

## **Financial Strain and Smoking**

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### **Abstract**

Using the 1999-2005 wave of the Panel Study of Income Dynamics (PSID) this paper examines the relationship between family financial strain and smoking. Family financial strain is characterized by three indicators that reflect family financial solvency and availability of emergency funds. Results indicate that individuals residing in families with insufficient emergency funds are 2-5% more likely to smoke. Results also show that the onset of financial strain, characterized by lack of sufficient emergency funds, impacts smoking among women with a time lag. The impact on smoking among men is more immediate. Family financial insolvency was found to be unrelated to smoking for both men and women in regression analysis.

**JEL classification:** I1, D1

**Keywords:** smoking, financial strain

## **Introduction**

Family financial strain is a multi-faceted concept. For example, it can be defined as the situation when a family does not have enough assets to cover its liabilities. Alternatively, it can be defined as a situation when family does not have adequate savings that can be used in case of an emergency, such as job loss, death, or illness. It can also be defined as a situation when family debt burden is too high. All of these and other various definitions of financial strain, while diverse, aim to capture family experience of financial pressure and lack of resources.

Recent data shows that both family assets and family financial liabilities have been increasing. However, the rise in liabilities has been more rapid (Bucks, Kennickell, and Moore (2006)). This increases the debt burden and puts many families under financial strain. In 2004, about 12.2% of all families with debt spent more than 40% of their family income on debt payments (Bucks, Kennickell, and Moore (2006)). Many families do not have sufficient savings that can be used in case of emergency: Lyons and Yilmazer (2005) find that 40.4% of all families have less than two and a half months worth of income saved in liquid assets.

Recent literature shows that family financial strain is associated with poorer individual physical and mental health. For example, higher debt and stress regarding debt have been found to be associated with lower self-reported health, higher degree of physical impairment (Drentea and Lavrakas (2000)), anxiety (Drentea (2000)), depression (Reading and Reynolds (2001); Zimmerman and Katon (2005)), and a higher degree of psychological distress (Brown, Taylor, and Price (2005)).

There are several important challenges on the way to a better understanding of the relationship between financial strain and health. First, as it can be seen from the discussion below, there are several hypotheses explaining what mechanisms can shape the relationship.

Second, these mechanisms could vary for different measures and different aspects of financial strain. Third, these mechanisms could vary for different physical health, mental health, and health behavior outcomes.

Most of the literature is devoted to the relationship between financial strain and self-reported health or mental health. With few exceptions (Grafova (2007)), very little is known about health behaviors, such as smoking. This paper aims to address this gap in the literature and explore the relationship between three different indicators of family financial strain and adult smoking. We concentrate on three different financial strain indicators since financial strain is a multi-faceted concept. Two of these indicators reflect the availability of adequate funds that can be used in case of an emergency and the third one reflects family financial solvency. While two out of three indicators were used before in the analysis of self-reported health, none of these indicators were used with regard to smoking behavior. Also, this paper utilizes several consecutive waves of the longitudinal data set. It enables us to go beyond the analysis that relates smoking to current financial strain status. For instance, we are able to identify families that had a recent onset of financial strain and examine the effect of this onset on smoking. In addition, we use several methodological approaches, including fixed effects technique, in the attempt to unveil the relative importance of different hypotheses explaining the mechanisms behind the association between smoking and financial strain.

### **Financial Strain and Health**

There are several hypotheses that explain why financial strain is associated with poorer health. First, financial strain can cause worries over one's financial situation, increased stress and anxiety (Drentea (2000)) which, in turn, may cause poorer health (Drentea and Lavrakas (2000));

Reading and Reynolds (2004)). This hypothesis is indirectly supported by the evidence that show the association between debt and psychological distress (Brown, Taylor, and Price (2008)) and depression (Zimmerman and Katon (2005)).

Second, it is possible that poorer health, and especially severe health conditions, may result in a larger financial burden, causing financial strain. For example, using the 1995-2001 waves of the Survey of Consumer Finances and simultaneous two-stage probit models, Lyons and Yilmazer (2005) argue that being in fair or poor health increases the probability of financial strain. Authors also find little evidence that financial strain causes poor and fair health. Similarly, using the 2002 and 2004 Health and Retirement Study, Kim and Lyons (2008) argue that severe chronic health conditions increase the likelihood of financial strain among adults, ages 65 years old and older.

Third, other factors may cause the correlation between health and financial strain. Individuals with lower valuation for the future, lower risk aversion and lower self-control are less likely to invest in their health and health behaviors (Barsky et al. (1997); Fuchs (1982); Smith, Bigin, and Bishai (2005)). For instance, those who are more impulsive and have a shorter financial planning horizon are more likely to smoke (Khwaja, Silverman, and Sloan (2007)). At the same time, individuals with a lower risk aversion would be more likely to invest in riskier assets rather than safer assets (Rosen and Wu (2004)), individuals with a lower valuation for the future would be likely to save less (Hendricks (2007)), and individuals with lower self-control may be less likely to control compulsive shopping behavior. Thus, unobserved heterogeneity in individual preferences could produce a correlation between financial strain and health. This hypothesis is supported by Grafova (2007). Using the 1999-2003 waves of the Panel Study of Income Dynamics the author argues that the correlation between having non-collateralized debt,

such as credit card debt, and health behaviors, such as smoking and obesity is not due to any causal explanations, but is rather shaped by other factors, such as preferences.

