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# Smoking Inequality across Genders and Socio-economic Classes. Evidence from Longitudinal Italian Data

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## Abstract

There has been a dearth of literature on smoking inequalities, in spite of its contribution to health inequalities. We exploit longitudinal Italian individual-level data to identify the main socio-demographic characteristics that determine smoking inequalities. We use the Erreygers Concentration Index to identify in which groups smoking is relatively more prevalent. We find that, among men, pro-poor prevalence is driven by members of the lower socio-economic classes, while we observe the opposite for women. We encourage policymakers to address the issue of smoking inequalities, which the current policies have largely disregarded.

**Keywords:** smoking inequality; Italy; gender; social classes

**JEL Codes:** I14; I18; J16

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## 1. Introduction

There exists a substantial literature showing that a healthier lifestyle is one of the key driving factors for good health (Balía and Jones, 2008; Di Novi, 2010 and Di Novi, 2013). In many European countries, smoking is still a major cause of premature morbidity and mortality and one of the largest contributors to inequalities in health and premature death. The magnitude and the persistence of the problem necessitate the development of comprehensive actions aimed at reducing tobacco consumption especially among lower socio-economic classes (Kunst et al., 2004). Besides the health threats engendered by smoking, problems of inequality between social classes also arise. In particular, data show that smoking is more prevalent amongst the poor than the wealthy, while the former have generally less access to health care than the latter. Consequently, smoking tends to harm the health of the poor more than that of the rich; policies aimed at reducing health inequalities should therefore also address smoking inequality. Indeed, several governments have enacted measures – spanning from increasing taxes on tobacco to banning smoking in several places and situations. The effects of these legislative approaches vary: on the one hand, increased taxes raise the final price of the products, which may foster smuggling, thus reducing the effectiveness of the measure, although the effect of smuggling is not very large (Yurekli and Zhang, 2000). On the other hand, increased taxes have the twofold effect of discouraging smoking and reinforcing the message that the consumption of tobacco represents a health risk. Banning smoking in public places is another strategy used by legislators to reduce smoking rates. However, these interventions aim to reduce overall prevalence of tobacco consumption rather than inequalities in smoking and seem to be more effective for those population groups which already have the lowest rates of smoking (Stehr, 2007).

In this paper, we analyse trends in inequalities in smoking by employing individual-level Italian data drawn from the 1999–2012 cross-sectional survey “Indagine Multiscopo sulle Famiglie, Aspetti della Vita Quotidiana”, which is part of the Istat Multiscopo survey carried out each year by the Italian National Statistical Office (ISTAT). We measure socio-economic inequalities in tobacco smoking by means of the Wagstaff and van Doorslaer (2000) concentration index, with the correction proposed by Erreygers (2009). The most important contribution of the paper is the decomposition of the Erreygers index into the contributions of socio-economic status and demographic factors (Van Doorslaer Koolman and Jones, 2004) which helps identify the drivers of the inequality. In addition to this, we split the sample by gender and conduct the analysis on these sub-samples. We also consider the relationship between the economic cycle and smoking

inequality and whether during periods of financial strain, individuals of different socio-economic status have different uptake rates into smoking.

Italy is an interesting case study because of its early focus on anti-smoking policies. In January 2003 Italy became the first large EU country to approve a strict and comprehensive smoking ban policy (also known as “Legge Sirchia”), which came into effect in January 2005. The Italian government banned smoking in all indoor public places, including offices, cafes, restaurants (except for a few with separate and regulated smoking areas), airports, and railway stations. Along with several other tobacco control measures introduced alongside the smoking ban, the result of these policy efforts has seen a significant decline in smoking prevalence in Italy over time, suggesting that anti-smoking policies have been – at least partially – effective: in 1993 25.7% of adults aged 15 and older were active smokers compared with 21.3% in 2013 (ISTAT, Health for All, 2014). However, as in many other countries, specific policies aimed at reducing smoking inequalities in Italy are poor or non-existent. Our paper shows that the problem of smoking inequality is present and relevant in Italy, that socio-economic status, gender and education are major explicators of it, and that policymakers should focus their objectives not only on overall smoking prevalence, but also on reducing the consumption of tobacco within the lower socio-economic classes.

