

# Time preferences, socioeconomic status and smokers' behaviours, attitudes and risk awareness.

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## ABSTRACT

**Aims.** To study the relationship between time preferences, socioeconomic status, and smoking behaviours, attitudes and risk awareness. **Methods.** We built two scales measuring respectively planning horizon and impulsivity. We also used various indicators of socioeconomic status together with participants' age and gender. These indicators were introduced in logistic regressions modelling smoking status as well as, among smokers only, concern towards anti-tobacco campaigns, quitting attempt, consumption reduction, fear of smoking-related cancer and risk perception. **Data.** A French national telephone survey conducted in 2008, with a random sample representative of French aged 18-75 (N=2000, 621 smokers). **Findings.** Most indicators of lower SES, as well as smoking status, were correlated to present orientation and impulsivity. When modeling smoking status, time preferences and lower SES indicators were significant predictors. Among smokers, several indicators of lower SES and present-orientation were predictive of several smoking related outcome: low concern toward anti-tobacco campaigns, not reporting recent behavioural changes, not expressing personal fear of smoking related cancer and low risk awareness. When time preferences were introduced in the analysis, the effects of several lower SES indicators became non-significant. **Conclusions/Implications.** Time preference is strongly correlated to smoking status, but it also a major determinant of other smoking-related outcomes, including risk perceptions and attitudes toward anti-smoking media campaign. The strong and well-known relationship between socioeconomic status and smoking behaviours, attitudes and beliefs may be partly mediated by time preference. Our results also call for further research regarding the endogeneity of time preference.

# **Time preferences, socioeconomic status and smokers' behaviours, attitudes and risk awareness.**

## **1. INTRODUCTION**

### ***1.1. The increasing social differentiation of smoking.***

According to the World Health Organization (WHO), cigarette smoking is the second major cause of death in the world, with about 5 million deaths each year (WHO, 2003). In France, cigarette smoking causes every year about 60,000 premature deaths (Hill & Laplanche, 2004), and the social cost of smoking has been estimated at 1.1% of the Gross Domestic Product (Kopp & Fenoglio, 2000). Most developed countries, including France, have joined the 'global war' on smoking launched by the WHO, with extensive tobacco control policies including high cigarette taxes, smoking ban in enclosed public places, restrictions on advertising and selling, as well as public education campaigns and health warnings on cigarette packs. In many countries, these policies have been successful in reducing tobacco use, but the decrease in smoking prevalence has been accompanied by its increased 'social differentiation': the smoking prevalence increasingly varies across the socioeconomic spectrum, to the detriment of people of lower socioeconomic status (SES).

For example, in the USA, the most deprived smokers attempt to quit as frequently as others, but succeed a lot less frequently (Kotz & West, 2009), while living under the poverty threshold is strongly correlated with smoking (Barbeau et al., 2000; Agrawal et al., 2008). Regarding the UK, between 1970 and 1990, smoking prevalence halved among professional and managerial categories, but fell only by one third among unskilled manual workers (Marsh & McKay, 1994), and a more recent study found that the social differentiation of smoking increases across the life-course (Jefferis et al., 2004). Comparative studies conducted among several European countries also concluded that the negative correlation between smoking prevalence and educational level have amplified between 1985 and 2000, especially in Scandinavian countries, Germany, Italy and Spain (Federico et al., 2004; Giskes et al., 2005). In France, between 2000 and 2007, smoking prevalence decreased by 22% among executive managers and professionals, by 11% among manual workers, and did not decrease among the unemployed, while indicators of an underprivileged social situation

(educational level, manual occupation, unemployment) were associated more markedly with smoking in 2005 than in 2000 (Peretti-Watel et al., 2009).

### ***1.2. Cigarette smoking, SES and present orientation.***

This increasing social differentiation of cigarette smoking is problematic, especially since reducing social inequalities in the field of health, in particular with regard to the distribution patterns of risk-related behaviours, including tobacco use, is another priority objective of public health authorities, in France as in many other countries. Why do people of lower SES are more prone to persist in smoking? First, those people, who have a lower educational level, may have greater difficulty in understanding the information spread by preventive campaigns, especially since this information is frequently based on statistical arguments that are not so easy to understand. This is consistent with the positive correlation found between a low educational level and the under-estimation of the health hazards of smoking (Feng, 2005; Peretti-Watel et al., 2007). Secondly, the most deprived smokers may be less likely to quit because they are more prone to consider tobacco as a necessity good, since they frequently use it to cope with the hardship of their everyday life (Graham, 1994; Krueger & Chang, 2008; Constance & Peretti-Watel, 2010).