## **Data**

We conducted the analysis of the relationship between smoking and financial strain using data from the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal survey based on a nationally representative sample of US individuals (men, women, and children) and the family units in which they reside. The PSID began in 1968 and has been conducted annually until 1997 and biannually since then. The PSID concentrates on dynamic aspects of economic, health, and demographic behavior. The four most recent waves of the PSID, namely the 1999, 2001, 2003 and 2005 waves, uniquely combine information on individual smoking behavior with detailed information on family financial status. Thus, we decided to concentrate on these waves in our analysis.

We impose several sample restrictions. First, we limit the sample to household heads and their wives (if present), since the smoking information is available only for these household members. Second, following Lyons and Yilmazer (2005), we drop families with non-positive income from the sample. The PSID sample contains only a few families with negative total family income, arising typically from a business or farm loss. Finally, we exclude the observations that had missing information on the variables used in the analysis. Due to these sample limitations, the original sample of 47,128 person-year observations of household heads and wives dropped to 43,251 person-year observations. The final sample includes 19,497 male person-year observations and 23,754 female person-year observations.

Table 1 shows descriptive statistics of the sample. About 23.33% of men and 29.83% of women in the sample are black. The average respondent is about 44 years old. 28.20% of men and 24.15% of women have a college degree in the sample. An additional 19.50% of men and 21.82% of women have some college education. The median annual family income is \$61,106.14 for men and \$51,911.66 for women.

### *Financial Strain Measures*

We used three measures of financial strain reflecting the concepts of emergency fund availability and financial insolvency. Emergency funds are supposed to help households deal with a financial crisis that may arise due to job loss, death, illness, etc. We utilize two measures of the emergency fund availability (DeVaney (2003)). The first measure shows ***whether a family has less than three months worth of income in liquid assets***. In other words, this measure shows whether a ratio of liquid assets to monthly family income (which is often referred to as ***liquidity ratio*** in the literature) is less than 3. Liquid assets include checking and savings accounts, money market funds, certificates of deposit, government bonds, treasury bills, etc. There is no uniform agreement among financial planners about what cut-off value to use for a liquidity ratio. The recommended range varies from 2 to 6 months. We have conducted some sensitivity checks, using several alternative cut-off points. The results of the regression analysis did not change substantially.

The second measure of emergency fund availability shows ***whether a family has less than six months worth of income in non-pension financial assets***. Mathematically, this measure shows whether a ratio of non-pension financial assets to monthly family income (which is often referred to as ***assets-to-income ratio***) is less than 6. Non-pension financial assets include

liquid assets, as described above, plus stocks, mutual funds, investment trusts, bond funds, and life insurance policy cash value, etc. This measure is intended to reflect how much money would be available in addition to liquid assets in case a crisis occurs. It assumes that a family would need to sell some of their financial assets, such as stocks or mutual funds.

Both liquidity ratio and assets-to-income ratio measures of financial strain reflect the availability of assets for a family if income flow is interrupted. The difference between these two measures is that a liquidity ratio is targeted at the situations when a family financial crisis lasts a relatively short period of time while an assets-to-income ratio is relevant for a lengthier period of financial problems.

The third measure of financial strain used in this paper is financial insolvency. A family is defined to be to be financial insolvent if it has *more liabilities than assets*. In other words, financial insolvency shows whether a ratio of total family assets to total family liabilities (which is often referred to as *solvency ratio*) is less than 1. In this paper, we measure family assets as the total amount of money in real estate (including main home), in checking or savings accounts, money market funds, certificates of deposit, government savings bonds, treasury bills, stock, mutual funds, investment trusts, IRAs, vehicles, farms or businesses that the family owns, etc. This definition of assets does not include pension wealth. Therefore, it excludes private defined contribution and defined benefit plans as well as rights to Social Security wealth. Liabilities are defined as the total amount of money owed as mortgage debt plus debts on farms or businesses that the family owns, plus debt on cars, trucks, a motor home, a trailer, or a boat that the family owns, plus credit card debt, student loans, medical or legal bills, loans from relatives, and other such debts.

Table 2 shows that about 9.03% of men and 10.39% of women in the sample live in the financially insolvent families. About 38.18% of men and 42.23% of women live in the families that have less than 3 month worth of income in liquid assets. Also, about 45.15% of men and 48.85% of women live in the families that have less than 6 months worth of income in non-pension financial assets. These numbers are very similar to the numbers found in the literature. For example, using the 1995, 1998, and 2001 Survey of Consumer Finances, Lyons and Yilmazer (2005) report that 7% of households are insolvent and 40.4% of households have a liquidity ratio of less than 2.5 in their sample.