## **2. Smoking-related inequalities**

Unhealthy lifestyles tend to be concentrated disproportionately among people in disadvantaged socioeconomic groups (Balía and Jones, 2008), even besides the effects of smoking. This phenomenon may contribute to the persistence of health inequalities over time, in spite of efforts to improve health care access (Costa-Font, 2014). Hence, approaches are needed which are more effective in improving lifestyles and, in particular, in reducing tobacco use, among disadvantaged groups and communities. The poor smoke more than the affluent (Laaksonen et al., 2005; Li and Guindon, 2012), while the latter have more resources to care for their health than the former. In this way, smoking inequalities amplify health inequalities between different socio-economic classes.

Smoking inequalities also correlate with other indicators of deprivation. Siahpush et al. (2002) highlight that Australian lone mothers smoke much more than coupled mothers. Smoking rates are higher amongst disadvantaged ethnic groups, such as aborigines in Oceania and blacks in

North America, when compared to relevant white groups (Barbeau et al., 2004; Barnett et al., 2004). Blue-collar workers smoke more than white-collar workers (Sorensen et al., 2004; Green et al., 2007) and smoking is more prevalent among the low-educated compared to the highly educated (Green et al., 2007; Layte and Whelan, 2009; Schaap and Kunst, 2009). In many countries smoking prevalence in disadvantaged social groups has also increased over time (Khang and Cho, 2006; Franks et al., 2007; Richter and Leppin, 2007; Hiscock et al., 2012a and Nagelhout et al., 2012).

The relationship between smoking inequality seems to be mediated by several factors at the individual level. The literature shows that the choice of smoking is affected by variables such as gender, education, and employment status (Hiscock et al., 2012b). For this reason, the study of individual-level data is particularly appropriate. Indeed, it allows us to capture the effect of factors such as gender and employment status, and to segment the population in different classes according to socio-economic status and educational level of individuals. Indeed, while smokers may be found across all socio-economic classes and educational levels, they are not homogeneously distributed within the population. On the one hand, preferences for leisure activities outside home and in public places (such as eating in restaurants, drinking in bars and pubs, going to the cinema, visiting museums, etc.) are in contrast with those for smoking. On the other hand, people with higher education, higher income, and better and more stable career opportunities seem more prone to reduce smoking than others. The effect of these individual variables and that of leisure activities is clearly likely to increase inequalities. Disadvantaged people have less disposable income to spend on leisure activities, but bans forbid smoking in public places such as pubs, restaurants, etc., which the affluent frequent more than the poor.

Finally, smoking behaviour and smoking prevalence presents some gender-specific traits. On the one hand, smoking is generally more prevalent among men than women (Fukuda et al., 2005; Khang and Cho, 2006; Bauer et al., 2007; Decicca et al., 2008; Anger et al., 2011; Hosseinpoor et al., 2012). Bauer et al. (2007) suggest that smoking behaviour differs substantially between men and women, and that education, marital and employment conditions explain a minor fraction of this difference (Khang et al., 2009 find similar results), suggesting the presence of a strong gender component in the choice of whether to smoke or not. Moreover, women from lower socio-economic classes generally smoke much less than women from higher socio-economic classes (Huisman et al., 2005). Some studies (e.g. Stehr, 2007; Jacobs et al., 2009) show that women's demand for cigarettes is more price elastic than men's.

Not only do policies to reduce the use of tobacco generally not address the problem of inequality, but they might also be non-neutral with respect to it; for this reason a review of the main results that link policies and inequality is necessary. Studies on price increases are useful to understand the relative elasticity of the demand for tobacco derivatives between different social groups. Stehr (2007) finds that in the U.S.A. increases in taxes on tobacco had no effect on the quantity of cigarettes smoked by the most disadvantaged groups (Hispanics and Blacks), suggesting that – in this case – the price elasticity of demand for lower socio-economic groups is lower than for more advantaged groups. This result casts doubt on the effectiveness of anti-smoking measures such as tax increases to also support reductions in smoking inequalities. Franks et al. (2007) find that high-income people are more sensitive to the price of cigarettes than low-income individuals; in other words, increasing tax on tobacco exacerbates already existing smoking inequalities. However, Decicca et al. (2008) suggest that people are more sensitive to (anti-)smoking sentiments of their reference groups than to price increases. Smokers become addicted and their demand for nicotine is very inelastic; heavy taxation on tobacco is likely to reduce smoking initiation among the youth, but the effects appear modest, and the evidence is limited to a few advanced countries such as Canada (Sen and Wirjanto, 2010). In other words, tobacco tax policies aimed at reducing overall consumption are likely to increase smoking inequalities.

