

Smoking habits in Mexico: Upward and Downward Comparisons of Economic Status

Abstract

While experimental and behavioural economics have extensively studied the role of both upward and downward comparisons of economic status, the latter have been largely neglected in secondary data studies. The scarce existing evidence shows mixed results and is essentially limited to analyses of subjective wellbeing in high income countries. Using nationally representative data from Mexico with almost 45,000 personal records, we disentangle the role of absolute wealth, relative deprivation and relative affluence as explanatory variables for smoking behaviour. We find robust evidence of greater smoking at higher levels of absolute achievement and relative deprivation and lower smoking at higher levels of relative affluence. Results hold for a variety of indicators of smoking habits, reflecting both smoking prevalence and intensity. Compared to males, we find that females tend to have stronger associations between the three facets of economic status and smoking prevalence. Results are robust to the use of alternative functional forms and reference groups for the measurement of relative deprivation and relative affluence.

Keywords. Relative Deprivation, Relative Affluence, Smoking, Gender, Wealth, Mexico.

JEL Classification. I14, I31, D31.

I Introduction

While economists have for a long time assumed that individuals are affected by absolute (i.e. own) income and not by the incomes of others, over the past three decades a growing body of literature has strongly challenged this assumption (for reviews covering the survey-based, experimental and theoretical literature see Clark, Frijters and Shields 2008; Clark and D'Ambrosio 2015; Esposito 2018; Verme 2018). In line with Duesenberry's (1949) 'Relative Income Hypothesis', individuals have shown a range of "other-regarding" preferences and susceptibility to others' levels of income or economic achievement (Sobel 2005; Camerer and Fehr 2006). A well agreed-upon pathway through which relative income would play a role is through the deleterious effect of *upward* comparisons, whereby relative deprivation or lower position in the socioeconomic hierarchy would decrease wellbeing and jeopardise health, educational and social attainments (Wilkinson and Pickett 2007; Ferrer-i-Carbonell and Ramos 2014).¹ By contrast, there is scarcer evidence, as well as weaker consensus, around the role of *downward* comparisons. People dislike having less than others, but the existence of a symmetric pathway concerning relative affluence or higher economic status and the way in which this would affect people is contested (Clark and D'Ambrosio 2015).

Absolute income, relative deprivation and relative affluence feature as the three facets of economic status in the Fehr and Schmidt (1999) framework of self-centered inequality aversion. So far, the study of the three facets of economic status has been largely circumscribed to experimental or behavioral studies (inter alia, Lavergne and Strobel 2004; Ellingsen and Johannesson 2004; Rotemberg 2008; Müller and Tan 2013). A much smaller number of studies have investigated the three components of economic status in empirical analyses using large secondary data, with the aim of disentangling the specific relationships between each of the three domains of economic status and social outcomes. These studies use data mostly from high-income countries and cover only dependent variables such as subjective wellbeing (e.g. Ferrer-i-Carbonell 2005; D'Ambrosio and Frick 2012) and job satisfaction (Lundquist 2008). This is in sharp contrast with the copious literature which has tried to disentangle the role of absolute income and relative deprivation as explanatory variables for a number of social outcomes and

¹ The main exception to this is the so-called 'tunnel effect' (Hirschman and Rothschild 1973, Ravallion and Lokshin 2000; Senik, 2004), where, in a dynamic perspective, individuals may consider others' economic gains as signals that living conditions will be soon improving also for them.

across contexts – e.g. migration (Stark and Taylor 1991; Antinyan and Corazzini 2018), education (Esposito and Villaseñor 2019), delinquency (Bernburg, Thorlindsson and Sigfusdottir 2009; Chamberlain and HIPP 2015), bullying victimization (Napoletano et al 2016) and a number of health outcomes (Deaton 2001; Eibner and Evans 2005; Gravelle and Sutton 2009).

In this paper, we expand the literature on the joint analysis of upward and downward comparisons by employing the three domains of economic status to study smoking behavior in a developing country – Mexico. Smoking is a leading cause of preventable mortality and morbidity globally and although prevalence has declined globally, trends vary considerably across countries (Gakidou et al 2017; Reitsma et al 2017). Smoking is strongly influenced by economic status but while there is generally higher prevalence among less affluent groups, this observation may vary across settings (Hosseinpoor et al. 2012; Carrieri and Jones 2016; Casetta et al 2016; Sreeramareddy, Harper and Ernstsen 2018). Tobacco control interventions rank high on national and international agendas (WHO 2017), but the evidence on the impact of tobacco control policies on different demographic and socioeconomic subgroups is still poorly understood (Brown et al. 2014; Hill et al 2014; Over et al 2014; Parks et al 2017). Improved understanding of the link between economic status and smoking behavior will help clarify empirical ambiguities as well as design more effective tobacco control policies.