But one should also take into account the fact that the most serious adverse health effects from cigarette smoking occur many years in the future, while the benefits of smoking are immediate. For this reason, people of lower SES could have less incentive to worry about these adverse effects. For example, the disutility attached to future smoking-related illness and therefore premature death is higher for an executive manager than for a manual worker, because the first one is likely to live longer and with a better pension (Harris & Harris, 1996). Moreover, sociological studies of poverty showed that material difficulties usually shrink the temporal horizon of those experiencing them (Halbwachs, 1913; Lewis, 1969). A classical study conducted in the UK during the 1950s also concluded that a strong present-orientation was a typical feature of the working class culture (Hoggart, 1957). In other words, people of lower SES may be more prone to persistent smoking partly because they are more present-oriented. This hypothesis sounds especially relevant for the most deprived people: the risk of having a smoking-related cancer in thirty years may not weigh much for individuals who do not know what is in store for them the next day.

### ***1.3 Time preferences: a key feature for studying contrasted smoking behaviours.***

In economics the individual is modeled as a coherent and consistent set of preferences and cognitive abilities, including time preferences. The rate of time preference is usually defined as the marginal rate of substitution between current and future utility: it refers to an individual's willingness to exchange utility today for utility later. Conversely, the discount factor measures an individual's propensity to discount the value of future utility: a small discount factor means that she/he is impatient. Time preferences are a key component of the theory of rational addiction, which is especially relevant to consider cigarette smoking from an economic point of view. This theory makes three assumptions regarding time preferences: time preferences are stable, they greatly vary from one individual to another, and people who discount the future heavily are more likely to become addicted (Becker & Murphy, 1988). Concerning the interindividual variations in time preferences, Rogers (1994) and Breuer et al. (2011) mentioned that time preference is shaped by learning and culture. Other authors claimed that schooling increases patience (Leigh, 1986; Becker & Mulligan, 1997). Becker and Mulligan also quoted some "great predecessors" to support their point: they referred to Eugen Böhm-Bawerk, who once stated that patience is associated with income, development, and education, while Irving Fisher used to consider that poverty increases present-orientation.

The importance of time preferences for choices related to cigarette smoking is self-evident: the decision to smoke represents an intertemporal trade-off between immediate benefits and delayed costs, and conversely the decision to quit represents an intertemporal trade-off between immediate costs and delayed rewards. Nevertheless, testing empirically the impact of time preferences on smoking decisions is not so easy, because time preferences are quite difficult to measure. For example, the most common method to assess one's discount factor consists in using hypothetical scenarios regarding willingness to exchange money today for (more) money in the future. But using this method Khwaja, Silverman & Sloan found no significant relationship between revealed rates of time discounting and smoking status (Khwaja et al., 2007). On the other hand, they found that their respondents' smoking status was strongly correlated to alternative measures of time preferences, namely scores of impulsivity and length of financial horizon, based on respondents' level of agreement with various assertions. Similar scores have been already proposed by Arrondel, Masson and Verger (2002), who argued that impulsivity is an indicator of time preference at a very short term, while planning horizon rather refers to medium or long term. Similar scores also

exist in social psychology since the 1960s (Calabresi & Cohen, 1968), and social psychologists distinguish more than two aspects in time perspective (see for example the five dimensions of the Zimbardo Time Perspective Inventory: past-negative, present-hedonistic, future, past-positive, and present-fatalistic, Zimbardo & Boyd, 1999).

In this article, in order to contribute to a better understanding of the increasing social differentiation of cigarette smoking, we investigated the determinants of various smokers' behaviours, attitudes and risk awareness, with a focus on indicators measuring a lower SES on the one hand, and time preferences on the other hand. We used two scores measuring planning horizon and impulsivity respectively, and we assumed that these scores would capture a part of the explanatory power of indicators of a lower SES.