Another policy instrument for tobacco control has been bans and restrictions on tobacco consumption in different countries. Again we would anticipate a social gradient in response to this policy since the more educated would be more responsive to information about the risks associated with smoking. The result is that bans are more effective on high-income (and highly-educated) people. Khang et al. (2009) examine the effects of anti-smoking policies in South Korea and find that they have been effective in reducing the overall number of cigarettes smoked, but that, nevertheless, smoking inequalities have increased after the introduction of the restrictions. Moreover, for young people, education and familial background matter, since young people from affluent families perceive smoking as more risky than the young from poorer families. This has an impact on the decision to start smoking (Gerking and Khaddaria, 2012); the consequence is that young people from disadvantaged families have a higher probability of starting (and continuing) to smoke.

Hill et al. (2014) have reviewed literature on the effect of tobacco control policies and highlight that taxes on tobacco products decrease the overall consumption, but there is evidence that generalised smoking cessation programmes (such as general bans) are found to increase

smoking inequalities, as smokers from more advantaged social classes are more responsive to these bans. In some cases (Jones et al., 2015) studies find that bans do not reduce overall cigarette consumption e.g. Scotland's ban. This somewhat mixed evidence on the effects of anti-smoking policies such as smoking bans, highlights the importance of focusing on smoking inequalities and suggests that research and policy interventions in the field of tobacco control should address smoking inequality specifically.

### **3. Data and methodology**

#### *Data*

We analyse the trend in smoking inequalities between 1999 and 2012 (the 2004 survey did not take place and hence was not included) employing individual-level data drawn from the cross-sectional survey "Indagine Multiscopo sulle Famiglie, Aspetti della Vita Quotidiana". This survey is part of the ISTAT Multiscopo survey system carried out every year by the Italian National Statistical Office (ISTAT), with a sample size of about 30,000 observations each year. Individual weights were applied in all computations in order to make the results representative of the Italian population. An assessment of the surveys was made in order to check their comparability and consistency. Given the repeated nature of the Multiscopo Survey, they were found to have more or less similar survey design, scope, coverage, sampling unit, reporting method, mode of survey and weighting method. Questionnaire wordings for most variables of interest were also found to be generally similar across the surveys. Where there were some differences with respect to some variables, efforts were made to align their definitions and/or categories as closely as possible across the surveys prior to pooling the data. For example, if the categories of variables were different across the surveys, the categories were collapsed to a minimum number to make them consistent and comparable across the surveys.

#### *Smoking Inequality Index*

Our empirical analysis involves two basic steps. First, we explore the level of horizontal inequity smoking prevalence, employing Erreygers's concentration index, and then we decompose the Erreygers index into the contributions of demographic and socioeconomic factors. Inequalities (and inequities) in smoking prevalence are calculated by means of a concentration index (CI) (Wagstaff et al., 1991; Wagstaff and van Doorslaer, 2000):

$$CI = \frac{2}{n\mu} \sum_{i=1}^n y_i R_i - 1 = \frac{2}{\mu} \text{cov}(y_i, R_i) \quad (1)$$

where  $\mu$  is the average smoking prevalence in the sample,  $n$  the sample size,  $Y$  is an indicator of smoking by individual  $i$  and  $R_i$  designates the  $i$ -th individual's rank within the wealth index distribution. The value of the index is equal to the covariance between the smoking indicator ( $Y_i$ ) and the individual's living standard rank ( $R_i$ ), divided by the average of smoking prevalence ( $\mu$ ). Then, the whole expression is multiplied by 2 to ensure that it ranges between -1 and +1 (with -1 meaning that smoking is concentrated in the most disadvantaged person, and 1 indicating that smoking is concentrated in the most advantaged person. This index takes value 0 when smoking is perfectly equally distributed among the population). Since the variable that measures smoking prevalence is distributed between 0 and 1, as suggested by Erreygers (2009), we use a corrected version of the concentration index to compute inequality in smoking. This index is defined as:

$$E(Y) = \frac{4\mu}{(b_n - a_n)} C(Y) \quad (2)$$

where  $b_n$  and  $a_n$  represent the maximum and the minimum of the smoking indicator variable ( $Y$ ) (in our case 0 and 1),  $\mu$  is the mean of the smoking prevalence variable in the sample, and  $C(Y)$  represents the concentration index specified in (1).

Wagstaff, et al. (2003) have shown that it is possible to compute the concentration index also through a "convenient regression" using the OLS properties. Formally, for each regression model, the concentration index  $E(Y)$  can be rewritten as the sum of two components: the first as a deterministic one and the second as a residual one:

$$EI(y) = 4[\beta_r \bar{x}_r CI_r + \sum_k \beta_k \bar{x}_k CI_k + GCI(\varepsilon)] \quad (3)$$

where  $\bar{x}_r$  and  $\bar{x}_k$  represent respectively the means of the living standard indicator used to rank the population ( $x_r$ ), and the regressors included in the regression model on which the computation of the concentration index is based.  $CI_r$ ,  $CI_k$  are their concentration indices while  $GCI(\varepsilon)$  is a residual term.