Using a nationally representative health survey from Mexico, we find that the three components in the Fehr and Schmidt (1999) framework are significantly linked to smoking habits. Our results indicate greater smoking at higher levels of absolute standards of living and of relative deprivation, and lower smoking at higher levels of relative affluence. These results are confirmed for five different smoking outcomes, and are robust to alternative indices of relative deprivation and relative affluence as well as to alternative definitions of reference groups. Given the increasing interest in gender differences among socioeconomic drivers of smoking (Amos et al 2012; Langer et al 2015), we investigate whether the observed relationships between facets of economic status differ between females and males. We find that our overall results hold for both females and males separately. In addition, interaction terms between gender and the three economic status indicators show significantly stronger associations with smoking prevalence for females.

The paper is organised as follows. Section II presents the Fehr and Schmidt's (1999) framework and the Yitzhaki indices of relative deprivation and relative affluence, and discusses the reasons why we hypothesise that each of the three facets of economic status is independently related to smoking habits – including a gender perspective on the issue. Section III introduces the data, variables and econometric approach we employ in our empirical analysis. Results are presented in Section IV and Section V concludes.

II. Background

2.1 The Fehr and Schmidt framework and measures of relative income

Fehr and Schmidt (1999) describe the notion of ‘self-centered inequality’ as follows. An individual experiences ‘disadvantageous inequality’ when comparing herself with individuals who are better-off than her, and she experiences ‘advantageous inequality’ when comparing herself with individuals who are worse-off. Economic status is therefore comprised of three components: own absolute economic achievement, a measure of disadvantage relative to those who are better-off and a measure of advantage relative to those who are worse-off. These three economic domains are seen as variables playing independent roles in determining individual outcomes.

Formally, let $i = 1, 2, \dots, N$, with $N \geq 3$, denote individuals in society. Let the vector $x = (x_1, \dots, x_N)$, denote society's distribution of an individual economic indicator (typically, income or wealth). Let the Better-off set, $B_i(x) = \{j \in n \mid x_j > x_i\}$ denote the set of individuals richer than individual i . Similarly, let the Worse-off set, $W_i(x) = \{j \in n \mid x_j < x_i\}$ denote the set of individuals poorer than individual i . Note that the Better-off and Worse-off sets contain individuals who are, respectively, poorer and richer than individual i and hence these sets depend on the society's vector x .

Before introducing the Fehr and Schmidt (1999) equation we lay out the Yitzhaki (1979) indices. These quantify the relative deprivation and relative affluence of individual i , $D_i(x)$ and $S_i(x)$, respectively, as follows:

$$D_i(x) = \sum_{j \in B_i(x)} \frac{x_j - x_i}{N} \tag{1}$$

$$S_i(x) = \sum_{j \in W_i(x)} \frac{x_i - x_j}{N} \quad (2)$$

Fehr and Schmidt (1999, p. 822) outline their model by arguing that U_i , the utility of individual i , depends on the three facets of economic status:²

$$U_i(x) = \alpha_a x_i + \alpha_d \cdot D_i(x) + \alpha_s \cdot S_i(x) \quad (3)$$

In equation (3), the subscript a denotes individual absolute achievement, d denotes individual relative deprivation or disadvantageous inequality and s denotes individual relative affluence or advantageous inequality. Fehr and Schmidt (1999) suggests that $\alpha_a > 0$ and $\alpha_d, \alpha_s < 0$.

Individual utility is positively related to absolute economic achievement and negatively related to the relativistic components. In particular, Fehr and Schmidt posit that $\alpha_d < 0$ because of the frustration arising for being poorer than others, and $\alpha_s < 0$ because fairness concerns may generate a sense of compassion or guilt for being richer than others in society. At the same time, however, they stress that the sign of α_s can be ambiguous; being better off than others may not always induce a sense of guilt, but it may instead foster a sense of accomplishment and be beneficial to the individual – in which case $\alpha_s > 0$.

We employ the three facets of economic status envisaged by the Fehr and Schmidt (1999) framework as explanatory variables in regression analysis. This approach has been adopted by Ferrer-i-Carbonell (2005), D'Ambrosio and Frick (2012), Cojocar (2014), Bárcena-Martín, Cortés-Aguilar and Moro-Egido (2017) and Leites and Ramos (2018), for whom the dependent variable was subjective wellbeing, and by Lundquist (2008), who studied job satisfaction.³ They generally observed $\alpha_d < 0$ and $\alpha_s > 0$, although the positive relationship for relative affluence was found to hold for East Germans but not for West Germans by Ferrer-i-Carbonell (2005), was not significant for Cojocar (2014) and was depended on the functional form used in the analysis for Bárcena-Martín, Cortés-Aguilar and Moro-Egido (2017) and for Leites and Ramos (2018). Negative values for α_s , in keeping with the idea of a feeling of guilt for being richer than others, are mainly restricted to the experimental literature (e.g. Rutledge et al. 2016), where participants take part in distributional games where a situation of undeserved advantaged is neatly created by

² It should be noted that Fehr and Schmidt (1999) did not relate their relativistic components directly to the Yitzhaki indices, although formally the difference is only in the normalization by the reference group size – which is N in the Yitzhaki indices and $(N-1)$ in for Fehr and Schmidt. We also added α_a for expositional purposes.