## **2. MATERIALS AND METHODS**

### ***2.1 Sample.***

We used data from a national telephone survey carried out by the French Institute for Health Promotion and Health Education in June-July 2008. This survey focused on people's unhealthy behaviours, especially cigarette smoking. Many questions also dealt with their knowledge, attitudes, beliefs and reactions to prevention campaigns. We used random digit dialling to obtain listed and unlisted telephone numbers. The corresponding households were forewarned by a letter announcing the survey. In each household, a professional interviewer randomly selected one person aged 18-75 to undergo the interview. Overall, 2,000 people were interviewed (response rate: 71%).

The resulting sample was weighted by the inverse of the household size (the probability of being asked to participate was inversely proportional to this variable). We also used data collected in 2007 by the National Institute of Statistics and Economic Studies to calculate weights so that our sample would be representative of French aged 18-75 in terms of age, gender, education, size of town and geographical area.

Among the 2,000 participants, 621 reported smoking cigarettes at least occasionally at the time of the survey and specific questions were asked to them, including some retrospective ones (e.g. age at smoking initiation). Non smokers were also asked retrospectively about their past smoking behavior (including age at cessation for those who used to smoke).

### ***2.2 Questionnaire.***

This survey covered a wide range of health-related topics. Only the questions used in the present study will be mentioned here.

First, regarding participants' socio-demographic characteristics and socio-economic status, the questionnaire provided the following indicators: gender, age, educational level, job status, occupation (we used a dummy indicating whether or not the respondent was a manual worker), financial resources of the household (<1,500 euros *versus*  $\geq$ 1,500 euros per month) and variation of these resources during the 5 last years (with a dummy for those who reported a strong decrease).

Secondly, the respondents' time preferences were determined by asking whether they agreed with eight statements borrowed from previous studies conducted in the fields of economics and social psychology (Zimbardo & Boyd, 1999; Arrondel et al., 2002; Khwaja et al., 2007): "*I often think about what my life will be like ten years from now*" (plan1), "*I prefer to enjoy the present, instead of worrying about the future*" (plan2), "*I am ready to go without some pleasures in order to live a few years longer*" (plan3), "*I prefer to enjoy spending the money I earn instead of putting it aside for the future*" (plan4) for planning horizon, "*sometimes I behave impulsively and I regret it later*" (imp1), "*I know how to keep disruptive emotions and impulses under control*" (imp2), "*I base my decisions on my instinct instead of balancing the pros and the cons*" (imp3), "*Once a make a decision I stick to it*" (imp4) for impulsivity. The response items were encoded from 0 to 3 ("I strongly agree"=3, "I agree"=2, "I disagree"=1, "I strongly disagree"=0.) and the resulting numerical outcomes were summed to obtain two scales ranging from 0 to 12, for planning horizon (plan1-plan2+plan3-plan4) and impulsivity (imp1-imp2+imp3-imp4) respectively. We assumed that a high (low) score for planning horizon reveals future (present) orientation.

Thirdly, regarding smoking-related behaviours, attitudes and beliefs, we used the following variables: smoking status (current/former/never smoker), and, for smokers only, cigarette consumption (>10 cigarettes per day or less), timing of the first cigarette smoked in the day (a good indicator of nicotine dependence, see Heatherton et al., 1991), changes in smoking behaviours during the past 12 months (smoking less cigarettes, quitting attempt for at least one week), attitude towards anti-tobacco campaigns conducted in 2006-2008 (feeling personally concerned by them: very, a little, *versus* not really, not at all), personal fear of smoking related cancer (yes a lot, yes a little *versus* not really, not at all) and, finally, two questions dealing with risk perception: first, respondents were asked how many of 100 smokers would die of a

tobacco-related disease (numerical responses were collapsed into a binary outcome: [0-49] *versus* [50-100]) and, secondly, how many years of life would lose, on average, a smoker who never quit (numerical responses were collapsed into a binary outcome: [0-9 years] *versus*  $\geq 10$  years).

### **2.3 Analysis.**

We first detailed the variations of the planning horizon and impulsivity scores depending on respondents' sociodemographic background and smoking status, using standard ANOVA tests to compare mean scores across the whole sample (N=2,000). Then we computed a logistic regression to model respondents' smoking status (current smoker *versus* never/former smokers), using a two-step approach: in the first step, the covariates were socio-demographic and SES indicators only, and in the second step we added time preferences.