#### *Financial Strain and Smoking: Descriptive Statistics*

Overall, 23.61% of men and 19.03% of women in the sample smoke. Table 3 shows that men and women residing in the families experiencing financial strain are more likely to smoke. For example, 32.05% of men residing in insolvent families smoke while 22.77% of men residing in solvent families smoke. Similarly, 33.32% of men residing in the families that have less than 3 months worth of income in liquid assets smoke, while only 17.61% of men residing in the families with sufficient liquid assets smoke. Also, 32.75% of men who reside in the families without a sufficient amount of financial assets smoke while only 16.08% of men in the families with a sufficient amount of financial assets smoke. Table 3 shows that smoking prevalence varies by financial strain not only for men but for women too.

#### **Methods**

To explore the relationship between financial strain and smoking further, one needs to take into account various factors that may influence both financial strain and smoking as well as

consider different mechanisms that may shape this association. We first concentrate on the following specification:

$$Smk_{it} = \alpha + \beta_1 FS_{it} + \beta_2 X_{it} + \beta_3 State_{it} + \beta_4 Year_t + \varepsilon_i, \quad (1)$$

where  $Smk_{it}$  is smoking status of individual  $i$  at the year  $t=1999, 2001, 2003, 2005$ ;  $FS_{it}$  is the financial strain status of a family where individual  $i$  resides in year  $t$ . As described above, we use three measures of financial strain  $FS_{it}$  in this paper: whether a family is financially insolvent, whether a family has less than three months worth of income in liquid assets (liquidity ratio measure), and whether a family has less than six month worth of income in non-pension financial assets (assets-to-income measure). We estimate model (1) separately for each of these three measures of financial strain.  $X_{it}$  contains various individual and family factors, such as age, race, education, number of children in the family, family annual income, assets<sup>1</sup>, marital status, unemployment status of both household head and wife, health insurance indicator, and homeowner status. In addition model (1) contains state and year fixed effects.

To begin with, we estimate model (1) using a probit regression technique separately by the gender of a respondent, including one measure of financial strain at a time. To explore the potential impact of financial strain on smoking we re-estimate model (1) separately for each income quartile. This would inform us whether financial strain may impact only low income families or whether it impacts families of various income levels. It would also reflect whether the size of the association between financial strain and smoking stays the same across income quartiles.

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<sup>1</sup> Similarly to Lyons and Yilmazer (2005), the regression that examines the effect of liquidity ratio includes non-liquid assets and does not include income or liquid assets. The regression for assets-to-income ratio does not include income or non-pension financial assets. Instead, it includes family non-financial and pension assets. Non-financial and pension assets include: value of businesses or farms that family owns net of debt; total value of any real estate family owns; total value of all cars, trucks, motor homes, trailers, or boats owned by family; value of other savings such as valuable collections; total amount in IRAs. The regression for solvency ratio includes income, but does not include any measure of assets.

The families in financial strain could be different from families that are not in financial strain on the basis of both observable and unobservable characteristics. This may mean that not having an adequate emergency fund or having more liabilities than assets could be endogenous. Thus, the estimates of impact of family financial strain on smoking from model (1) cannot, in general, be interpreted as causal. It is possible that unobserved factors could be correlated with both family financial strain and smoking, causing an association between them. It is also possible that smoking can cause family financial strain rather than the other way around. For instance, smoking may lead to serious health conditions that may result in large out-of-pocket medical expenditures, causing family financial strain. We are going to use several different approaches to address these statistical problems.

First, we estimate model (1) separately for individuals who never attended college and for individuals who attended college and may or may not have college degree. It has been argued (see Grossman and Kaestner (1997) for literature review) that the relationship between education and health and health behaviors could be due to differences in time preferences for individuals. Individuals who are more future-oriented tend to attend school for longer periods of time and also tend to make larger investments in their health. Thus, it can be argued that individuals who attended college may tend to have on average a higher degree of time preferences for the future than individuals who never attended college. Comparing the strength of the association between financial strain and smoking for these two groups of individuals may shed some light on the potential importance of time preferences.

Second, we estimate model (1) for a subsample that excludes persistent smokers. We define persistent smokers as individuals who smoke in all waves that we observe them. It has been argued that smokers tend to have lower valuation for the future (Fuchs (1982)). It has also

been suggested that smokers are a heterogeneous group and that smokers who do not quit and persist in their habit may have different preferences from the rest of the smokers (Grafova and Stafford (2008)). Persistent smokers could be less risk averse and more myopic than other individuals. Thus, re-estimating model (1) on a sample that excludes *persistent* smokers may provide additional information as to the role of preferences in the association between financial strain and smoking.

Third, we estimate model (1) using individual fixed effects. The identifying assumption of the fixed effects procedure is that the correlation between smoking and unmeasured determinants of financial strain is due to an unmeasured, time-invariant, family-specific effect. Note that this approach does not account for time-variant family-specific effects<sup>2</sup>.