³ D'Ambrosio and Frick (2012) propose a generalization of equation (1) which accounts for the dynamic aspects of both relative deprivation and relative satisfaction (see their equation 7, p. 289).

design – although it should be noted that strong evidence of advantage seeking is found by the experimental paper by Cox (2013).

The discrepancy between experimental and survey studies with respect to the sign of α_s can partly be made sense of by considering that in real life situations the scope for the existence of feelings of guilt for higher economic status is likely to be lower, given the tendency to justify socioeconomic advantage and regard it as deserved and based on merit (see, inter alia, Kleugel and Smith 1986; Jost and Banaji 1994; McCoy and Major 2007). Individuals are also more likely to feel compassion for people who are embarking on a joint experience with them (e.g. participating in a game) rather than with the more anonymous population at large – the nature of the relationship among individuals is argued to be particularly important in shaping reactions to downward comparisons (Loewenstein, Thompson and Bazerman 1989). It should also be noted that upward and downward comparisons involve different neural processes (Güroğlu, Will and Crone 2014), and that while negative feelings related to upward comparisons are ubiquitous amongst humans as well as other social species, feelings related to downward comparisons seem to be circumscribed to humans (Brosnan and de Waal 2014), and within humans they seem differ across cultures and at different stages of development across childhood (Blake et al 2015; McAuliffe et al 2017).

2.2 Literature on Economic Status and Smoking

The literature suggests that smoking is positively related to standards of living in Mexico. Analysing data from the World Health Survey, Hosseinpoor et al. (2012) found that Mexico is one of the few countries where there is a positive relationship between smoking and standards of living. On the basis of Mexican data, Franco-Marina (2007) found that smoking prevalence and intensity was generally higher among more educated and wealthier individuals; the data also pointed to declining prevalence in smoking among men but rising prevalence in women. Similarly, Corsi and Subramanian (2014) found a greater prevalence of smoking among wealthier strata in India. They interpreted this finding as indicative of a country which has not transitioned yet to later stages of the tobacco epidemic when health concerns override affordability of smoking among the rich – an interpretation which may well apply to Mexico. A number of reasons suggest that relative deprivation is a risk factor for smoking (i.e. positively associated). Relative deprivation leads to anxiety and stress related to lower status (Wilkinson

1997) and psychosocial stressors trigger smoking (Lawless et al. 2015). Interestingly, Slopen et al. (2013) found that among a series of psychosocial stressors positively associated with smoking, an important factor is the degree of perceived inequality – assessed as the dissatisfaction with one’s relative position in society in terms of work opportunities, living conditions and ability to provide for her children. In addition, a positive association between relative deprivation or lower standing in the economic ladder and smoking has been found in several studies (Eibner and Evans 2005; Siahpush et al. 2006; Ling 2009; Balsa, French and Regan 2014).

Relative affluence being a symmetric and somehow ‘opposite’ phenomenon to relative deprivation, we expect a negative relationship with smoking. Relative affluence can be hypothesised to be a protective factor for smoking (i.e. negatively associated) through the generation of a sense of accomplishment and appeasement – or, at least, a sense of relief or a shield from psychosocial stress thanks to the existence of a ‘buffer’ between you and the bottom of society. This is in keeping with Will’s (1981) theory of downward comparisons, according to which “Persons can increase their subjective well-being through comparison with a less fortunate other” (p. 245). This is also in line with the positive relationship between relative affluence and subjective wellbeing and job satisfaction found in the survey literature referred to above, as well as the literature showing that downward comparisons tend to reinforce the promotion of self-interest against others (Anier, Guimond and Dambrun 2016).

There are marked differences in smoking habits across genders (Smith et al 2016; Pogun et al 2017), and we expect the three facets of economic status to play a greater role for females than for males. Higher standards of living are generally associated with female emancipation from traditional gender roles and more equality in the household (Marks, Lam and McHale 2009), which have been described as important factors for understanding the propensity to smoke of females in Latin America (Regueira, Suárez-Lugo and Jakimczuk 2010). For women, weight control is a strong motivation to smoke (McKee et al. 2006) and higher standards of living increase the importance women attach to slimness and slenderness (Swami, 2015). Evidence from Mexico indicates that at low standards of living females’ earnings are almost entirely allocated to the cover basic household expenses, while males often keep a share of their earnings for personal purposes (Benería and Roldan 1987; Bobonis 2009); it is then reasonable to hypothesise that the availability of resources for personal uses such as smoking increases with

standards of living more steeply for females. In addition, females tend to exhibit stronger inequality aversion (Croson and Gneezy 2009; Corazzini, Esposito and Majorano, 2012) and are more strongly affected by stress (Bale and Epperson 2015), which can be triggered by socioeconomic hierarchy, is a risk factor for mental illness (Scott et al. 2014) and can trigger smoking as a consequence (McKee et al 2003).

