
	(0.018)	(0.015)	(0.014)	(0.016)
Spouses Smokes	1.058***	1.077***	1.081***	1.069***
	[0.014]	[0.014]	[0.014]	[0.016]
	(0.247)	(0.234)	(0.220)	(0.166)
Avg Price of Cigarette	0.256*	0.181	0.071	-0.125
(real terms by State)	[0.145]	[0.152]	[0.157]	[0.191]
	(0.060)	(0.039)	(0.015)	(-0.019)
Price * age	-0.018***	-0.015**	-0.011	-0.005
	[0.006]	[0.007]	[0.007]	[0.008]
	(-0.004)	(-0.003)	(-0.002)	(-0.001)

Variables	Smokes>=30	Smokes>=150	Smokes>=300	Smokes>=600
Price * age^2	0.000***	0.000**	0.000*	0.000
	[0.000]	[0.000]	[0.000]	[0.000]
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.507***	-1.552***	-1.515***	-1.847***
	[0.244]	[0.255]	[0.264]	[0.314]
Sample Size	120,173	117,627	115,596	109,116
Log Likelihood	-50240	-45934	-42523	-30882

Notes: Standard errors are in brackets, marginal effect are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Indicators for year and state were also included in the model.

Table A3: Log Wage Regression

	Full Sample		Males		Females	
	Smoker	Non-Smoker	Smoker	Non-Smoker	Smoker	Non-Smoker
Age	0.042***	0.043***	0.048***	0.051***	0.035***	0.034***
	[0.002]	[0.001]	[0.003]	[0.001]	[0.003]	[0.001]
Age Squared	-0.000***	-0.000***	-0.001***	-0.001***	-0.000***	-0.000***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Female	-0.213***	-0.206***	-	-	-	-
	[0.007]	[0.004]				
Black	-0.098***	-0.095***	-0.149***	-0.141***	-0.052***	-0.059***
	[0.011]	[0.006]	[0.017]	[0.009]	[0.015]	[0.007]
Hispanic	-0.103***	-0.112***	-0.124***	-0.133***	-0.066***	-0.084***
	[0.015]	[0.007]	[0.020]	[0.010]	[0.024]	[0.010]
Married	0.043***	0.054***	0.097***	0.104***	-0.007	0.012**
	[0.006]	[0.004]	[0.009]	[0.006]	[0.008]	[0.005]
Less than High School	-0.135***	-0.190***	-0.145***	-0.212***	-0.118***	-0.156***
	[0.009]	[0.007]	[0.013]	[0.009]	[0.013]	[0.009]
Some College	0.072***	0.090***	0.056***	0.068***	0.078***	0.098***
	[0.007]	[0.004]	[0.011]	[0.007]	[0.010]	[0.006]
BA or Grad degree	0.257***	0.321***	0.213***	0.278***	0.301***	0.357***
	[0.011]	[0.005]	[0.016]	[0.008]	[0.015]	[0.007]
Part-Time	-0.077***	-0.087***	-0.045***	-0.085***	-0.090***	-0.078***
	[0.008]	[0.004]	[0.013]	[0.008]	[0.010]	[0.005]
Constant	1.643***	1.821***	1.468***	-0.005	1.545***	-0.003
	[0.059]	[0.030]	[0.083]	[0.017]	[0.087]	[0.016]
λ	0.046***	-0.019	0.045***	1.595***	0.040***	1.755***
	[0.010]	[0.012]	[0.014]	[0.043]	[0.014]	[0.046]
R^2	0.239	0.368	0.194	0.339	0.226	0.352
Sample Size	24,340	96,994	12,372	47,796	11,968	49,198

Notes: Standard errors are in brackets, *** p<0.01, ** p<0.05, * p<0.1. Indicators for occupation, industry, hours, year, and state were also included in the model.

Table A4: Log Wage by Smoking Intensity

	Smokes>=30		Smokes>=150		Smokes>=300		Smokes>=600	
	Smoker	**Non Smoker**	**Smoker**	**Non Smoker**	**Smoker**	**Non Smoker**	**Former Smoker**	**Non Smoker**
Age	0.042***	0.043***	0.042***	0.043***	0.041***	0.043***	0.041***	0.043***
	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.003]	[0.001]
Age Squared	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Female	-0.213***	-0.206***	-0.213***	-0.206***	-0.220***	-0.207***	-0.230***	-0.207***
	[0.007]	[0.004]	[0.007]	[0.004]	[0.008]	[0.004]	[0.010]	[0.004]
Black	-0.099***	-0.095***	-0.094***	-0.096***	-0.084***	-0.096***	-0.097***	-0.097***
	[0.011]	[0.006]	[0.013]	[0.006]	[0.014]	[0.006]	[0.021]	[0.006]
Hispanic	-0.113***	-0.112***	-0.115***	-0.113***	-0.120***	-0.113***	-0.133***	-0.114***
	[0.017]	[0.007]	[0.019]	[0.007]	[0.021]	[0.007]	[0.032]	[0.007]
Married	0.044***	0.054***	0.049***	0.054***	0.050***	0.054***	0.054***	0.054***
	[0.006]	[0.004]	[0.007]	[0.004]	[0.007]	[0.004]	[0.008]	[0.004]
Less than	-0.132***	-0.190***	-0.128***	-0.190***	-0.127***	-0.190***	-0.119***	-0.190***
High School	[0.010]	[0.007]	[0.010]	[0.007]	[0.010]	[0.007]	[0.012]	[0.007]
Some	0.072***	0.090***	0.073***	0.090***	0.070***	0.090***	0.065***	0.090***
College	[0.007]	[0.004]	[0.008]	[0.004]	[0.008]	[0.004]	[0.010]	[0.004]
BA or Grad	0.256***	0.320***	0.254***	0.320***	0.249***	0.320***	0.231***	0.320***
degree	[0.012]	[0.006]	[0.013]	[0.006]	[0.014]	[0.006]	[0.018]	[0.005]
Part Time	0.235	-0.087***	-0.072***	-0.087***	-0.071***	-0.087***	-0.074***	-0.087***
	[0.008]	[0.004]	[0.009]	[0.004]	[0.009]	[0.004]	[0.012]	[0.004]
Constant	0.044***	1.820***	0.039***	1.820***	0.041***	1.819***	0.047***	1.817***
	[0.010]	[0.030]	[0.011]	[0.030]	[0.011]	[0.030]	[0.013]	[0.030]
λ	1.645***	-0.019	1.612***	-0.020*	1.619***	-0.023*	1.616***	-0.026*
	[0.061]	[0.012]	[0.064]	[0.012]	[0.067]	[0.012]	[0.087]	[0.014]
R^2	0.235	0.368	0.229	0.368	0.231	0.368	0.222	0.368
Sample Size	23179	96994	20633	96994	18602	96994	12122	96994

Notes: Standard errors are in brackets, *** p<0.01, ** p<0.05, * p<0.1. Indicators for occupation, industry, hours, year, and state were also included in the model.