In the approaches described above all families in financial strain are treated similarly. In other words, no distinction is made between the families that have started to experience financial strain recently versus families that have been under financial strain for some time. To examine these differences, we concentrated on the families that were not in financial strain in the 1999 wave of the PSID. The problem is that due to the lack of financial data in the prior waves of the PSID, we cannot identify how long the families that experience financial strain in 1999 have been in such a position. Some of these families probably only started to experience financial strain while other families could potentially be in the condition of chronic financial strain. Thus, we concentrated on the families that were not in financial strain in 1999 and who were present in all four waves of the survey. We estimate the following model:

$$Smk_{it} = \alpha + \beta_1 FSI_{it} + \beta_2 FS23_{it} + \beta_3 X_{it} + \beta_4 State_{it} + \beta_5 Year_t + \varepsilon_i, \quad (2)$$

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<sup>2</sup> We also tried to use an instrumental variable technique. We considered the average state unemployment rate, whether received gifts and inheritances worth \$10,000 or more in the past two year, and an increase in the house value in the past two years as instrumental variables for financial strain measures. Unfortunately, all these instruments were weak.

where  $FS1_{it}$  is a dummy variable that equals one if person  $i$  lives in a family that experiences financial strain at the wave  $t$  but has not experienced it in the prior wave.  $FS23_{it}$  is a dummy variable that equals one if wave  $t$  is the second or the third consecutive wave during which person's  $i$  family experiences financial strain<sup>3</sup>. Thus, model (2) separates families that have only recently experienced the onset of financial strain from the families that have been experiencing financial strain in more than one consecutive wave. Thus, unlike model (1), model (2) can show whether financial strain impacts smoking with lag or whether it has a more immediate effect. Another key difference between models (1) and (2) is that the sample in model (1) includes individuals who are, potentially, in chronic financial strain while the sample in model (2) excludes these individuals. Thus, comparing the size of the association between financial strain and smoking in models (1) and (2) can shed some light on the strength of the potential impact of chronic financial strain.

Finally, we explore the role that medical expenditures may play in shaping the association between financial strain and smoking. As described above, it is possible that smoking may cause serious health conditions that may lead to large out-of-pocket medical expenditures, causing financial strain in the family. To explore this hypothesis, we estimate the following model:

$$FS_{it} = \alpha + \beta_1 Smk_{it} + \beta_2 MedExpenditure_{it} + \beta_3 X_{it} + \beta_4 State_{it} + \beta_5 Year_t + \varepsilon_i, \quad (3)$$

where  $MedExpenditure_{it}$  is the total out-of-pocket family medical expenditure.  $MedExpenditure$  includes out-of-pocket expenditures for doctor, outpatient surgery, and dental bills; out-of-pocket expenditures on prescriptions, nursing home and hospital bills, in-home medical care, special

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<sup>3</sup> We have included families that experience financial strain for the second or the third consecutive wave into one variable since there are very few families that experience financial strain during three consecutive waves. The reason is that only the families that were not in financial strain in 1999 and were in financial strain in both 2001 and 2003 can potentially experience financial strain during three consecutive waves.

facilities, and other such services. Estimating model (3) with and without out-of-pocket medical expenditures could be informative. If medical expenditures play a critical role in shaping the relationship between financial strain and smoking then an estimated coefficient in front of a smoker variable is expected to decrease substantially once medical expenditures are added into model (3).

## Results

Column one in Table 4 shows the estimation results for a baseline specification of model (1). These results indicate that both measures of emergency fund availability are related to smoking. For example, men (women) who live in the families that *do not* have at least three months worth of income in liquid assets are, on average, 8.16% (5.76%) more likely to smoke than men (women) living in families with sufficient liquid assets. Similarly, men (women) living in the families that *do not* have at least 6 months worth of income in non-pension financial assets are, on average, 8.97% (6.03%) more likely to smoke than men (women) living in families with sufficient non-pension financial assets. Interestingly, while Table 3 showed that both men and women in financially insolvent families are more likely to smoke than men and women in financially solvent families, these differences disappear once various individual and family factors are accounted for. Column one in Table 4 shows that men and women residing in financially insolvent families are, on average, about 1% more likely to smoke than men and women in solvent families and these effects are insignificant.

Table 5 explores how the association between financial strain and smoking varies over different income quartiles. Results indicate that emergency fund availability is statistically significantly related to smoking across all four quartiles. This holds true for both liquidity ratio

and assets-to-income ratio indicators. However, the strength of these associations is stronger for individuals in lower income families. For instance, men living in the families that *do not* have six months worth of income in non-pension financial assets are, on average, 14.7% more likely to smoke if their family income is in the lowest quartile and only 4.13% more likely to smoke if their family income is in the highest quartile. Altogether, men and women living in families with insufficient emergency funds are more likely to smoke, with the effect of financial strain being strongest in the lowest income group. With few exceptions, the association between financial insolvency and smoking remains small and insignificant across income quartiles, similar to the baseline estimation of model (1).

The results described above, while interesting and important, do not inform us on the mechanisms behind the associations between financial strain and smoking. In the next several steps we try to shed some light on this question. Columns two and three of Table 4 show estimation results for model (1) by education status. Results indicate that the association between financial strain and smoking does not vary substantially by education. For instance, among women with at least some college education those who are living in families that *do not* have a sufficient emergency fund in liquid assets are, on average, 5.01% more likely to smoke than those women who live in the families with a sufficient amount of liquid assets. A similar number is 5.92% for women who never went to college. The estimated effects of financial insolvency remain, with one exception, small and insignificant.