Equation (3) shows that smoking inequality can be represented as a weighted sum of the inequalities in its determinants. The weights are represented by the regression coefficients evaluated at the means (i.e. semi-elasticities). The decomposition provides the possibility of identifying the driving factors of inequality in smoking prevalence. Decomposition of the



concentration index as in equation (3) is based on linear modelling of smoking prevalence. However, since the outcome variable in our application is binary, following van Doorslaer, Koolman and Jones (2004), we base the decomposition on a linear approximation based on partial effects (the  $\beta$ s in equation 3) estimated by a non-linear model.

Hence, we estimated a model of the determinants of smoking behaviour through a probit model, where the dependent variable is binary and takes a value one if the respondent is a current smoker or zero if she is a former smoker or a non-smoker. Then, we used this model to compute and decompose the concentration index. In the probit model, we control for a set of explanatory variables such as age, sex, marital status, education, employment status, and a living standard index. Age is modelled as a continuous variable; female is the reference category for sex. Marital status dummy variables include married (reference category), divorced/separated, widowed and never married. Three levels of education are considered: 1) low education (no educational certificates or primary school certificate or lower secondary education); 2) medium education (upper secondary education or high school graduation) (reference category) and 3) high education (university or postgraduate degree). Employment status is divided into six groups: employed (reference category), unemployed, retired, student, housewife, unable to work.

In the “Indagine Multiscopo sulle Famiglie, Aspetti della Vita Quotidiana” direct numeric measures of welfare – such as household income – are not available; therefore, we use other proxies for household wealth. We derive a one-dimensional index of wealth from assets and living standards collected during the interviews, through principal component analysis (PCA) under the assumption that wealth is reflected in the assets owned and in the living conditions of the household. PCA was used to generate scoring weights for each variable: whether the interviewee owns the home where she lives, the number of rooms per household member, whether the house receives regular water supply, the presence of service staff and a battery of items on possessions in the home.) The possessions include household items such as televisions, satellite dish, mobile phone, computer, internet access, hi-fi, camera, washing machine, dishwasher, air conditioning, and car (Vyas and Kumaranayake, 2006; O’Donnel et al., 2008). For a detailed discussion of how to construct asset indices see Vyas and Kumaranayake (2006). We also rescaled the wealth index by adding a constant of 4.0, which was the minimum whole number required to eliminate negative values. This rescaling does not affect the contribution of each variable to the concentration index, since the rank ordering remains unchanged.

In order to measure smoking inequalities that reflect only non-demographic smoking differences, an indirectly standardised concentration index was computed. Smoking status has been standardised by age and gender to obtain an estimate of potentially avoidable inequality (see also O'Donnell et al., 2008). The standardisation allows for exploring whether lower socioeconomic groups are more likely to smoke than higher socioeconomic groups, keeping demographics constant. After standardisation, any residual inequality in smoking is interpretable as horizontal inequity (which could be pro-rich or pro-poor). Indirectly standardised smoking behaviour  $\hat{Y}_i^{IS}$  can then be obtained by calculating the difference between actual smoking status ( $Y_i$ ) and standardised health status ( $\widehat{Y}_i^X$ ) plus the sample mean ( $\bar{Y}$ ):

$$\hat{Y}_i^{IS} = Y_i - \hat{Y}_i^X + \bar{Y} \quad (4)$$

Equation (4) represents the EDA (Erregeyers Demographic Adjusted) index and indicates that standardisation will subtract the variation in smoking behaviour driven by demographic factors from actual smoking status. Therefore, the distribution of  $\hat{Y}_i^{IS}$  across wealth can be interpreted as the smoking status we expect to observe in an individual, irrespective of differences in the distribution of demographic characteristics. As smoking is unhealthy, a negative value of *EDA* indicates that smoking is concentrated among the poor. If, instead, the value of the inequality index is positive, then smoking is concentrated among the most advantaged of the population. We examine the correlation between the *EDA* index and the Italian GDP lagged by one year to assess whether smoking increases during economic downturns, (Kendzor et al., 2010), and whether – because of budget constraints – people with high incomes tend to relapse smoking more than people with low incomes during periods of financial strain (McClure et al., 2012).