Subsequent analyses were carried out on the subsample of smokers (N=621) only. We used the same two-step approach to model successively: attitude towards recent anti-tobacco campaigns, changes in smoking behaviour during the past 12 months (consumption reduction and quitting attempt), personal fear of smoking related cancer, and tobacco risk awareness (considering that at least 50 smokers out of 100 would die of a tobacco-related disease, considering that persistent smokers lose at least 10 years of life expectancy). As these outcomes may depend on consumption level and nicotine dependence, we introduced corresponding indicators in the analysis (except for consumption level when modeling consumption reduction, as the number of cigarettes smoked everyday is directly impacted by a reduction of consumption). Due to the small size of the smokers subsample, we only kept in the estimated models the most significant covariates (selected with the stepwise method, at selection threshold  $p > 0.1$  with the Wald  $\chi^2$  test).

## **3. RESULTS**

### **3.1 Times preferences, SES and smoking status.**

The correlation coefficient between the two scores measuring planning horizon and impulsivity respectively was negative and statistically significant (-0.18,  $p < 0.001$ ). Table 1 shows the variations of the planning horizon and impulsivity scores depending on respondents' gender, age, SES and smoking status.

Regarding planning horizon, women were more future-oriented than men ( $p < 0.1$ ), and future orientation increased with educational level ( $p < 0.05$ ). Manual workers,

unemployed people and those with low financial resources were more present-oriented than their counterparts. The planning horizon also vary significantly with smoking status: never smokers were the most future-oriented, while current were the most present-oriented.

The score measuring impulsivity was significantly correlated to every indicator considered, except for respondents' age. Women obtained a higher mean score, and impulsivity decreased with educational level. Regarding indicators of a lower SES, the impulsivity score was higher among manual workers, unemployed people, respondents whose household had financial resources inferior to 1,500 euros / month, as well as among those who reported a strong decrease in their household's resources during the past 5 years. Finally, regarding smoking status, current smokers were more impulsive than never and former smokers.

**Table 1. Socio-demographic background, SES, smoking status and time preferences (N=2000, INPES 2008).**

	<i>column %</i>	<i>Planning horizon mean score</i>	<i>impulsivity mean score</i>
Gender:			
- man	49%	5.44	4.78
- woman	51%	5.64 #	5.33 ***
Age:			
- 18-24	13%	5.63	5.03
- 25-34	18%	5.56	5.19
- 35-49	30%	5.42	4.94
- 50-75	39%	5.59 ns	5.10 ns
Educational level:			
- < high-school	58%	5.42	5.37
- high-school, 1 <sup>st</sup> university degree	29%	5.67	4.81
- > 1 <sup>st</sup> university degree	13%	5.78 *	4.21 ***
Occupations:			
- manual worker	23%	5.10	5.36
- other	77%	5.56 *	4.97 ***
Job status:			
- unemployed	5%	5.16	5.45
- employed, other	95%	6.10 **	5.04 *
Financial resources of the household:			
- <1,500 euros / month	20%	5.10	5.42
- ≥1,500 euros / month	80%	5.76 *	4.97 ***
Variations in financial resources (past 5 years):			
- stability/increase/slight decrease	86%	5.24	5.02
- strong decrease	14%	5.18 ns	5.33 *
Smoking status :			
- never smoker	47%	5.74	4.97
- former smoker	22%	5.55	4.96
- current smoker	31%	5.23 ***	5.26 *

\*\*\*, \*\*, \*, #, ns: respectively statistically significant at  $p < 0.001$ ,  $p < 0.01$ ,  $p < 0.05$ ,  $p < 0.1$ , non significant (multiple T-tests for comparing means).

In Table 2, the second column detailed the socio-demographic and SES indicators associated with current smoking when time preferences were not included in the analysis. Men, people aged 18-24 and those with an educational level under 1<sup>st</sup> university degree were more likely to report current smoking. Regarding low SES, all indicators were significant predictors of current smoking, except for household's income level: manual workers (OR=1.23), unemployed people (OR=1.58), and reporting a strong decrease in one's household financial resources during the past 5 years (OR=1.45).

