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The Wage Effects of Personal Smoking History

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Abstract

Why do we observe a wage differential between smokers and non-smokers? Pooling reports of current and prior smoking activity across 15 years from the Panel Study of Income Dynamics (PSID) allows the reconstruction of individual smoking histories. Dividing the sample into smoking history groups, the four largest of which are: *persistent smokers*, *never smokers*, *former smokers*, and *future quitters* reveals that there is no observed wage gap between former smokers and those who have never smoked. There is, however, a wage gap between those smokers who will continue smoking and three other groups of individuals: (1) those smokers who will quit smoking in the future, (2) those smokers who have quit smoking already, and (3) those who never smoked. The wage gap between smokers and non-smokers, observed in the 1986 cross-section, is largely driven by those who persist as smokers, 1986–2001. These results support the hypothesis that the cross-sectional wage differential is not driven by smoking per se, but may be driven by a non-causal explanation. One plausible interpretation is that a common factor such as myopia, leads to reduced investment in both health capital or firm-specific or other human capital.

Keywords

smoking; wages; health capital

An apparent causal relationship between smoking and coronary heart disease was reported at Mayo clinic in 1940. Since that time the various costs that smokers impose on themselves and others have been extensively studied and widely and continually publicized in public and even private advertising campaigns. It has been established that smoking adversely affects one's health and often causes premature death and increased health care costs. Smoking is empirically shown to be a leading cause of lung cancer, chronic bronchitis, emphysema and a major cause of heart disease and stroke. Overall, smoking is a leading cause of premature death and avoidable morbidity and disability in the US. Besides, it is associated with a variety of other conditions including slowed healing from injuries and increased susceptibility to some infections (Napier 1996; Blake, Abell, and Stanley 1988). From a behavioral economic perspective smoking seems to have an adverse effect on wages. The goal of the present paper is to analyze data over a long panel period to understand better the relationship between smoking and wages and to evaluate possible explanations.

Explanations for a wage gap between smokers and non-smokers can be classified into two broad categories: causal explanations and non-causal explanations. Causal explanations suggest that the smoking behavior itself leads to an adverse effect on wages via, for example, lower health status and lower productivity. Non-causal explanations suggest it is possible that there is one or more common factors associated with differences in preferences and/or behaviors; smoking behavior is not the cause, it is rather an indicator of preferences¹ which lead to less investment in both health and labor market capital. These lower levels of health and human capital are only partly captured by observed indicators, such as education, years of work experience and self-reported health.

In the paper, we will identify a set of smokers who are persistent - those who, from a point in time forward, are observed in a long panel not to have quit. Biomedical studies have suggested that persistent smokers are different from those who do not smoke and from those who currently smoke but are able to “kick the habit” (Uhl et al. 2007). Does this show up in the labor market? Do these persistent smokers - have wage differences between themselves and non-smokers and their smoking peers who manage to quit?

Background and Literature Review

Causal explanations for the wage gap include health and productivity effects. Smoking leads to lower productivity either because of time away from their job while at work (e.g. for smoking breaks) or missed work from illness because of poorer health. Smoking leads to worse health, which in turn propagates lower productivity through a number of channels, some observable, such as a greater number of absentee days (Bertera 1991; Kristein 1983) or outcomes more difficult to quantify such as lower physical and mental endurance.

Another type of explanation is that the wage gap can be attributed to a type of discrimination relative to non-smoking co-workers. Suppose smoking leads to relatively low physical attractiveness and that this physical attractiveness is unrelated to productivity. The empirical relationship between physical attractiveness and wages is well documented in the sociology, psychology (Frieze et al. 1990; Freize et al. 1991; Martel and Biller 1987) and economics literatures (Hamermesh and Biddle 1994; Persico et al. 2001; Mirta 2001). It is possible that the smell of tobacco associated with smokers makes them less attractive and contributes to a wage reduction, or that tobacco use otherwise reduces workers' physical attractiveness. Finally, smokers may be more costly for employers in terms of benefit provision; for instance with greater health costs and leads to a compensating (negative) wage differential². All these causal reasons, along with non-causal explanations mentioned above, may play a significant role in the effect of smoking on wages.

The first of two main sets of non-causal explanations of the smokers wage gap suggests that smokers may experience lower wages because they invest less in both human and health capital. Many studies show that there is a correlation between more schooling and good health³. Grossman (1972, 1976) and Michael (1973) hypothesize that schooling increases the efficiency of household health production. As a contrasting interpretation, Farrel and Fuchs (1982) and Fuchs (1982) argue that unobservable differences in the rate of time preference determine the level of human capital investment as well as the level of health

¹The role of preference formation on choice has been developed by several authors (Becker and Mulligan 1997; Cunha et. al (2006)) Here we assume that the adverse health impacts of smoking are widely known. It could be argued that some smokers are not informed or choose not to assess the intertemporal cost-benefit aspects of their decision. Being myopic or uninformed may shape the smoking decision and carry over to earnings - in terms of unobserved capacities or labor market knowledge.