We also split the sample by gender and conduct the same analysis on the two sub-samples.

#### 4. Results

We present first the inequality index for the full sample, and then those disaggregated by gender. Table 1 reveals the aggregated *EDA* index is almost always negative, highlighting that smoking inequality tends to be pro-poor (i.e. concentrated amongst the poor). The trend of the index suggests that the magnitude of the inequality has increased over time, but this increase has

not been constant. During the last years examined, the figures have been decreasing in absolute terms.

[TABLE 1 ABOUT HERE]

If we couple these figures with the variation of the Italian GDP lagged by one year, we notice that the two variables present a relatively high and statistically significant correlation (correlation coefficient: 0.581; p-value: 0.078). This is an interesting result, as it suggests that smoking inequality in Italy co-varies with GDP. This suggests that in times of recession, a small number of poor and a relatively large number of rich people relapse smoking, while the opposite happens when the economy grows.

Table 2 shows a disaggregation of the EDA index, according to individual characteristics (in particular, socio-economic status, level of education and employment status). Starting with the living standards index, we notice that its contribution is mixed: in some years, it is statistically significant with a negative sign; in others, it is not statistically significant, and sometimes it has a positive sign and is statistically significant.

Considering education, we notice almost no trend: the signs of the contributions of high and low education remain negative. This indicates that low and high levels of education are associated with higher pro-poor inequality. In addition, the magnitude of these contributions is relatively stable over the years. Together with the results for living standards, these findings suggest that overall, education is more relevant in shaping smoking behaviour than wealth is.

Smoking inequality tends to decrease with age, and also in this case we do not observe any relevant change over time. The contribution of male gender to pro-poor inequality is mainly negative (i.e. pro-poor inequality is slightly lower among men than among women) before 2005, but becomes steadily positive after. This may suggest that the ban, which came into effect in 2005, had different effects on men and women, and indeed the results below show that these differ by gender.

[TABLE 2 ABOUT HERE]

Tables 3 and 4 present the same analysis as in Tables 1 and 2, but restricting the sample to males. We first focus on the *EDA* index: it takes negative and statistically significant values over the entire period considered. This means that inequality is present among males and that smoking is more prevalent among the poor than the wealthy. This result is in line with that for the full

sample. However, in contrast, we observe a constant decline of the *EDA* index after 2006 the pro-rich inequality increases until 2008, while, after that year, the value of the index is decreasing, consistently until 2011 and 2012, with the effects of the economic recession on smoking inequality previously mentioned.

Focusing our attention on the contributors to the male inequality result, we notice that the living standard index and the age of the individual are the most relevant variables. They are both statistically significant over the entire period and have (almost) always opposite signs. On the one hand, the living standard index has the same sign as the *EDA* index, suggesting that smoking is prevalent among people from disadvantaged socio-economic classes. However, during the last two periods considered, the contribution of the living standard index reduces substantially, in line with that observed before. Age has a positive sign in most of the years. This result suggests that the pro-poor inequality decreases with age. In other words, smoking is prevalent among the young and disadvantaged socio-economic classes.

As in the case of the full sample, pro-poor inequality is prevalent among low- and high-educated males compared to those with an intermediate level of education. Among students, inequality is pro-poor before 2005, and becomes pro-rich afterwards. Although the magnitude of the contribution is small, the reversal of the sign is statistically significant and interesting. This effect may be due to the smoking ban enforced since 2005; this ban may have discouraged smoking among students from the poorer socio-economic classes, contributing to mitigate inequality. Since students are young, if this change in behaviour were to persist as these individuals age, then we would observe a reduction in the pro-poor smoking inequality in future years. Being unemployed decreases inequality, and the effect is particularly strong since 2007. This result may be due to the tight budget constraints that affect people who do not work; the effect is stronger after 2007, perhaps as a consequence of the international economic crisis, which has impacted the lower socio-economic classes more than others. In this way, the result has been a reduction in the pro-poor smoking inequality, where the poorer the individual, the higher the probability of giving up smoking.

[TABLE 3 ABOUT HERE]

[TABLE 4 ABOUT HERE]

Tables 5 and 6 present the results for the female subsample. Here, the figures tell us a story that is completely different from that seen so far. Smoking inequality among women is pro-

rich: the EDA index is indeed positive and statistically significant, indicating that smoking is more prevalent among affluent than among poor women. Moreover, pro-rich inequality in the female sub-sample decreases after the introduction of the smoking ban in Italy, suggesting that it was more effective in reducing smoking prevalence in the upper than in the lower socio-economic classes.