Table 4 further shows that the above results come in the sharp contrast with the result for the sample that excludes persistent smokers and with fixed effects results. When persistent smokers are excluded from the sample (see column four of Table 4) the estimated effect of financial strain on smoking decreases substantially. For example, men living in the families with

insufficient liquid assets are, on average, 8.16% more likely to smoke than men living in the families with sufficient liquid assets. This number goes down to 3.77% once persistent smokers are excluded from the sample. For women this number goes down from 5.76% to 1.86%. The estimated effects of financial insolvency remain small and insignificant.

Next, we examine the fixed effects results. Since the fixed effects in probit is likely to produce a biased coefficient (Hsiao (1993)) when only four time periods are used, we rely on a fixed effects OLS model that produces a consistent estimate that is easy to interpret and implement. Column five of Table 4 presents OLS pooled cross-sectional estimates to show that OLS method of estimation makes little difference. Column six lists the fixed effects estimates. Estimation results indicate that the association between financial strain and smoking is drastically reduced once fixed effects are applied. The relationship between an emergency fund availability indicators and smoking among women becomes small and insignificant. For men, living in families without an adequate emergency fund is still significantly associated with an increased probability of smoking. However, the size of the effects goes down from 8-9% to 1-2% for both indicators of emergency fund availability. The estimated effects of financial insolvency remain small and insignificant.

Analysis of all results presented in Table 4 paints a very interesting picture. On the one hand, the results of estimation of model (1) by education seem to indicate that the association between smoking and financial strain may not necessarily be driven by preferences. On the other hand, the estimation results of model (1) on a sample excluding persistent smokers and fixed effects results seem to imply that the association between financial strain and smoking is primarily driven by preferences. When reconciling these sets of results it is important to remember that identifying variation in the fixed effects model comes from families that change

their financial strain status over the observed period of time. If the association between financial strain and smoking is strongest for individuals in families with chronic financial strain the fixed effects model is expected to produce the estimates that will be much smaller in size than baseline probit results. In fact, a chronic financial strain seems to be highly prevalent among families in financial strain. Consider, for example, women living in families without an adequate amount of liquid assets. About half of these women do not have adequate liquid assets not just in one wave of the data but in all the waves of the data where we observe these women.

Similarly, a chronic financial strain seems to be more prevalent among persistent smokers than in the rest of the population. Women persistent smokers are twice as likely as women who are not persistent smokers to have inadequate liquid assets in all the waves of the data where we observe these women. Also, persistence in smoking behavior is also very prevalent among smokers. Almost two thirds of all men and women who smoke, report to be smokers in all the waves of the data where we observe them.

Summing up, the results seem to signal that the association between inadequate emergency fund availability and smoking is largely driven by individuals who are in a chronic financial strain and who, also, are more likely to be persistent smokers. Since persistent smokers are likely to be in chronic financial strain and individuals in chronic financial strain are likely to be persistent smokers deciphering causal effects from endogeneous effects presents a serious identification problem. This problem is very similar in its nature to the “reflection” problem described by Manski (1993, p. 532) in his analysis of social interactions: “...the problem is similar to that of interpreting the almost simultaneous movements of a person and his reflection in a mirror. Does the mirror image cause the person's movements or reflect them? An observer who does not understand something of optics and human behavior would not be able to tell.”

While examining financial strain it is important to keep in mind the potential difference between *new spells of financial strain* and *spells of financial strain already in progress*. To highlight these differences, we compare spells of financial strain that were in progress in the 1999 wave to spells of financial strain that started in the 2001 wave. For the purpose of this analysis, we will call the former spells *existing spells* and the latter *new spells that started in the 2001 wave*. To clarify, *the new spells that started in the 2001* refer to individuals who were not in financial strain in the 1999 wave but are in financial strain in the 2001 wave. Table 6 compares the percentage of these existing and new spells of financial strain that continue throughout the entire available data span. In other words, it compares the percentage of existing spells that continues throughout the 2001, 2003, and 2005 waves to the percentage of *new spells that started in the 2001* that continues throughout 2003 and 2005. The results indicate that for emergency fund availability measures of financial strain, existing spells tend to last longer than new spells. For example, 33.54% of men (42.11% of women) who have no adequate liquid assets in the 1999 wave will continue to have no adequate liquid assets throughout the 2005 wave. However, only 21.63% of men (24.56% of women) who had adequate liquid assets in the 1999 wave and had no adequate liquid assets in the 2001 wave will continue to be in financial strain in both the 2003 and 2005 waves. The results for assets-to-income financial strain measure are similar. Summing up, individuals who have insufficient emergency funds at a point in time tend to remain in financially strained situation longer than individuals who only started to experience financial strain.