²On the other hand, earlier post retirement mortality could reduce employer pension costs in defined benefit plans with life annuities.

³It has been found that individuals with more education have lower mortality rates (Kitagawa and Hauser 1973; Grossman 1976, Rosen and Taubman 1982), lower incidence of most chronic disease (Pincus et al. 1987) and better self-reported health status (Grossman 1976).

capital investment, and Lahiri and Song (2000) provide evidence to argue that persistent smokers have a higher rate of time preference. Those with low rates of time preference tend to care more about their future, and thereby invest more both into human and health capital, resulting in the observed wage gap between smokers and non-smokers which is only partly predicted by usual measures of human capital and general health. Self-selection into smoking is a variant of the preferences perspective (Lahiri and Song 2000). For instance, the Surgeon General's report of 1985 noted differences in smoking behavior, both for initiation and cessation, between white and blue collar workers. More recently there has been evidence of a biologically shaped joint addiction to smoking and alcohol consumption (Uhl et al. 2007). Here we consider such an addiction as an exogenous 'preference' since it creates a predisposition to behave in certain ways. The extent to which biological and learned factors⁴ combine to shape a set of preferences is not within the scope of this paper.

Empirically, several papers have examined the relationship between smoking and wages with a differential in favor of nonsmokers in the range of 2 to 10 percent, depending on data source, time and country. Using the 1973 Quality of Employment Survey (QES), Leigh and Berger (1989) report point estimates of the earnings gap and report a differential of 1.5–3.5 percent, an estimated differential which is statistically insignificant. Levine et al. (1997) use the National Longitudinal Survey of Youth (NLSY) data to estimate that smoking reduces wages by roughly 4.2 percent and 6.9 percent in 1984 and 1992 data samples, respectively. International evidence is consistent with US evidence. Van Ours (2004) reports a 10 percent wage gap between smokers and non-smokers using the Dutch 2001 CentER data. Auld (1998) finds an 8 percent wage gap using the 1991 Canadian General Social Survey and Lee (1999) reports a 5 percent wage gap using Australian Twin Registry of 1980–1982 and 1988–1989.

While Leigh and Berger (1989) use cross-sectional analysis only and have a relatively moderate sample size of the adult population, Levine et al. (1997) estimate the wage effect of smoking more precisely using both a larger cross-sectional sample and companion panel analysis. In contrast to the PSID, which has information on smoking and wage detail only for those who are household heads or spouses, for Levine et al. (1997), by the sample design, the NLSY is limited to young people. While most PSID household heads are over 25, in the initial year, 1984, the oldest NLSY respondents were no more than 26 years old. So results could differ based of sample concepts.

Previous research has often accounted for smoking behavior by current smoker and former smoker dummy variables. In this paper we start our analysis by estimating a series of models that use current smoker and former smoker dummy variables and that are similar to the models used in the previous research. This traditional approach treats smokers as a homogeneous group. The main methodological contribution of this paper is that we recognize the heterogeneity of smokers as a group and use this heterogeneity to examine the wage gap in more details and to gain some insight into the nature of the wage gap.

Utilizing the longitudinal nature of the data, we reconstruct the prospective pattern of the individual's smoking behavior. These reconstructed patterns of smoking behavior allowed us to identify those who smoke and never quit smoking (*persistent smokers*), those who used to smoke and have successfully quit smoking (*former smokers*), those who will quit smoking in the future (*future quitters*), those who try to quit unsuccessfully and end up being *on and off smokers*, those who never smoked in their life (*never smokers*), etc.

⁴For example smoking at an early age tends to lead to smoking as an adult and factors such as the effectiveness of local laws prohibiting smoking by youth may play a role.

Identifying these heterogeneous groups enabled us to unmask some striking results. For example, our estimates show that it is those smokers who are not going to quit smoking in the future (*persistent smokers*) that receive lower wages than non-smokers. Those smokers who will quit smoking in the future (*future quitters*) tend to receive equal wages with non-smokers. Similarly, we found that those who successfully quit smoking (*former smokers*) tend to receive equal wages with non-smokers, even in the years when they were smokers. Rephrased, among those smoking in the current period, the smoking wage effect appears concentrated on those who are, in subsequent panel data observation, the persistent smokers.

Data

This study uses waves of the Panel Study of Income Dynamics (PSID) in which smoking was reported. The PSID is a longitudinal study of a representative sample of U.S. individuals (men, women, and children) and the family units in which they reside that began in 1968. It concentrates on dynamic aspects of economic, health and demographic behavior. The sample size has grown from the original 4,800 family units in 1968 to over 8,400 family units in 1996, with changes since 1997 and a resulting sample of 7,406 family units in 2001. This paper utilizes information on males from three waves of the data: 1986, 1999 and 2001. In these waves information on life course smoking behavior of male and female family heads was reported, and, for married couples, of their wives.