The contribution of the living standard index always has a positive sign, meaning that smoking is more prevalent among the rich than among poor women, however its magnitude has reduced after the introduction of the ban, suggesting that the behaviour of the rich women is affected more than that of the women from lower socio-economic classes.

The contribution of age reveals that pro-rich smoking inequality is prevalent in older women. After 2003, the value of the contribution of age decreases, though its sign is persistently positive (when it is statistically significant).

[TABLE 5 ABOUT HERE]

[TABLE 6 ABOUT HERE]

## **5. Conclusions**

The results presented in this paper show relevant differences between men and women in smoking inequalities. Among men, inequality is pro-poor, while the opposite is true among women.

This result is in line with the cited literature and seems to be a (perverse) result of the process of female emancipation. The negative stereotype of smoking women has been abandoned over time, and smoking has become a symbol of liberation of the female gender (Tinkler, 2003 and 2006; Hunt et al., 2004). It has led to gender differences in smoking initiation disappearing in contemporary young generations (Sen and Wirjanto, 2010). In some countries, smoking is even more prevalent among girls than among boys (Li and Guindon, 2012). As often happens, affluent socio-economic classes emancipate faster and earlier than lower socio-economic classes. However, the introduction of the ban seems to have reduced inequality among females. On the one hand, women are generally more sensitive to prevention and to health campaigns than men (Vlassoff and Garcia-Moreno, 2002), and this sensitivity is stronger among the rich than among the poor. On the other hand, if smoking is a sign of emancipation, women may want to signal their freedom by smoking in public. Assuming that affluent women are more emancipated than poor

women, the policies aimed at restricting smoking both by higher taxes on tobacco and by banning it in public places are likely to have reduced smoking more in the affluent socio-economic classes than in the lower socio-economic classes. This result is particularly worrying, as health is generally better in the upper than in the lower socio-economic classes. Therefore, a reduction in the pro-rich smoking inequality (which is equivalent to an increase of smoking prevalence among the poor) will likely widen the health gap between rich and poor women. In this sense, the ban introduced in 2005 not only seems ineffective in reducing inequality, but its effects appear even perverse.

This paper contributes to the literature in a number of ways. First, it shows that smoking inequality follows the economic cycle. Financial strain during economic downturns may affect smoking behavior, inducing individuals to ameliorate the effects of feeling anxiety by more frequently enacting behaviors which give temporary relief such as smoking. However, the effects of population-level financial strain on smoking can also differ amongst those of differing socio-economic levels, sometimes affecting inequalities. In Italy, while the national prevalence of smoking had increased between 2009 and 2010 compared with 2008 (ISTAT, Health for All, 2017) possibly due to the economic crisis and to the relapsing of former smokers (Gallus et al., 2011), inequality in smoking prevalence has decreased, supporting the idea that people with high income tend to relapse smoking more than people with low income.

Second, the paper shows that smoking inequality is gender-driven across different socio-economic classes. Our findings suggest that smoking policies should target men and women differently. Moreover, as men are less sensitive than women to health campaigns and to smoking bans, governments should spend more resources on convincing men to stop smoking. Welfare policies aimed at protecting the most disadvantaged social classes could have also the (ancillary) effect of reducing smoking inequality (among women), although this outcome works in the direction of increasing the overall health inequality between rich and poor.

We conclude by highlighting the importance of enacting policies targeted at socio-economic classes that are particularly vulnerable to smoking. Such policies will have to account for the heterogeneity between genders and socio-economic classes highlighted in this paper, e.g. focusing messages through specific channels and in delivered in ways which target different socio-economic groups. Of course, we acknowledge that this heterogeneity is a challenge for the legislator; nevertheless, the positive externalities in terms of individual and public health expected from a decrease in smoking inequality should convince policymakers to intervene.

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**Table 1. Smoking inequality among the overall Italian adult population**

	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
EDA index	-0.009	-0.003	0.004	-0.021	-0.023
Standard error	0.005	0.005	0.006	0.005	0.006
Significance	*			***	***
	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
EDA index	-0.021	-0.030	-0.034	-0.036	-0.018
Standard error	0.006	0.006	0.006	0.005	0.006
Significance	***	***	***	***	***
	<b>2010</b>	<b>2011</b>	<b>2012</b>		
EDA index		-0.014	-0.020	-0.036	
Standard error		0.007	0.005	0.005	
Significance		**	***	***	