**Table 2. Factors associated with current smoking (logistic regressions, N=2000, INPES 2008).**

	Step 1: model without time preferences:	Step 2: model including time preferences:
<i>Odds ratios (OR)</i>		
Gender:		
- man (ref.)	-1-	-1-
- woman	0.80 *	0.79 *
Age:		
- 18-24 (ref.)	-1-	-1-
- 25-34	1.10 ns	1.08 ns
- 35-49	0.60 **	0.59 **
- 50-75	0.22 ***	0.22 ***
Educational level:		
- < high-school (ref.)	-1-	-1-
- high-school, 1 <sup>st</sup> university degree	0.92 ns	0.98 ns
- > 1 <sup>st</sup> university degree	0.77 *	0.71 ns
Occupations:		
- manual worker	1.23 #	1.22 #
- other (ref.)	-1-	-1-
Job status:		
- unemployed	1.58 *	1.48 *
- employed, other (ref.)	-1-	-1-
Financial resources of the household:		
- <1,500 euros / month	0.89 ns	0.99 ns
- ≥1,500 euros / month (ref.)	-1-	-1-
Variations in financial resources (past 5 years):		
- stability/increase/slight decrease	1.45 *	1.43 *
- strong decrease (ref.)	-1-	-1-
Planning horizon score	_____	0.93 ***
Impulsivity score	_____	1.05 *

\*\*\*, \*\*, \*, #, ns: respectively statistically significant at p<0.001, p<0.01, p<0.05, p<0.1, non significant (Wald's  $\chi^2$  for odds ratios).

In the second-step model, planning horizon and impulsivity were significant predictors of current smoking: once controlled for the effects of socio-demographic and SES indicators, the more people were present-oriented or impulsive, the more they were likely to report smoking at the time of the survey. The odds ratios estimated for socio-demographic and SES indicators remained very close to estimates from the first-step model, except for educational level: once controlled for the effects of planning horizon and impulsivity, educational level was no longer a significant predictor of current smoking.

### ***3.2 Time preferences, SES and smokers' behaviours, attitudes and risk perception.***

Table 3 showed the results of logistic modeling for smokers' concern toward anti-tobacco campaign and recent behavioural changes. Smokers aged 25-34 (OR=1.66) and those who were more addicted to nicotine (they smoked their first cigarette early in the morning, OR=1.59) were more likely to feel personally concerned by anti-tobacco campaigns. On the contrary, manual workers (OR=0.65) and smokers reporting a strong decrease in their income during the past 5 years (OR=0.47) were less likely to feel so. In step 2, future-oriented smokers were more prone to feel concerned by preventive campaigns, while the effect of impulsivity was not significant. Other estimated effects remained very similar, except for age, which effect was no longer significant.

Regarding recent behavioural changes, manual workers were more likely to report a reduction in their cigarette consumption during the previous 12 months (OR=1.76), while older smokers (OR=0.68), the unemployed ones (OR=0.55) and those who were more addicted to nicotine (OR=0.61) were less likely to do so. One again, in step 2, the age effect was no longer significant but other estimated effects remained very similar, and future orientation was a significant predictor of consumption reduction.

Regarding quitting attempts, in step 1 we found several significant predictors: being aged 18-24, reporting a high educational level and a low level of financial resources. On the contrary, heavier smokers (those who smoked more than 10 cigarettes per day) and the most dependent ones were less likely to report a quitting attempt during the last 12 months. In step 2, the education effect was no longer significant, while other effects remained close to estimates from step 1. Both indicators of time preferences exhibited a significant odds ratio: future-oriented smokers were more prone to try to quit, and more impulsive ones were less likely to do so.

**Table 3. Factors associated with smokers' attitudes and behavioural changes (logistic regressions, N=621, INPES 2008).**