In the health module of these years, individuals are asked whether they currently smoke. Current smokers were further queried on average daily cigarette consumption and age when they first smoked regularly. Current non-smokers are asked whether they smoked previously; former smokers are identified and asked about their average cigarette consumption and at what age they first and last smoked cigarettes regularly. These questions enable the construction of average daily cigarette consumption and duration of smoking histories for current smokers.

This study is based on male household heads between the ages of 25 and 60 years old who are employed full-time (defined as 1500 hours or more a year). In this way, the sample is restricted to those individuals who have established themselves as a head of a separate household⁵ and who are likely, on one hand, to be out of school and, on the other hand, not yet retired. These restrictions will enable this study to overcome some of the potential limitations of previous research.

Methodology

Separating the effect of smoking on wages from the effects of correlated personal characteristics presents an empirical challenge. Previous studies have dealt with the challenge by enriching the set of controls, or using available sibling information, or considering regression models based on first differences. While previous studies have treated both former smokers and those who have never smoked as homogeneous groups, there may be substantial differences within each of these groups which can be used to estimate and understand wage effect of a smoking.

As a baseline, we present a standard human capital earnings model (containing such personal characteristics as highest level of education attained, years of work experience (years of work experience since 18, as reported by a respondent), job tenure, white collar job dummy, race dummy, union and marital status) augmented by a whether-current-smoker variable. This baseline approach is very similar to the augmented human capital model of

⁵The household may be a one person household but not a young adult living at home with the parents.

the effects of health status and health behavior on labor market outcomes used by previous researchers. The regression takes form

$$\ln W_i = \alpha + \beta X_i + \gamma_0 Smk_i + e_i, \quad (1)$$

where W_i is the average hourly wage rate, X_i is a vector of individual characteristics and Smk_i is a current smoking behavior dummy, and in some specifications is accompanied by a former smoking behavior dummy. Specifications, including only a current smoking status dummy, estimate the average effect of current smoking status on the hourly wage. The specification that includes both current and former smoking dummies recognizes that smoking may be associated with lower wages not only while one is a smoker but produce a persistent wage effect after quitting. Thus, the entire sample is divided into three categories: current smokers, former smokers, and those who never smoked prior to the interview date. Interestingly, the results of the regression analysis suggest that there is no wage gap between former smokers and those who never smoked.

Health may play a potentially important role in the relationship between smoking and wages. The adverse effect of smoking on health may decrease smokers' productivity, thus, lowering their wages. However, the relationship between health and smoking is not straightforward. On one hand, the adverse effect of smoking on health may alarm smokers causing them to quit. On the other hand, poor health and adverse health events may impose additional stress on individuals causing them to start or to continue smoking. To accommodate for the hypothesis that smoking may affect wages through lower productivity due to poorer health, the baseline model is augmented by self-reported health status indicators *Health_i*.⁶

$$\ln W_i = \alpha + \beta X_i + \gamma_0 Smk_i + \gamma_1 Health_i + e_i, \quad (1')$$

Model (1') is estimated in three different ways. First, we estimate models (1') for each of the three survey years (1986, 1999, and 2001) separately. Second, we pooled the data from all three waves and estimated pooled Ordinary Least Squares (OLS) model. Finally, we estimate model (1') using OLS fixed effect technique. The fixed effect procedure accounts for unmeasured, time-invariant, individual-specific variables that could be correlated with both wages and smoking behavior.

Next, we exploit differences within current and former smoker groups. Using observations for those individuals for whom information is available in at least two waves out of the three that included the smoking behavior module, the entire sample is thus divided into five categories based on a reconstructed smoking history: those who report themselves as smokers in all waves of data available (*persistent smokers*); those who smoke in a year under consideration but will quit in later years (*future quitters*); those who smoke intermittently (*on and off smokers*); those smokers who successfully quit smoking prior to the time of the interview (*former smokers*); those who will start smoking after the interview (*future smokers*), and those who have never smoked (*never smokers*). This sample is referred to as the "retrospective sample" in the rest of the paper. This finer division enables the comparison of various types of smokers to address the question of which subgroups seems to drive the wage gap between smokers and non-smokers. To maintain sample size, only the four largest groups from the retrospective sample are considered: *persistent smokers*, *former smokers*, *future quitters* and *never smokers*. Interestingly, while there are

⁶The concurrent validity of self-reported health status measure is consistently supported (Idler and Benyamini 1997).

some striking differences in education, health status and job choice between *persistent smokers* and *never smokers*, these differences are not so large between *former smokers* and *persistent smokers*. Using the following regression framework,

$$\ln W_i = \alpha + \beta X_i + \gamma_3 \text{Group_indicator}_i + e_i \quad (3)$$

these groups can be compared.