Negative values of EDA index mean that smoking is prevalent among the poor  
EDA index ranges from -1 (only the poorest smoke) to 1 (only the richest smoke)  
Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 2. Contributions of different socio-demographic characteristics to the EDA index. Full sample. Standard errors in brackets**

	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012
<b>living standards index</b>	0.012 (0.005)**	0.009 (0.004)**	-0.013 (0.004)***	0.004 (0.004)	0.011 (0.005)**	-0.020 (0.004)***	-0.009 (0.005)	-0.010 (0.005)*	-0.008 (0.005)	0.005 (0.005)	0.001 (0.005)	0.001 (0.005)	-0.006 (0.005)
<b>age</b>	0.039 (0.002)***	0.037 (0.003)***	-0.034 (0.001)***	0.043 (0.003)***	0.040 (0.003)***	-0.026 (0.000)***	0.037 (0.003)***	0.042 (0.003)***	0.038 (0.003)***	0.031 (0.003)***	0.032 (0.003)***	0.034 (0.003)***	0.027 (0.003)***
<b>male</b>	0.002 (0.001)**	0.002 (0.001)***	-0.005 (0.001)***	0.001 (0.001)	0.001 (0.001)**	-0.004 (0.001)***	0.001 (0.001)	-0.005 (0.001)***	-0.007 (0.001)***	-0.006 (0.001)***	-0.007 (0.001)***	-0.006 (0.001)***	-0.006 (0.001)***
<b>single</b>	-0.001 (0.000)***	0.000 (0.000)	0.001 (0.000)***	-0.001 (0.001)	0.001 (0.000)**	-0.005 (0.000)***	0.002 (0.001)***	0.003 (0.000)***	0.002 (0.000)***	0.002 (0.001)***	0.002 (0.001)***	0.003 (0.001)***	0.003 (0.000)***
<b>widow</b>	-0.000 (0.000)	0.000 (0.000)*	0.005 (0.000)***	-0.000 (0.000)	-0.000 (0.000)*	-0.003 (0.000)***	-0.001 (0.000)**	-0.000 (0.000)	-0.000 (0.000)***	-0.001 (0.000)**	-0.001 (0.000)***	-0.001 (0.001)	-0.001 (0.000)***
<b>divorced</b>	0.000 (0.000)	0.000 (0.000)*	0.006 (0.000)***	0.001 (0.000)***	-0.000 (0.000)	0.005 (0.000)***	-0.001 (0.000)***	-0.000 (0.000)*	0.000 (0.000)	-0.001 (0.000)***	-0.000 (0.000)**	-0.001 (0.000)***	-0.001 (0.000)***
<b>loweduc</b>	-0.016 (0.002)***	-0.015 (0.002)***	-0.000 (0.001)	-0.015 (0.002)***	-0.017 (0.002)***	-0.000 (0.001)	-0.009 (0.002)***	-0.021 (0.002)***	-0.017 (0.002)***	-0.013 (0.002)***	-0.016 (0.002)***	-0.016 (0.002)***	-0.017 (0.002)***
<b>higheduc</b>	-0.006 (0.001)***	-0.005 (0.001)***	-0.002 (0.001)***	-0.007 (0.001)***	-0.008 (0.001)***	-0.003 (0.001)***	-0.007 (0.001)***	-0.009 (0.001)***	-0.010 (0.001)***	-0.012 (0.001)***	-0.009 (0.001)***	-0.010 (0.001)***	-0.013 (0.001)***
<b>unemployed</b>	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)*	0.000 (0.000)	-0.000 (0.000)	0.001 (0.000)***	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001 (0.000)	-0.001 (0.000)***	-0.001 (0.001)	-0.001 (0.001)
<b>housewife</b>	0.004 (0.001)***	0.004 (0.001)***	0.002 (0.001)***	0.006 (0.001)***	0.006 (0.001)***	0.002 (0.000)***	0.005 (0.001)***	-0.013 (0.001)***	-0.015 (0.001)***	-0.015 (0.001)***	-0.014 (0.001)***	-0.016 (0.001)***	-0.014 (0.001)***
<b>student</b>	-0.013 (0.001)***	-0.014 (0.001)***	0.007 (0.000)***	-0.013 (0.001)***	-0.015 (0.001)***	0.008 (0.000)***	0.013 (0.001)***	0.002 (0.000)***	0.001 (0.000)***	0.002 (0.000)***	0.003 (0.000)***	0.003 (0.000)***	0.001 (0.000)***
<b>unable to work</b>	0.001 (0.000)***	0.001 (0.000)***	0.001 (0.000)**	0.002 (0.000)***	0.002 (0.000)***	0.000 (0.00)	0.001 (0.000)***	0.033 (0.002)***	0.032 (0.003)***	0.034 (0.003)***	0.039 (0.003)***	0.038 (0.003)***	0.036 (0.002)***
<b>retired</b>	0.022 (0.002)***	0.026 (0.002)***	-0.030 (0.000)***	0.025 (0.002)***	0.023 (0.002)***	-0.020 (0.000)***	0.027 (0.002)***	0.002 (0.000)***	0.001 (0.000)***	0.000 (0.000)**	-0.000 (0.000)***	0.001 (0.000)***	0.001 (0.000)***