In the next step of the analysis we limit the sample to families who were not in financial strain in the 1999 wave<sup>4</sup>. The discussion in the paragraph above highlights the importance of this

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<sup>4</sup> There are 10,196 men and women who were present in 1999 wave and had no missing data in 1999 wave. Only 7,421 of these men and women are present in all of 1999, 2001, 2003, and 2005 waves and have no missing data.

sample restriction. The restricted sample excludes *spells of financial strain already in progress* in 1999 and includes *new spells of financial strain* that started after the 1999 wave. This allows us to examine the impact of financial strain onset using model (2). Note that some of these new spells of financial strain that started after the 1999 wave started in the 2001 wave, while others started in the 2003 or the 2005 wave. Table 7 shows the association between smoking and the duration of these new spells of financial strain. In particular, it compares individuals who only started being in financial strain and individuals who have been in financial strain for two or three consecutive waves to individuals who are not in financial strain.

Similar to previous results Table 7 shows no significant association between smoking and insolvency. The results in Table 7 further show that emergency fund availability is related to smoking. The impact of lack of emergency funds seems to have a bigger lag for women than for men.

During the first wave when the family starts to experience the lack of emergency funds availability, women residing in these families are as likely to smoke as women who have adequate emergency funds. During the second or the third consecutive wave of experiencing the lack of emergency funds availability, women residing in these families are, on average, 4-5% more likely to smoke than women who have adequate emergency funds.

Men in the families that only started to experience the lack of emergency funds are about 2-3% more likely to smoke than men who have sufficient emergency funds. The impact that insufficient emergency funds has on male smokers increases only slightly with time. Men in the

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The sample drops down further once the condition of not being in the financial strain in the 1999 wave is imposed. For example, only 4,635 out of these 7,421 men and women have at least three months worth of income in liquid assets in 1999. 4,156 out of these 7,421 men and women have at least six months worth of income in non-pension financial assets in 1999. 6,803 out of these 7,421 men and women are solvent in 1999.

families that experience a lack of emergency funds for two or three consecutive waves are about 3-4% more likely to smoke than men who have sufficient emergency funds.

Thus, the impact of financial strain on smoking seems to be more immediate for men than for women. This gender difference may explain why fixed effects results turned out to be significant for men and not for women. Since the effect of financial strain on smoking for women does not reveal itself until a woman's family is in the second or the third consecutive wave of financial strain, fixed effects results for women were insignificant.

Also, if we compare the estimates of the relationship between financial strain and smoking in Table 7 to the baseline estimates of model (1) in Table 4, we notice that the size of the estimates is much smaller in Table 7. One of the key differences between these two sets of estimates is that the estimates in Table 4 include existing spells of financial strain that are excluded from the consideration in Table 7. Since existing spells of financial strain are more likely to last longer than new spells of financial strain it is another indicator that individuals in chronic financial strain primarily drive the relationship between financial strain and smoking.

So far, the analysis has been devoted to the hypothesis that financial strain causes smoking and that the estimated effect of this causal relationship can be biased due to unobserved heterogeneity. However, as mentioned earlier in the paper, the alternative explanation for the relationship between smoking and financial strain is that smoking can cause financial strain through increased medical expenditure. Table 8 shows the estimation results for model (3) and addresses this hypothesis. Table 8 shows that medical expenditures play an important role in explaining the family financial strain. At the same time, the estimated effect of smoking on financial strain remains almost unchanged when medical expenditures are controlled for. This

signals that smoking causing financial strain via increased medical expenditures is not likely to be the main mechanism shaping the relationship.

## **Conclusions**

We find that certain aspects of financial strain are related to smoking. Specifically, we find that having insufficient emergency funds is related to a higher prevalence of smoking for both men and women. This result holds true for both liquidity ratio and assets-to-income ratio measures of emergency fund availability. However, we also find that for another aspect of financial strain – insolvency – the relationship with smoking disappears once various family and individual characteristics are accounted for.

Deciphering mechanisms behind the association between emergency fund availability and smoking proved to be complicated. The results from model (3) indicate that it is unlikely that the association is driven by smoking causing financial strain via an increased medical expenditure. Thus, the two main hypotheses that may explain the relationship are that either insufficiency of emergency funds causes smoking or that other unobserved factors, such as preferences, cause the correlation between smoking and adequacy of emergency funds.

Distinguishing between these two hypotheses is complicated. Results indicate that the correlation between emergency fund availability and smoking is driven primarily by individuals in chronic financial strain, who are also much more likely to be persistent smokers. When chronic financial strain is strongly related to persistent smoking it is hard to say to what extent the association is causal and to what extent it is driven by unobserved preferences.

However, we have learned something about chronic financial strain. We learned that chronic financial strain seems to be more common among spells of financial strain already in

progress than among new spells of financial strain. Given the panel nature of the data, we were able to concentrate on these new spells of financial strain. We find substantial gender differences. The onset of financial strain impacts women with a delay while for men we do not observe such lag in the effect.

Summing up, we find no evidence that financial insolvency is related to smoking. We find that emergency fund availability is related to smoking. Furthermore, we find that the association between emergency fund availability and smoking is largely driven by individuals in chronic financial strain. The onset of new spells of financial strain due to insufficiency of emergency funds affects both men and women. However, the effect for women is lagged. The average effect of financial strain on smoking is about 2-5% for men and 4-5% for women.