Results

Descriptive Statistics

Weighted descriptive statistics of various individual characteristics by current smoking status are presented in Table 1. Unconditional mean wage differences between current smokers and current non-smokers grew from 17 percent in 1986 to 25 percent in 1999 and to almost 29 percent in 2001. Table 1 also shows substantial educational, occupational and health status differences. For instance, smokers are only half as likely as current non-smokers to hold a college degree and smokers are 40 percent less likely to be in white collar jobs. There are striking differences in self-reported health status between smokers and non-smokers. Indeed, smokers are 30–47 percent less likely to report excellent health status even though there is no substantial age difference between the two groups. Table 1 indicates that the relationships indicated above are rather stable over a span of 15 years.

Table 2 presents mean characteristics of smoking behavior for current and former smokers. It can be observed from the table that average daily cigarette consumption for current smokers falls between 1986 and 2001 by almost 20 percent (by over 4 cigarettes a day). Over the same period of time, the percentage of heavy smokers among current smokers is cut almost in half: from 29 percent in 1986 to 15 percent in 2001. This last observation indicates even further that individual consumption of cigarettes has fallen dramatically over time, a result consistent with better information on health effects and a rising real cigarette price – via rising taxes (Chaloupka and Warner 2000). Not surprisingly, the table shows that the percentage of former heavy smokers is higher than the percentage of current heavy smokers and that former smokers' average cigarette consumption is higher than current smokers' average cigarette consumption.

Overall, the descriptive statistics indicate two major patterns. First, there are large educational, occupational and health differences between current smokers and non-smokers. Second, cigarette consumption declines over time while mean real wage differences increase over time.

Cross-sectional Analysis

Results of the baseline cross-sectional analysis corresponding to equations (1) and (1') can be found in Table 3. The baseline model (1) indicates that the wage gap between current smokers and current non-smokers increased from 4.1 percent in 1986 to 10.8 percent and 11.8 percent in the years of 1999 and 2001 respectively. Since an approach very similar to the baseline approach has been taken in previous studies, it is useful to compare their results to the results of the current study. The 1973 QES data analysis by Leigh and Berger gives statistically insignificant point estimates of 1.5–3.5 percent. In addition, Levine et al. estimate the wage gap based on the 1984 wave of NLSY as 4.2 percent. This estimate goes up to 6.9 percent in the 1992 wave of NLSY. As can be seen from the above comparison, the previous studies are consistent with the current study's baseline model for 1986.

The adverse effect of smoking on health provides one of the most important explanations of the smokers/non-smokers wage gap. This hypothesis is incorporated into the analysis by augmenting specification (1) by self-reported health status dummies. The estimation results of specification (1') suggest that health status is an important factor that determines one's wage rate. In addition, introduction of the health status into the analysis reduces the smokers/non-smokers wage gap suggesting that part of the gap is in fact explained by the health differences. However, the wage gap reduction is not very large, so other explanations of the wage gap merit analysis⁷. Another path for a wage effect is that smoking produces health shocks which reduce labor market hours well below full time or lead to labor force exit. While important, this probably is not very common concern among men under 60 and can be studied as additional waves of PSID data are collected.

Since smoking may lower one's productivity, it may also affect the choice of occupation. Thus, job type variables (white collar, union status) are potentially endogenous. To conduct a sensitivity check we estimated model (2) from Table 3 omitting white collar and union status variables to find that results do not change significantly. Similarly, we have verified that our results are robust to the exclusion of tenure.

As another sensitivity check, we examined the effect of intensity of smoking on wages. We found that conditional on smoking, the level of cigarette consumption, years of smoking experience, and heavy smoker status all have a small and insignificant additional effect on wages (results are available from authors upon request).

Table 3 indicates that the former smoker dummy has a small and insignificant coefficient in all three waves of data. Thus, there is evidence that only current smoker status reduces one's wage and that those who ever smoke are a different group in terms of wage potential.

Fixed Effect Analysis

To utilize the panel nature of the data we pooled 1986, 1999, and 2001 waves of the survey and estimated model (1') as pooled OLS and as fixed effect OLS. The results of these estimation procedures are presented in the last two columns of Table 3. Pooled OLS model suggests that smokers tend to receive 7.3 percent lower wages than non-smokers. This estimate is consistent with our wage gap estimates described above. The fixed effect estimates are dramatically smaller than the cross-sectional estimates. The estimated wage gap between smokers and non-smokers becomes small and insignificant. As a robustness check, we estimated the fixed effects model on a sample that excludes *future smokers* from the analysis to find that the results do not change significantly (not shown). In addition, we also estimated a fixed effect model while excluding self-reported health status from the specifications (not shown). The estimated wage gap remains small and insignificant.