	Feeling personally concerned by anti-tobacco campaigns		Behavioural changes during the past 12 months: reduction of consumption quitting attempt			
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	<i>Odds ratios (OR)</i>					
Gender:						
- man	NS	NS	NS	NS	NS	NS
- woman						
Age:						
- 18-24	-1-	NS	-1-	NS	-1-	-1-
- 25-34	1.66 #		0.89 ns		0.29 ***	0.31 ***
- 35-49	1.02 ns		0.96 ns		0.33 ***	0.34 ***
- 50-75	0.67 ns		0.68 #		0.26 ***	0.27 ***
Educational level:						
- < high-school	NS	NS	NS	NS	-1-	NS
- high-school, 1 <sup>st</sup> university degree					0.86 ns	
- > 1 <sup>st</sup> university degree					1.38 #	
Occupations:						
- manual worker	0.65 *	0.68 *	1.49 *	1.47 *	NS	NS
- other	-1-	-1-	-1-	-1-		
Job status:						
- unemployed	NS	NS	0.55 #	0.50 *	NS	NS
- employed, other			-1-	-1-		
Financial resources of the household:						
- <1,500 euros / month	NS	NS	NS	NS	1.88 **	1.82 **
- ≥1,500 euros / month					-1-	-1-
Variations in resources (past 5 years):						
- stability/increase/slight decrease	0.47 **	0.40 ***	NS	NS	NS	NS
- strong decrease	-1-	-1-				
Smoking the first cigarette:						
- within the first 30mn after waking up	1.59*	1.53*	0.61 **	0.61 **	0.54 *	0.55 *
- later	-1-	-1-	-1-	-1-	-1-	-1-
Cigarette consumption :						
- >10 cigarettes per day	NS	NS	—	—	0.26 ***	0.26 ***
- ≤10 cigarettes per day					-1-	-1-
Planning horizon score	—	1.10 **	—	1.10 **	—	1.06 *
Impulsivity score	—	NS	—	NS	—	0.94 *

\*\*\*, \*\*, \*, #, ns: respectively statistically significant at p<0.001, p<0.01, p<0.05, p<0.1, non significant (Wald's  $\chi^2$  for odds ratios).

NS: variable not selected by the stepwise procedure.

Regarding personal fear of smoking related cancer (see Table 4), smokers aged 25-34 and heavier smokers were more likely to express such fear (OR=2.31 and 2.19 respectively), while the more educated ones and those who experienced a strong decrease of their income during the past 5 years were less likely to do so. In step 2, only the effect of a strong income decrease vanished, and present-orientation appeared as a significant predictor of personal fear of tobacco related cancer. For the first indicator of risk perception, considering that at least 50 smokers out of 100 will die of a smoking related disease, we only presented the results of the step 2 model, as both indicators of

time preferences were not significant predictors. Smokers aged 25-34 were more prone to endorse this opinion (OR=1.58), while the older ones and manual workers were less likely to do so (OR=0.66 and 0.63 respectively).

**Table 4. Factors associated with smokers' fear and risk awareness (logistic regressions, N=621, INPES 2008).**

	Personal fear of smoking related cancer		Risk awareness: ≥50/100 smokers will die of a tobacco-related disease		
	Step 1	Step 2	Step 2	Step 1	Step 2
	<i>Odds ratios (OR)</i>				
Gender:					
- man	NS	NS	NS	NS	NS
- woman					
Age:					
- 18-24	-1-	-1-	-1-	-1-	1-
- 25-34	2.31 **	2.27 **	1.58 #	1.00 ns	0.99 ns
- 35-49	1.07 ns	1.02 ns	1.30 ns	0.77 ns	0.78 ns
- 50-75	0.75 ns	0.68ns	0.66 #	0.41 ***	0.41 **
Educational level:					
- < high-school	-1-	-1-	-1-	NS	NS
- high-school, 1 <sup>st</sup> university degree	1.31 ns	1.29 ns	0.83 ns		
- > 1 <sup>st</sup> university degree	0.61 #	0.64 #	0.49 *		
Occupations:					
- manual worker	NS	NS	0.63 *	NS	NS
- other			-1-		
Job status:					
- unemployed	NS	NS	NS	NS	NS
- employed, other					
Financial resources of the household:					
- <1,500 euros / month	NS	NS	NS	0.67 #	NS
- ≥1,500 euros / month				-1-	
Variations in resources (past 5 years):					
- stability/increase/slight decrease	-1-	NS	NS	-1-	NS
- strong decrease	0.69 #			0.63 *	
Smoking the first cigarette:					
- within the first 30mn after waking up	NS	NS	NS	NS	NS
- later					
Cigarette consumption :					
- >10 cigarettes per day	2.19 ***	2.37 ***	NS	NS	NS
- ≤10 cigarettes per day	-1-	-1-			
Planning horizon score	___	1.23 ***	NS	___	1.07 *
Impulsivity score	___	NS	NS	___	NS

\*\*\*, \*\*, \*, #, ns: respectively statistically significant at p<0.001, p<0.01, p<0.05, p<0.1, non significant (Wald's  $\chi^2$  for odds ratios).  
NS: variable not selected by the stepwise procedure.