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Table 1: Descriptive Statistics

	Men	Women
Race		
... black, %	23.33	29.83
... other non-white race, %	5.91	5.21
Age, years	44.55	44.14
Education		
... college, %	28.20	24.15
... some college, %	19.50	21.82
... high school or GED, %	33.62	34.22
Non-liquid assets, mean	324,405.3	287,528.3
Non-liquid assets, median	102,000	82,000
Non-financial assets and IRAs, mean	280,563.9	250,532.8
Non-financial assets and IRAs, median	98,000	78,542.02
Annual family income, mean	79,581.93	69,506.98
Annual family income, median	61,106.14	51,911.66
Homeownership (1 does not own a home), %	29.26	33.70
Marital status, %	80.87	66.65
Health insurance <sup>a</sup> , %	92.86	94.22
Unemployment status of head <sup>b</sup> , %	7.53	7.99
Unemployment status of wife <sup>b</sup> , %	5.40	4.44
Number of children in the household	0.90	1.00

<sup>a</sup> This variable shows whether anyone in the family is covered by health insurance in the past two years.

<sup>b</sup> These variables indicate whether a person was unemployed in the past year.

Table 2: Prevalence of Financial Strain (in %) by Gender

	Total Sample	Men	Women
Insolvent	9.77	9.03	10.39
Liquid assets < 3 months of income	40.41	38.18	42.23
Non-pension financial assets < 6 months of income	47.18	45.15	48.85
Sample size	43,251	19,497	23,754

Table 3: Prevalence of Smoking (in %) by Financial Strain Status

	Men		Women	
	Financial Strain		Financial Strain	
	Yes	No	Yes	No
Insolvent	32.05	22.77	26.10	18.21
Liquid assets < 3 months of income	33.32	17.61	25.70	14.16
Non-pension financial assets < 6 months of income	32.75	16.08	25.23	13.12

Table 4: Smoking and Financial Strain

	Dependent Variable: Current Smoking Status					
	Probit Regressions				OLS Regressions	
	Entire Sample	At Least Some College	No College	Exclude Persistent Smokers	OLS	OLS FE
<b>Men sample</b>						
Insolvent	.0306 (.0364) [.0090]	.0100 (.0570) [.0022]	.0721 (.0492) [.0252]	.0323 (.0484) [.0048]	.0089 (.0120)	.0075 (.0086)
Liquid assets < 3 months of income	.2747*** (.0229) [.0816]	.2581*** (.0369) [.0618]	.2760*** (.0296) [.0946]	.2470*** (.0307) [.0377]	.0842*** (.0069)	.0128** (.0051)
Non-pension financial assets < 6 months of income	.3066*** (.0231) [.0897]	.2835*** (.0363) [.0672]	.3140*** (.0306) [.1059]	.2454*** (.0311) [.0366]	.0901*** (.0068)	.0195*** (.0053)
<b>Women sample</b>						
Insolvent	.0283 (.0319) [.0072]	-.0044 (.0504) [-.0009]	.0830* (.0432) [.0247]	-.0179 (.0435) [-.0022]	.0076 (.0095)	.0004 (.0071)
Liquid assets < 3 months of income	.2259*** (.0222) [.0576]	.2423*** (.0353) [.0501]	.2048*** (.0292) [.0592]	.1451*** (.0302) [.0186]	.0610*** (.0058)	-.0044 (.0041)
Non-pension financial assets < 6 months of income	.2403*** (.0226) [.0603]	.2462*** (.0351) [.0500]	.2359*** (.0302) [.0673]	.1754*** (.0305) [.0222]	.0616*** (.0057)	-.0007 (.0042)

Notes: 1. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

2. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one.

3. Other regressors include age, race, education, number of children in the family, marital status, unemployment status of both household head and wife, health insurance indicator, homeowner status, and state and year fixed effects. The regression that examines the effect of liquidity ratio also includes total amount of family non-liquid assets. The regression for assets-to-income ratio includes family non-financial and assets and IRAs. The regression for solvency ratio includes income.

Table 5: The Effect of Financial Strain on Smoking by Income Quartile (Probit Models)

	1st Quartile (lowest income)	2nd Quartile	3rd Quartile	4th Quartile (highest income)
<b>Men sample</b>				
Insolvent	-.0141 (.0570) [-.0051]	.0342 (.0657) [.0110]	.1423* (.0839) [.0403]	-.3691** (.1599) [-.0546]
Liquid assets < 3 months of income	.4343*** (.0449) [.1527]	.2394*** (.0437) [.0766]	.2259*** (.0467) [.0630]	.0724*** (.0575) [.0137]
Non-pension financial assets < 6 months of income	.4237*** (.0478) [.1470]	.2753*** (.0450) [.0867]	.2466*** (.0451) [.0676]	.2093*** (.0539) [.0413]
<b>Women sample</b>				
Insolvent	.0376 (.0520) [.0114]	-.0174 (.0576) [-.0047]	.0314 (.0706) [.0078]	.0989 (.1179) [.0188]
Liquid assets < 3 months of income	.3317*** (.0462) [.0951]	.2771*** (.0424) [.0748]	.1633*** (.0434) [.0410]	.1415*** (.0522) [.0267]
Non-pension financial assets < 6 months of income	.2950*** (.0489) [.0840]	.2723*** (.0440) [.0721]	.1980*** (.0429) [.0491]	.2328*** (.0492) [.0445]

Notes: 1. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

2. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one.