The fixed effect analysis has a couple of important limitations. First, it does not account for time variant unobserved heterogeneity. Second, the identification in the fixed effect analysis comes from the individuals who change their smoking behavior over time. There is a potential endogeneity regarding the individuals who choose to change their smoking behavior and quit smoking. These people could be quite different from the ones who decide to continue smoking. Thus, the fixed effect model is informative with regard to people who change their smoking behavior over time but is not really informative with regard to people who choose to continue smoking. In the next section we examine wage gap for individuals with different types of smoking behavior histories.

⁷1999 and 2001 waves of PSID contained the information on whether respondents had certain chronic conditions. When equation (1) is run for these two waves is augmented by the chronic condition dummy instead of self-reported health status dummies results do not change much.

Retrospective Data Analysis

Based on the long period panel, 1986–2001, smoking histories are taken into account. Some of the current smokers as of 1986 will end up persistently smoking into the future, some others will quit smoking and others will be intermittent, or on and off, smokers. Among current non-smokers various mutually exclusive categories can be recognized: never smokers, future persistent smokers, future smokers, former smokers and intermittent on and off smokers.

In order to reconstruct a smoking history only those individuals who provide their smoking behavior information in at least two waves are included. Then, as portrayed in Table 4, comparing their responses across time, the entire sample is divided into seven mutually exclusive categories: never smokers, persistent smokers, former smokers, future quitters, on and off smokers, future smokers, and inconsistent responses category⁸. Even though the data span over fifteen years, the inconsistent response category comprises only 8–10 percent of the sample. This category is dropped from further analysis.

The largest category of all is, of course, the never a smoker category constituting 43–51 percent of the sample. The *persistent smoker* category makes up about a fifth of the sample. The only other large category, constituting over 10 percent of the sample, is *former smokers*. Most of other categories, though potentially very interesting by their nature are not large enough to be included in the regression analysis. Thus, the regression analysis will mainly concentrate on the three largest groups: *never smokers*, *former smokers* and *persistent smokers*.

Descriptive statistics of various individual characteristics for the retrospective data sample for years 1986 and 1999 are presented in Tables 5 and 6. As can be seen from these tables, key individual characteristics such as highest level of education attained, white collar status and health status are very similar between the never and former smoker groups. For instance, the percentage of never smokers and former smokers with at least a college degree is virtually identical: 46 percent. These similarities are particularly interesting since the results of this study seem to suggest that the wage gap between former smokers and never smokers is either very small or non-existent.

A comparison of mean characteristics further suggests that there seems to be a self-selection process. Individuals who smoke at one point and later quit are very different in their individual characteristics from persistent smokers. Mean individual characteristics of two other groups: future quitters and on and off smokers usually lie between those for persistent smokers and never/former smokers. From this we may expect that the wage effect of their smoking status should be less in magnitude than that of persistent smoker status.

Table 7 presents the estimation of the wage gap between the three largest groups: *persistent smokers*, *never smokers*, and *former smokers*. As can be seen from this table, the *persistent smokers* vs. *former smokers* wage gap estimates are very close to *persistent smokers* vs. *never smokers* wage gap estimates. This is further supported by former/never smokers wage gap being insignificant.

Some results depicted in Table 7 may appear to contradict some of the results depicted in Table 3. On the one hand, Table 3 shows that the wage gap between current smokers and

⁸Smoking histories are reconstructed based on contemporaneous smoking behavior measures. However, a retrospective question on age of smoking onset was used to (a) identify the individuals who gave inconsistent responses and (b) identify the individuals who truly quit smoking from those who are on and off smokers. Further details of how smoking histories were reconstructed are available from the authors upon request.

those who currently do not smoke widens over time. On the other hand, estimation results from Table 7 show that the wage differential between *persistent smokers* and *never smokers* is stable (7–11 percent) over time⁹.

To reconcile these two results we need to take into account results from Table 8. Table 8 utilizes the unique feature of our data that allows us to identify and analyze those smokers who smoke in 1986 and are known to quit smoking in the future (*future quitters*). Table 8 compares these *future quitters as of 1986* to those who quit smoking by 1986 (*former smokers*), to those *never smokers* and to *persistent smokers*. It shows that those smokers who are going to quit smoking in the future (*future quitters*) receive, on average, 12 percent higher wages than those who smoke in 1986 and do not quit in the future (*persistent smokers*). It also indicates that *future quitters* tend to receive equal wages with those who never smoked and with those who have already managed to quit smoking successfully (*former smokers*).