III. Empirical strategy

3.1 Data and measures

We use the 2012 Health and Nutrition Survey in Mexico (ENSANUT) conducted by the Mexican National Institute of Public Health. The data is collected from a nationally representative sample of the population selected using a stratified, multistage probability sample design where the 2010 National Census was used as a sampling frame. We use the health and household modules contained in the survey, which provide information on around 45,000 adults, aged 20 and above.

Table 1 provides the survey questions on the outcome variables and the descriptive statistics for each of them. Looking at the variables based on the whole sample (*Smoker* and *HowOld*), 32.18 percent of our respondents had a significant experience of smoking in their lives (they smoked 100 cigarettes or more), and 18.78 percent currently smoke; 53.08 percent never smoked at all, and among those who smoked the large majority had their first smoking experience when they were aged between 13 and 20 years. Focusing on the subsample of respondents who are current smokers, we have three variables indicating in different ways smoking intensity. Looking at the frequency of smoking and the number of cigarettes smoked (*HowOften* and *HowMany*, respectively), 53.36 percent of smokers smokes daily and 16.65 percent weekly, with an average of 2.18 cigarettes per day with a standard deviation of 5.19. Finally, *HowSoon* shows that only a minority of smokers is unable to wait one hour before smoking the first cigarette of the day.

[Table 1 around here]

We measure absolute wealth by computing an asset index on the basis of the rich information offered by the survey on dwelling characteristics (e.g. walls, floors, roof quality), access to services and utilities (e.g. source of water, garbage disposal, electricity) and durable goods

ownership (e.g. computers, television, cars) – a total of 38 indicators. We derive our asset index using principal components analysis (PCA). Since running customary PCA with a large proportion of binary and cardinal variables, as in our data, may yield incorrect results (Kolenikov and Angeles 2009; Howe et al. 2012), we adopt the methodology proposed by Kolenikov and Angeles (2009) and we run PCA using polychoric correlations.

We measure relative deprivation and relative affluence using the Yitzaki indices D_i and S_i as given in equations (1) and (2), respectively, and we adopt a geographic criterion for the definition of the reference group (individuals living in the same municipality). Deriving our relative deprivation and relative affluence indices from our asset index is in keeping with the view of Pollak et al (2007), Laaksonen et al (2009) and Sweet (2011), who suggest that wealth is a useful variable for the study socioeconomic gradients in health. In addition, the visible character of assets makes wealth particularly suitable for the construction of indices of relative economic status (Heffetz 2011; Hicks and Hicks 2014). Additional details about our asset index and relative indices are provided in the Appendix, Sections I.A.1 and I.A.2. Summary statistics on all explanatory variables are given in Table A.2 in the Appendix.

3.2 Econometric strategy

Our baseline model can be summarised by the following equation:

$$Y_i = \beta_0 + \beta_1 w_i + \beta_2 D_i + \beta_3 S_i + \beta X_i + u_i \quad (4)$$

The outcome variable (Y_i) is measured by using the five variables on different aspects of smoking behaviours seen above, and the specific econometric model varies according to the characteristic of the outcome variable. Specifically, we use:

- i) binary logit models for outcome variable *Smoker* (we report results for the dichotomous outcome ‘having smoked at least 100 cigarettes’ as this indicates a non-trivial experience of smoking, but findings are qualitatively unchanged if we use alternative dichotomous outcomes such as ‘being a current smoker’, or on ‘having ever experienced smoking’);
- ii) ordered logit models for *HowOften* (i.e. how frequently the respondent smokes – daily, weekly, monthly, etc.);

- iii) OLS models for *HowMany* (i.e. number of cigarettes smoked per day – results are qualitatively unchanged whether we use the exact number of cigarettes or a concave transformation of it which would lessen the possible influence of outliers);⁴
- iv) ordered logit models for *HowSoon* (i.e. how soon after waking up the first cigarette of the day is smoked);
- v) multinomial logit models for *HowOld* (i.e. the age bracket when the respondent’s first smoking experience occurred – ‘never smoked’ is used as base outcome, so that the categories ‘age 12 or younger’, ‘between 13 and 20’ and ‘20 or older’ are interpreted with respect to having never smoked).