3. Other regressors include age, race, education, number of children in the family, marital status, unemployment status of both household head and wife, health insurance indicator, homeowner status, and state and year fixed effects. The regression that examines the effect of liquidity ratio also includes total amount of family non-liquid assets. The regression for assets-to-income ratio includes family non-financial and assets and IRAs. The regression for solvency ratio includes income.

Table 6: Percentage of Spells Already in Progress in the 1999 Wave and the percentage of Spells New in 2001 that Continue Until the 2005 Wave

	% of Existing Spells that Continues <sup>a</sup>	% of New Spells that Continues <sup>b</sup>
<b>Men</b>		
Insolvent	12.93	13.86
Liquid assets < 3 months of income	33.54	21.63
Non-pension financial assets < 6 months of income	44.27	27.20
<b>Women</b>		
Insolvent	13.21	21.05
Liquid assets < 3 months of income	42.11	24.56
Non-pension financial assets < 6 months of income	50.34	29.57

<sup>a</sup>Percentage of individuals who will continue being in financial strain in all of the 2001, 2003, and 2005 waves out of those who are in financial strain in the 1999 wave.

<sup>b</sup>Percentage of individuals who will continue being in financial strain in both of the 2003 and 2005 waves out of those who are in financial strain in the 2001 wave but not in financial strain in the 1999 wave.

Table 7: Smoking Prevalence and the Duration of New Spells of Financial Strain

	Men	Women
<b>Insolvent during</b>		
... one wave	.0067 (.0887) [.0017]	.0626 (.0720) [.0138]
... two or three consecutive waves	-.0937 (.1788) [-.0220]	.0572 (.1197) [.0125]
Number of observations	9,057	11,352
<b>Liquid assets &lt; 3 months of income during</b>		
... one wave	.1018* (.0583) [.0235]	.0911 (.0564) [.0166]
... two or three consecutive waves	.1191 (.0852) [.0277]	.2557*** (.0772) [.0514]
Number of observations	6,417	7,488
<b>Non-pension financial assets &lt; 6 months of income during</b>		
... one wave	.1553** (.0620) [.0326]	.0445 (.0612) [.0075]
... two or three consecutive waves	.2225** (.0870) [.0485]	.2171*** (.0823) [.0409]
Number of observations	5,775	6,693

Notes: 1. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

2. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one.

3. Other regressors include age, race, education, number of children in the family, marital status, unemployment status of both household head and wife, health insurance indicator, homeowner status, and state and year fixed effects. The regression that examines the effect of liquidity ratio also includes total amount of family non-liquid assets. The regression for assets-to-income ratio includes family non-financial and assets and IRAs. The regression for solvency ratio includes income.

4. For each of the financial strain indicators the sample is limited to families that had no such type of financial strain in the 1999 wave of PSID.

Table 8: The Effect of Medical Expenditures on Financial Strain

	Men		Women	
<b>Dependent Variable: Insolvent</b>				
Smoker	.0290 (.0348)	.0310 (.0349)	.0393 (.0314)	.0383 (.0315)
Total annual family out-of-pocket medical expenditure, in \$1,000		.0297*** (.0053)		.0234*** (.0052)
Total annual family out-of-pocket medical expenditure squared		-.0002** (.0001)		-.0002** (.0001)
<b>Dependent Variable: Liquid Assets &lt; 3 Months of Income</b>				
Smoker	.2923*** (.0244)	.2919*** (.0244)	.2559*** (.0242)	.2564*** (.0242)
Total annual family out-of-pocket medical expenditure, in \$1,000		-.0081** (.0036)		-.0093*** (.0029)
Total annual family out-of-pocket medical expenditure squared		.00003** (.00001)		.00004*** (.00001)
<b>Dependent Variable: Non-pension Financial Assets &lt; 6 Months of Income</b>				
Smoker	.3323*** (.0249)	.3319*** (.0249)	.2612*** (.0248)	.2635*** (.0248)
Total annual family out-of-pocket medical expenditure, in \$1,000		-.0137*** (.0042)		-.0193*** (.0037)
Total annual family out-of-pocket medical expenditure squared		.00013 (.00008)		.00017*** (.00005)

- Notes: 1. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%
2. Sample size in this regression is slightly different than the sample size in the main table because some observations are missing on medical expenditure data.
3. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one.
4. Other regressors include age, race, education, number of children in the family, marital status, unemployment status of both household head and wife, health insurance indicator, homeowner status, and state and year fixed effects. The regression that examines the effect of liquidity ratio also includes total amount of family non-liquid assets. The regression for assets-to-income ratio includes family non-financial and assets and IRAs. The regression for solvency ratio includes income.