Finally, older smokers were less prone to consider that lifetime smokers lose at least 10 years of life expectancy (OR=0.41), as well as low income smokers (OR=0.67) and those who reported a strong income decrease (OR=0.63). In step 2, the effects of income level and income decrease became non-significant, while the planning horizon score was selected as a significant predictor.

## **4. DISCUSSION**

### **4.1 Main results.**

We built two scales measuring respectively planning horizon (present/future orientation) and impulsivity. Most indicators of lower SES, as well as smoking status, were significantly correlated to present orientation and impulsivity. When modeling smoking status, time preferences and lower SES indicators were significant predictors. Among smokers, several indicators of lower SES and present-orientation were predictive of low concern toward anti-tobacco campaigns. Regarding recent behavioural changes, we obtained more mixed results for indicators of lower SES, while impulsivity was predictive of quitting attempt, and present orientation was predictive of both quitting attempt and reduction of cigarette consumption. Present orientation and several lower SES indicators were also positively correlated to personal fear of smoking related cancer (but the more educated were less likely to express such fear) and one indicator of risk awareness (considering that smokers lose at least 10 years of life). Moreover, in several occasions, when planning horizon and impulsivity were introduced in the analysis, the effects of several SES indicators became non-significant (especially for educational level, when modeling smoking status and recent quitting attempt).

### **4.2 Some shortcomings of the present study.**

Before discussing our results, we must acknowledge several shortcomings of the present study. Firstly, because of the small size of our smokers' subsample, our analyses lack statistical power. Secondly, we built scales for measuring planning horizon and impulsivity, but these scales need more investigations to test their accuracy and their reliability, especially since they try to capture general attitudes, as several authors claimed that time preferences may be domain-specific (for example, one could be present-oriented for professional issues, but future-oriented concerning health issues) (Khwaja et al., 2007; Cawley & Ruhm, 2011). Finally, we did not take into account some endogeneity issues which are discussed below.

### **4.3 The potential endogeneity of time preferences and SES/cigarette smoking.**

We found strong evidence that time preferences and socioeconomic status were correlated: respondents with a low SES were present-oriented and more impulsive. As previously discussed in the Introduction section, socioeconomic hardship may shorten time horizon. Moreover, schooling focuses students' attention on the future and could help them learning patience and planning skills (Becker & Mulligan, 1997). But conversely a low SES could be the consequence of present orientation and impulsivity / lack of self-control: for example, self-control and the propensity to plan may help academic achievement and wealth accumulation (Farrell & Fuchs, 1982; Ameriks et al., 2003).

We also found that present-oriented and impulsive people were more prone to cigarette smoking, like Khwaja et al. (2007). Moreover, impulsive smokers were less likely to report a recent quitting attempt, while a previous study found that impulsivity / lack of self-control was correlated to unsuccessful attempts (Feng, 2007). But conversely some authors argued that addictive behaviours alters people's time preferences and induce them to discount the future more heavily (Becker & Mulligan, 1997). Bretteville-Jansen (1999) found some empirical evidence supporting this point: heroin users are more present-oriented than non-users, but former users were less present-oriented than current users. Similarly, we found that former smokers were less present-oriented and less impulsive than current smokers.

#### **4.4 Does SES mediate the impact of time preferences on smoking behaviours?**

As mentioned in the Introduction section, in existing scientific literature many studies have already highlighted the connection between a low SES and cigarette smoking on the one hand, and between present orientation, impulsivity and cigarette smoking on the other hand. But to our knowledge the relationships between SES, time preferences and smoking were not considered simultaneously. Despite the endogeneity problems mentioned above, our results suggest that SES partly mediate the effect of time preferences on smoking behaviours. Indeed, when modeling smoking status and recent quitting attempt, after we introduced time preferences indicators in our analyses the effect of educational level (a key component of SES) became non-significant.

#### **4.5 Beyond smoking status, extending the analysis to other aspects of smoking.**

Finally, our results also suggest to extend the investigation to other aspects of cigarette smoking. Indeed, SES and time preferences appeared to have a significant impact on smokers' attitudes, fears and risk perception, and the effects of some low SES indicators vanished after introducing horizon planning in the analysis. For example, present-

oriented smokers were less likely to feel personally concerned by anti-tobacco campaigns and to fear smoking-related cancer, probably because feeling personally concerned by the risk of smoking related cancer highlighted in preventive messages requires the ability to make future adverse health effects less remote.

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