Moving to explanatory variables, our main regressors of interest are the three economic variables featuring in the Fehr and Schmidt (1999) framework, namely absolute wealth (w_i), relative deprivation (D_i) and relative affluence (S_i). The vector of controls (X_i) includes a gender dummy, age (continuous: years), age squared, level of education (ordinal: none, primary, secondary, post-secondary, tertiary), marital status (categorical: single, free union, married, divorced, widowed), employment status (categorical: employed, unemployed, retired, student, works at home), household size (continuous: number of people in the household), number of chronic illnesses (continuous: number of long-term illnesses the respondent suffers from), number of limitations in daily activities (continuous: number of actions the respondent is unable to perform on her own), drinking habits (ordinal: does not drink, drinks yearly, monthly, weekly, daily), whether the individual has been a victim of violent events in the past year (dummy) and intensity of depressive symptoms (continuous: 0-21 values from a nationally validated reduced version of the widely used Centre for Epidemiologic Studies Depression Scale CES-D, Radloff 1977).⁵ In all our estimations, standard errors are clustered at municipal level. Finally, (u_i) is the error term. We run a number of robustness checks employing (D_i) and (S_i) calculated using alternative functional forms as well as reference groups – these checks confirm our results and are available upon request.

⁴ See Mullahy (1997) for alternative estimation approaches based on Poisson models where the dependent variable is packs of cigarettes smoked (i.e. number of cigarettes divided by 20).

⁵ We follow Tampubolon and Hanandita (2014) and quantify the intensity of depressive symptoms by simply summing up the CES-D scores.

IV. Results

4.1 Main results: smoking habits and economic domains

Table 2 summarises the main regression results for each of our five dependent variables – full regression output is provided in Appendix Table A.3. The upper panel of Table 2 displays results from logit models for *Smoker* [columns (1)-(3)], ordered logit models for *HowOften* [columns (4)-(6)], OLS models for *HowMany* [columns (7)-(9)] and ordered logit models for *HowSoon* [columns (10)-(12)]; the lower panel displays results from a multinomial logit model for *HowOld* where the base outcome is never having smoked [columns (13)-(21)]. For each dependent variable, we report three models differing in the progressive inclusion of our three economic indicators: the first model includes only absolute wealth, the second adds relative deprivation and the third adds also relative affluence in keeping with the full Fehr and Schmidt (1999) framework. Every model includes all control variables.

[Table 2 around here]

Across the 21 columns featuring in Table 2, our three economic indicators are consistently significant predictors of smoking behaviour (in all cases, $p < 0.01$). The signs of these variables are as expected, with absolute wealth and relative deprivation being risk factors and relative affluence being a protective factor. Looking at measures of fit, the progressive inclusion of relative deprivation and relative affluence improves the ability of the model to fit the data; this is the case also for the Bayesian Information Factor, which penalises models for the inclusion of additional regressors (Kass and Raftery 1995). These results are consistent with evidence in the literature which shows a positive relation of smoking and absolute standard of living in Mexico (Franco-Marina 2007; Hosseinpoor et al. 2012) and with the argument that relative deprivation triggers or maintains smoking (Wilkinson 1997; Eibner and Evans 2005). They also indicate that the adoption the Fehr and Schmidt's (1999) framework, where, on top of absolute achievement, both the 'looking upward' and the 'looking downward' aspects of relative achievement are included, better captures the nuances of how economic status relates to smoking behaviour.

As can be seen in Table A.3 in the Appendix, control variables show reassuring patterns. In all models, gender is significant with a negative coefficient, indicating that, in line with the literature, smoking is for women less frequent and less intense than for men (Smith et al 2016; Pogun et al 2017). We observe a positive sign for age and a negative sign for age squared; this

appears credible considering that Jha et al (1996) find that smoking prevalence peaks around age 30-49. Consistent with the results of Zhu et al (1996), respondents with a university degree or above tend to smoke less compared those with very low education. Suffering from depression or from a number of chronic illnesses and having been a victim of violent crime tend to be positively associated with smoking – in accordance with the idea that smoking may be triggered by stressful events, as argued above. The literature typically finds a positive correlation between smoking and drinking (Bien and Burge 1990) – our results confirm this pattern for heavy drinkers but not for moderate drinkers. Finally, being married and being divorced are, respectively, negatively and positively associated with smoking – although only for some outcome variables.

On the basis of column (3) we produce Figure 1, which shows predicted probabilities and marginal effects for the probability of having smoked at least 100 cigarettes over the domain of our three economic indicators. The curves for absolute wealth and for relative deprivation have an upward slope, and marginal effects are positive with confidence intervals not overlapping with zero. Relative affluence exhibits a downward slope and negative marginal effects which again are significant over the whole domain. These curves also suggest that the probability of having smoked at least 100 cigarettes changes at fairly constant rates over relative deprivation domain, while there is evidence of increasing rate of change in the case of absolute wealth and (moderate) decreasing rate of change in the case of relative affluence. The predicted probabilities curves also enable a visual appreciation of the magnitudes of the relationships between smoking behaviour and economic domains. We quantify exact predicted probabilities of having smoked at least 100 cigarettes for respondents at the 5th, 50th and 95th percentiles of absolute wealth (who have wealth figures of 2.96, 7.04 and 10.16, respectively), and find that these are 17.57%, 32.73% and 47.13%, respectively. Predicted number of cigarettes for these respondents, on the basis of model (9), are 2.61, 5.39 and 7.53, respectively. The above results are qualitatively unchanged for female and male subsamples (results available upon requests).