Putting together these results seems to suggest that the widening of the gap between current smokers and those who currently do not smoke is due to increasingly higher proportion of *persistent smokers* among current smokers. Smoking rates among working adults were falling over the past twenty years. Those who used to smoke in the mid-80s included many individuals who successfully managed to quit smoking later on. As we know from Table 8, this group of people received on average equal wages with never smokers. Thus, higher proportion of *future quitters* among current smokers can potentially bias the estimated wage gap downward, explaining why the estimated wage gaps between current smokers and non-smokers tend to be smaller in the 80s than in the late 90s.

Results from Tables 7 and 8 give some other interesting insights. For example, it is well known that in recent years, social acceptance of smoking diminished. Under a discrimination hypothesis we would expect to see a widening of the gap between never smokers and persistent smokers. This seems not to be the case.

Also, the result that the wage gap observed between *persistent smokers* and *future quitters* at the time when latter smoked could be interpreted as the evidence against work discrimination hypothesis. It could be difficult for co-workers to single out the future quitters and exempt them from the discriminatory treatment of their other smoking colleagues as of 1986.

To summarize, the effect of smoking on wages seems to be present for current but not for former smokers. Further, this wage gap is driven primarily by the persistent smoker group and this wage differential is stable over time. Those who quit smoking seem to have no significant wage disadvantage, suggesting that the main driving force behind this wage gap may lie in a self-selection process for those who are unable to quit, a possible addiction (Uhl et al. 2007) or preference, rather than any of the causal explanations. However, causal explanations cannot be completely excluded from consideration. Quitting smoking is potentially an endogenous process¹⁰. It is possible, for example, that workers who perceive that they will incur a higher wage loss in the future if they continue smoking are more likely to quit.

⁹The stability of the wage differential implies that the wage growth should be similar for *persistent smokers* and *never smokers*. We have estimated wage growth equation which showed that, indeed, *persistent smokers*, *never smokers*, and *former smokers* have similar wage growth.

¹⁰This is consistent with the observation that wage differential between former smokers and persistent and never smokers differs across different education groups. However, the wage gap between persistent smokers and never smokers does not substantially differ across different education groups.

Conclusion

The wage effect of smoking has been examined in this paper from several different perspectives. In the baseline, smokers and non-smokers are considered as otherwise rather uniform groups of individuals. Human capital earnings regressions augmented by a current smoking status dummy show a wage gap in the 4–11 percent range and one that increases over time, at least up to 2001. Both the point estimates as well as their increasing pattern are consistent with previous research.

Recognizing the differences among individuals with respect to their smoking behavior, the entire sample was divided into seven categories with respect to histories of smoking behavior. This finer division allows comparison to one another of the three largest categories: *persistent smokers*, *never smokers* and *former smokers*. This comparison implied that the wage gap is largely driven by persistent smokers and that the size of the gap did not change much across time. Additionally, this interpretation is supported by the result that there is no wage gap between former smokers and those who have never smoked.

Smoking has some indirect effects on wages via health status. Smoking is far more likely to predict lower reported health status, and this in turn lowers wages. Thus, smoking appears to affect wages somewhat via real effects on health status but also from unobserved preferences and behavior of the persistent smokers.

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Table 1

Mean Characteristics in 1986, 1999 and 2001 Cross-Section Data, by smoking Status^a

Characteristic	1986 Data			1999 Data			2001 Data		
	Smokers	Non-Smokers		Smokers	Non-Smokers		Smokers	Non-Smokers	
Avg. Hourly Wage (in 2000 Dollars)	17.06	20.58		16.64	22.13		17.48	24.48	
Highest Educational Level Attained									
College Degree	.17	.37		.17	.38		.15	.38	
Some College, No College Degree	.18	.18		.25	.23		.26	.24	
High School Diploma or GED	.41	.33		.40	.25		.40	.25	
# of Years of Experience with Current Employer	6.92	7.69		7.51	8.24		7.24	8.38	
# of Years Worked for Money Since 18 Years Old	17.25	18.01		18.43	18.09		18.15	18.72	
White Collar Job	.31	.51		.31	.52		.36	.53	
Job Covered by Union Contract	.22	.20		.19	.18		.17	.20	
Marital Status	.77	.84		.77	.85		.72	.86	
Non-White Race	.32	.26		.34	.32		.33	.31	
Self-Reported Health Status									
Excellent	.25	.36		.18	.34		.20	.31	
Very Good	.36	.36		.36	.36		.39	.37	
Good	.28	.20		.32	.23		.30	.24	
Sample Size	1,087	1,969		719	2,343		652	2,246	
Age	36.69	37.56		40.60	40.23		40.84	41.67	

^aThe sample in Table 1 includes male household heads between 25 and 60 years old, working at least 1500 hours a year.

Table 2

Mean Characteristics of Smoking Behavior in 1986, 1999 and 2001 Cross-Section Data^a

Characteristic	1986 Data			1999 Data			2001 Data		
	Smokers	Former Smokers		Smokers	Former Smokers		Smokers	Former Smokers	
Average Hourly Wage (in 2000 Dollars)	17.06	21.44		16.64	22.36		17.48	24.36	
Number of Cigarettes Consumed Daily	20.71	23.00		17.26	19.83		16.62	19.36	
Number of Smoking Experience Years	19.26	13.48		23.26	14.83		23.11	14.57	
Share of Heavy Smokers	.29	.32		.18	.23		.15	.23	
Age	36.69	40.16		40.60	43.40		40.84	44.85	
Sample Size	1,087	770		719	669		652	646	

^aThe sample in Table 2 includes male household heads between 25 and 60 years old, working at least 1500 hours a year.

Table 3

OLS Estimates of Smoking Behavior on Wages (Standard Error in Parenthesis)

Explanatory Variable	1986 Data ^a			1999 Data ^a			2001 Data ^a			Pooled OLS ^a	OLS Fixed
	(1)	(1')	(2)	(1)	(1')	(2)	(1)	(1')	(2)		
Health Status											
Excellent		.0382 (.4.0800)	.1567 (.0382)		.2248 (.0410)	.2261 (.0410)		.0430 (5.2100)	.2245 (.0431)	.1966 (.0236)	.0118 (.0327)
Very Good		.1326 (.0373)	.1327 (.0373)		.1867 (.0395)	.1877 (.0395)		.2137 (.0416)	.2140 (.0416)	.1721 (.0229)	.0215 (.0304)
Good		.0792 (.0380)	.0788 (.0380)		.1303 (.0404)	.1309 (.0404)		.1444 (.0424)	.1448 (.0425)	.1118 (.0233)	.0044 (.0292)
Former Smoker			.0251 (.0237)			.0216 (.0250)			.0059 (.0262)		
Current Smoker	-.0405 (.0197)	-.0344 (.0197)	-.0242 (.0219)	-.1082 (.0236)	-.0924 (.0237)	-.0856 (.0250)	-.1183 (.0254)	-.1091 (.0253)	-.1073 (.0266)	-.0737 (.0131)	.0093 (.0276)
College	.4403 (.0339)	.4154 (.0342)	.4176 (.0343)	.4068 (.0358)	.3752 (.0360)	.3774 (.0361)	.4667 (.0379)	.4375 (.0380)	.4381 (.0381)	.3989 (.0207)	.0207 (.1160)
Some College	.2437 (.0337)	.2225 (.0339)	.2232 (.0339)	.1917 (.0344)	.1710 (.0344)	.1718 (.0344)	.2089 (.0367)	.1885 (.0367)	.1888 (.0367)	.1829 (.0200)	-.0169 (.0936)
High School or GED	.1896 (.0285)	.1746 (.0286)	.1747 (.0286)	.1053 (.0326)	.0895 (.0326)	.0895 (.0326)	.0873 (.0350)	.0705 (.0350)	.0706 (.0350)	.1072 (.0183)	.1509 (.0875)
Non-White	-.1566 (.0222)	-.1488 (.0222)	-.1478 (.0223)	-.1707 (.0226)	-.1598 (.0226)	-.1581 (.0227)	-.1880 (.0241)	-.1740 (.0241)	-.1736 (.0242)	-.1586 (.0133)	-.0849 (.0928)
Tenure	.0202 (.0013)	.0203 (.0013)	.0203 (.0013)	.0112 (.0014)	.0110 (.0014)	.0110 (.0014)	.0118 (.0014)	.0117 (.0014)	.0117 (.0014)	.0140 (.0008)	.0073 (.0012)
Experience	.0314 (.0044)	.0318 (.0044)	.0313 (.0044)	.0178 (.0040)	.0190 (.0040)	.0188 (.0040)	.0251 (.0059)	.0257 (.0058)	.0257 (.0058)	.0207 (.0026)	.0034 (.0053)
Experience ²	-.0007 (.0001)	-.0006 (.0001)	-.0006 (.0001)	-.0004 (.0001)	-.0004 (.0001)	-.0004 (.0001)	-.0006 (.0001)	-.0006 (.0001)	-.0006 (.0001)	-.0004 (.0001)	-.0007 (0.0001)
Sample Size	3,056	3,056	3,056	3,062	3,062	3,062	2,898	2,898	2,898	9,016	9,016
R ² _{adj}	.3228	.3267	.3268	.2897	.2970	.2920	.2961	.3035	.3032	0.3970	

^aDependent variable is Log hourly wage rate; other regressors include union and marital status, white collar job, and regional dummies

Table 4Retrospective Smoking Behavior Information Consistency Check^a

Smoking Behavior Groups	1986 Retro Sample		1999 Retro Sample	
	Number of Observation	Percentage Out of Sample Size	Number of Observations	Percentage Out of Sample Size
Never Smokers	636	43.4	1,788	50.6
Persistent Smokers	292	19.9	710	20.1
Former Smokers	152	10.4	489	13.8
Future Quitters	128	8.7	82	2.3
On and Off Smokers	104	7.1	182	5.2
Future Smokers	9	0.6	9	0.3
Inconsistent Responses	145	9.9	272	7.7
Sample Size	1,466	100	3,532	100

^aNo restrictions on hours of work or age are applied to Table 4.