[Figure 1 around here]

Finally, we address the issue of multicollinearity, which is a potential concern because absolute and relative economic indicators are bound to be rather highly correlated – in our case, correlations are -.69 for (w_i) and (D_i), .70 for (w_i) and (S_i) and -.66 for (D_i) and (S_i). The high

significance of the three variables is a first suggestion that collinearity may not be a problem. This indication is strengthened by the fact that the sequential introduction of relative deprivation and relative satisfaction does not alter significance levels or trigger switches in coefficient signs. This is also the case when we extend the stepwise regression procedure further, applying it to a number of other potentially related variables such as education (results available upon request) – in fact, there is no qualitative change in results if any of the covariates are dropped. Variance Inflation Factor (VIF) statistics provide further reassurance, since figures for the three economic variables never exceed 4 and overall mean VIF never exceeds 5 – the only variables having high VIF are as expected age and age squared.

We next test whether there is a significant difference in the predictive role of the three economic domains between females and males. We do this by estimating equation (5) below, which includes interaction terms between each of our three economic variables and the dummy for female (F):

$$Y_i = \beta_0 + \beta_1 w_i + \beta_2(F)(w_i) + \beta_3 D_i + \beta_4(F)(D_i) + \beta_5 S_i + \beta_6(F)(S_i) + \beta X_i + u_i \quad (5).$$

Table 3 summarises the main regression results for each of our five dependent variables – full regression output is provided in Appendix Table A.4. Results show significant gender differences for the two outcomes related to smoking prevalence and specified over the whole sample, i.e. *Smoker* and *HowOld* – i.e. regressions (3g) and (18g). The sign of the interaction term is the same as the sign of the economic status variables, indicating that the associations between economic status indicators and the probability of experiencing smoking (positive for absolute wealth and relative deprivation and negative for relative affluence) are heightened for females. In Figure 2 we plot predicted margins and marginal effects for females and males on the basis of model (3g). For both genders, slopes of predictive margins are positive for absolute wealth and relative deprivation and negative for relative satisfaction, and again marginal effects are significant. Yet, the absolute wealth and relative deprivation curves are remarkably steeper for females – due to which gender differences are greatest at low values and tend to vanish at high values. With regard to the relative affluence curve, the slope is again steeper for females although the difference is in this case less appreciable. The observed gender heterogeneity is in line with our hypotheses. The stronger link between absolute wealth and smoking for females can be explained on the basis of more modern socialisation patterns, female emancipation and

social acceptability of female smoking for wealthier women. The results for relative standards of living tally with our earlier discussion of stress being pathway through which relative deprivation has been argued to trigger smoking and being more prevalent among females. It should be noted that gender differences are however not found in the case of outcomes related to smoking intensity (*HowMany*, *HowOften* and *HowSoon*).

[Table 3 around here]

[Figure 2 around here]

V. Conclusion

In this paper we employed the three facets of economic status featuring in the Fehr and Schmidt (1999) framework as explanatory variables for an array of outcome variables related to smoking behaviour – for the first time extending the joint study of upward and downward comparisons beyond subjective wellbeing outcomes. Using a large representative Mexican health survey, we found robust evidence that absolute wealth and relative deprivation are risk factors while relative affluence is a protective factor for smoking. Disentangling the potential role of absolute and relative standards of living is an important task for the study of health outcomes, since it enables a better understanding of the mechanisms related to economic affluence and economic inequality.

Our work has implications for policy and for further research. While Mexico has recently strengthened tobacco control policies, much remains to be done. The successful implementation of the Framework Convention for Tobacco Control recommendations may avoid 470,000 preventable deaths in Mexico during the next four decades (Fleischer et al 2017). Understanding the socioeconomic drivers of smoking is key to this aim, in particular for an upper-middle income country like Mexico where national and sub-national indicators of inequality are strikingly high (OECD 2016). Studying whether the relationships identified for Mexico using the Fehr and Schmidt framework are similar in other settings is an important task for future research, as is monitoring whether these relationships will hold at different phases of Mexico's epidemiological transition. Our evidence is also important given the predicted sharp increase in female tobacco users by 2025 (WHO 2010) and given the differences across genders in the

effectiveness of tobacco policies (Kuipers et al 2014). Future research should also go beyond our cross-sectional study and use panel data to explore the causal nature of the relationships we found.

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Table 1: Summary of Outcome Variables on Smoking Habits

DICHOTOMOUS INDICATORS	
<i>Smoker: Have you smoked at least 5 packs (100 cigarettes) in life? (%)</i>	
No	67.82
Yes	32.18
 <i>- Do you currently smoke? (%)</i>	
No	81.22
Yes	18.78
 <hr/>	
POLYTOMOUS INDICATORS	
<i>HowOld: How old were you when you first smoked a cigarette? (%)</i>	
Never smoked	53.08
12 years old or younger	5.00
Between 13 and 20 years old	33.54
21 years old or older	8.38
 <i>HowOften: How frequently do you smoke? (%)</i>	

At least once a year	2.48
Occasionally	20.92
Monthly	6.59
Weekly	16.65
Daily	53.36

HowMany: *How many cigarettes do you smoke per day?*

Mean, Std Dev.	2.18, 5.19
Min, Max	0, 80

HowSoon: *How soon after waking up do you smoke your first cigarette? (%)*

More than 1 hour	85.24
Between 31-60 minutes	3.93
Between 6-30 minutes	5.47
First 5 minutes	5.36

Table 2. Main regressions for our 5 outcome variables: summary results

<i>1) Having smoked 100 cigarettes</i>	<i>2) Smoking frequency</i>	<i>3) No of cigarettes per day</i>	<i>4) How soon after waking up</i>
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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Wealth	0.118*** (0.009)	0.223*** (0.013)	0.252*** (0.015)	0.092*** (0.013)	0.209*** (0.021)	0.258*** (0.025)	0.067*** (0.008)	0.126*** (0.011)	0.139*** (0.014)	0.093*** (0.021)	0.227*** (0.031)	0.303*** (0.038)
Depriv		0.322*** (0.022)	0.281*** (0.022)		0.311*** (0.036)	0.254*** (0.035)		0.155*** (0.020)	0.143*** (0.020)		0.325*** (0.053)	0.291*** (0.057)
Satisf			-0.151*** (0.024)			-0.253*** (0.048)			-0.064** (0.026)			-0.306*** (0.077)
Female	-1.43*** (0.044)	-1.45*** (0.044)	-1.45*** (0.044)	-0.28*** (0.066)	-0.32*** (0.066)	-0.34*** (0.066)	-0.30*** (0.033)	-0.32*** (0.033)	-0.32*** (0.033)	-0.41*** (0.102)	-0.45*** (0.102)	-0.46*** (0.102)
N	44,370	44,370	44,370	8,556	8,556	8,556	8,487	8,487	8,487	8,556	8,556	8,556
LL	-23,152	-22,987	-22,959	-10,346	-10,299	-10,277	-12,929	-12,894	-12,890	-4,688	-4,667	-4,653
BIC	46,594	46,273	46,228	20,963	20,879	20,843	26,103	26,042	26,043	9,639	9,605	9,588

5) Age of first cigarette ('Never smoked' as base outcome)

	12 years old or younger			Between 13 and 20 years old			21 years old or older		
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Wealth	0.121*** (0.014)	0.254*** (0.021)	0.291*** (0.024)	0.126*** (0.009)	0.222*** (0.014)	0.253*** (0.016)	0.066*** (0.012)	0.135*** (0.018)	0.158*** (0.020)
Depriv		0.400*** (0.039)	0.345*** (0.039)		0.304*** (0.026)	0.254*** (0.026)		0.219*** (0.035)	0.178*** (0.035)
Satisf			-0.210*** (0.048)			-0.169*** (0.028)			-0.136*** (0.038)
Female	-2.39*** (0.088)	-2.42*** (0.088)	-2.42*** (0.088)	-1.69*** (0.047)	-1.71*** (0.048)	-1.72*** (0.047)	-0.68*** (0.054)	-0.71*** (0.053)	-0.71*** (0.053)
N	44,240	44,240	44,240	44,240	44,240	44,240	44,240	44,240	44,240
LL	-39,726	-39,564	-39,527	-39,726	-39,564	-39,527	-39,726	-39,564	-39,527
BIC	80,318	80,026	79,984	80,318	80,026	79,984	80,318	80,026	79,984

Note. Clustered errors at municipal level in parentheses. *, ** and *** denote $p < 0.1$, $p < 0.05$ and $p < 0.01$, respectively. All regressors included. BIC indicates Bayesian Information Factor.