Table 5

Mean Characteristics in 1986 Retrospective Sample^a

Characteristic	Never Smokers	Persistent Smokers	Former Smokers	Future Quitters	On and Off Smokers	Inconsistent Responses
Average Hourly Wage Rate	12.40	9.928	14.35	11.26	12.43	10.70
Highest Educational Level Attained						
College Degree	.46	.16	.46	.20	.21	.38
Some College, No College Degree	.18	.18	.15	.21	.31	.16
High School Diploma or GED Recipient	.31	.46	.35	.45	.37	.38
Years of Experience with Current Employer	5.63	5.64	6.81	5.93	5.55	6.37
Number of Years Worked for Money Since 18 Years Old	12.35	12.86	17.08	15.65	14.11	13.67
White Collar Job	.56	.31	.62	.35	.51	.49
Job Covered by Union Contract	.16	.21	.23	.20	.21	.26
Marital Status	.80	.74	.91	.88	.83	.76
Non-White Race	.22	.27	.16	.16	.22	.23
Self-Reported Health Status						
Excellent	.45	.26	.40	.22	.32	.32
Very Good	.38	.42	.36	.44	.43	.40
Good	.14	.24	.20	.24	.21	.21
Age	31.87	32.29	36.53	34.71	33.32	32.97
Sample Size	636	292	152	128	104	145

^aNo restrictions on hours of work or age are applied to Table 5.

Table 6

Mean Characteristics in 1999 Retrospective Sample^a

Characteristic	Never Smokers	Persistent Smokers	Former Smokers	Future Quitters	On and Off Smokers	Inconsistent Responses
Average Hourly Wage Rate	20.27	15.01	20.96	17.67	20.59	
Highest Educational Level Attained						
College Degree	.39	.15	.34	.23	.23	.29
Some College, No College Degree	.26	.26	.26	.24	.26	.19
High School Diploma or GED Recipient	.25	.41	.26	.37	.37	.33
Years of Experience with Current Employer	7.72	6.64	8.77	5.21	7.07	7.61
Number of Years Worked for Money Since 18 Years Old	16.46	16.71	21.05	16.72	17.88	18.22
White Collar Job	.54	.32	.51	.35	.50	.47
Job Covered by Union Contract	.17	.17	.22	.21	.16	.18
Marital Status	.79	.62	.76	.79	.74	.75
Non-White Race	.36	.35	.27	.30	.27	.41
Self-Reported Health Status						
Excellent	.35	.20	.26	.23	.34	.26
Very Good	.36	.35	.37	.41	.35	.40
Good	.24	.32	.28	.28	.23	.26
Age	38.58	39.01	44.55	39.32	40.62	40.37
Sample Size	1,788	710	489	82	181	272

^aNo restrictions on hours of work or age are applied to Table 6.

Table 7

OLS Estimates of Wage Gaps between Persistent Smokers, Former Smokers, and Never Smokers (Standard Error in Parenthesis)

Specification	1986 Data ^a	1999 Data ^a	2001 Data ^a
Persistent Smoker Versus Never Smokers	-.0764 (.0406)	-.0821 (.0275)	-.1023 (.0277)
Persistent Smoker Versus Former Smokers	-.1132 (.0563)	-.1125 (.0576)	-.1024 (.0362)
Former Smoker Versus Never Smokers	.0371 (.0480)	.0391 (.0303)	-.0108 (.0306)

^aDependent variable is Log hourly wage rate; other regressors include education controls, experience, experience squared, tenure, and dummies for health status, race, union membership, marital status and regional dummies. Sample includes male household heads between 25 and 60 years, working at least 1500 hours a year

Table 8

Future Quitters in 1986 (Standard Error in Parenthesis)

	Ref. Group: Never Smokers ^a	Ref. Group: Former Smokers ^a	Ref. Group: Persistent Smokers ^a
Future Quitter Dummy	.0440 (.0507)	-.0175 (.0599)	.1236 (.0511)
Sample Size	628	256	355
R ²	.290	.261	.344

^aDependent variable is Log hourly wage rate; other regressors include education controls, experience, experience squared, tenure, and dummies for health status, race, union membership, marital status and regional dummies. Sample includes male household heads between 25 and 60 years, working at least 1500 hours a year