Table 3. Gender Differences: summary results

	<i>1) Having smoked 100 cigarettes</i> (3g)	<i>2) Smoking frequency</i> (6g)	<i>3) No of cigarettes per day</i> (9g)	<i>4) How soon after waking up</i> (12g)
Abs Wealth	0.158*** (0.016)	0.250*** (0.026)	0.141*** (0.014)	0.313*** (0.041)
Female*Wealth	0.297*** (0.025)	0.045 (0.054)	-0.008 (0.025)	-0.057 (0.072)
Rel Depriv	0.206*** (0.026)	0.257*** (0.039)	0.146*** (0.022)	0.275*** (0.065)
Female*Depriv	0.260*** (0.043)	0.001 (0.094)	-0.026 (0.045)	0.073 (0.140)
Rel Satisf	-0.103*** (0.028)	-0.234*** (0.048)	-0.079** (0.031)	-0.341*** (0.089)
Female*Satisf	-0.163*** (0.046)	-0.083 (0.089)	0.046 (0.043)	0.157 (0.134)
Female	-3.735*** (0.194)	-0.601 (0.446)	-0.293 (0.215)	-0.242 (0.616)
N	44,370	8,556	8,487	8,556
LL	-22,832	-10,276	-12,889	-4,652
BIC	46,007	20,869	26,067	9,612
<i>5) Age of first cigarette ('Never smoked' as base outcome)</i>				
	12 years old or younger (15g)	Between 13 and 20 years old (18g)	21 years old or older (21g)	
Abs Wealth	0.184*** (0.026)	0.114*** (0.019)	0.004 (0.027)	
Female*Wealth	0.217*** (0.057)	0.329*** (0.025)	0.272*** (0.033)	
Rel Depriv	0.276*** (0.046)	0.157*** (0.034)	0.067 (0.050)	
Female*Depriv	0.150 (0.096)	0.260*** (0.046)	0.214*** (0.067)	
Satisf	-0.138** (0.056)	-0.098*** (0.035)	-0.023 (0.055)	
Female*Satisf	-0.175* (0.102)	-0.169*** (0.044)	-0.197*** (0.069)	
Female	-3.929*** (0.453)	-4.184*** (0.197)	-2.624*** (0.269)	
N	44,240	44,240	44,240	
LL	-39,349	-39,349	-39,349	
BIC	79,725	79,725	79,725	

Note. Clustered errors at municipal level in parentheses. *, ** and *** denote $p < 0.1$, $p < 0.05$ and $p < 0.01$, respectively. All regressors included. BIC indicates Bayesian Information Factor.

Figure 1. Pr(Smoker=1) along the domains of (x_i) , (D_i) and (S_i)

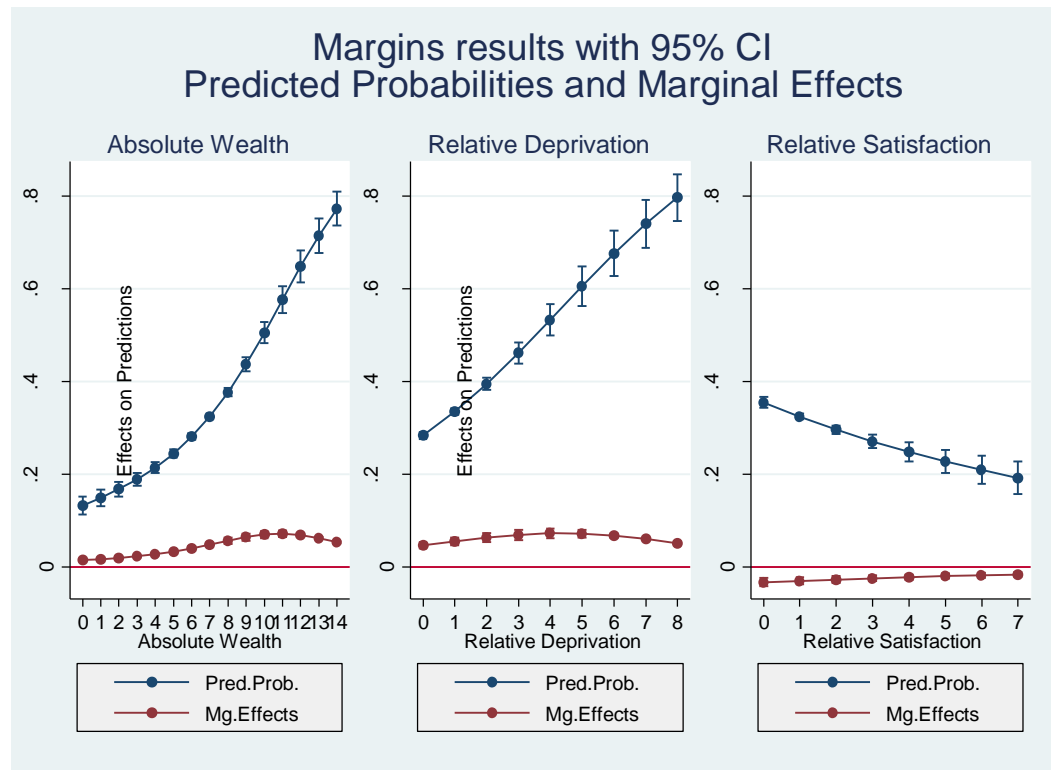


Figure 2. $\Pr(\text{Smoker}=1)$ along the domains of (x_i) , (D_i) and (S_i) by gender