A negative sign means that the considered variable contributes to increase pro-poor inequality; i.e. for a given level of the variable, smoking is prevalent among the poorer.

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 3. Smoking inequality: male subsample**

	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
EDA index	-0.046	-0.048	-0.060	-0.075	-0.074
Standard error	0.007	0.007	0.006	0.007	0.007
Significance	***	***	***	***	***
	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
EDA index	-0.065	-0.073	-0.056	-0.052	-0.034
Standard error	0.006	0.007	0.006	0.006	0.006
Significance	***	***	***	***	***
	<b>2010</b>	<b>2011</b>	<b>2012</b>		
EDA index	-0.015	-0.056	-0.063		
Standard error	0.006	0.007	0.008		
Significance	***	***	***		

Negative values of EDA index mean that smoking is prevalent among the poor  
EDA index ranges from -1 (only the poorest smoke) to 1 (only the richest smoke)  
Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 4. Contributions of different socio-demographic characteristics to the EDA index. Male subsample. Standard errors in brackets**

	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012
<b>living standards index</b>	-0.021 (0.007)***	-0.027 (0.005)***	-0.049 (0.004)***	-0.046 (0.006)***	-0.037 (0.006)***	-0.047 (0.004)***	-0.039 (0.006)***	-0.046 (0.006)***	-0.041 (0.006)***	-0.026 (0.005)***	-0.031 (0.005)***	-0.017 (0.006)***	-0.024 (0.006)***
<b>age</b>	0.043 (0.003)***	0.045 (0.003)***	-0.034 (0.001)***	0.058 (0.003)***	0.047 (0.003)***	-0.037 (0.001)***	0.054 (0.004)***	0.047 (0.004)***	0.042 (0.003)***	0.038 (0.003)***	0.031 (0.003)***	0.063 (0.004)***	0.051 (0.004)***
<b>single</b>	-0.002 (0.000)	-0.002 (0.000)***	0.002 (0.000)***	-0.003 (0.001)***	-0.000 (0.001)	-0.003 (0.000)***	0.000 (0.001)	-0.002 (0.001)***	-0.003 (0.001)***	-0.003 (0.001)***	-0.003 (0.001)***	-0.001 (0.000)**	0.000 (0.001)
<b>widow</b>	-0.000 (0.000)	-0.001 (0.000)***	0.005 (0.000)***	-0.000 (0.000)*	-0.001 (0.000)***	-0.003 (0.000)***	-0.001 (0.000)***	-0.000 (0.000)	-0.000 (0.000)**	-0.000 (0.000)*	-0.001 (0.000)***	-0.001 (0.001)	-0.001 (0.000)***
<b>divorced</b>	0.000 (0.000)	0.000 (0.000)**	0.005 (0.000)***	0.001 (0.000)***	0.000 (0.000)	0.006 (0.000)***	-0.000 (0.000)***	0.000 (0.000)	0.000 (0.000)*	-0.000 (0.000)**	0.000 (0.000)*	0.000 (0.001)	0.000 (0.000)
<b>loweduc</b>	-0.024 (0.002)***	-0.024 (0.002)***	-0.003 (0.001)***	-0.022 (0.002)***	-0.023 (0.003)***	-0.004 (0.002)**	-0.014 (0.002)***	-0.024 (0.002)***	-0.019 (0.002)***	-0.013 (0.002)***	-0.015 (0.002)***	-0.023 (0.002)***	-0.024 (0.002)***
<b>higheduc</b>	-0.010 (0.001)***	-0.006 (0.001)***	-0.003 (0.001)***	-0.008 (0.001)***	-0.008 (0.001)***	-0.003 (0.001)***	-0.010 (0.001)***	-0.009 (0.001)***	-0.009 (0.001)***	-0.011 (0.001)***	-0.008 (0.001)***	-0.009 (0.001)***	-0.014 (0.001)***
<b>unemployed</b>	-0.002 (0.001)***	-0.001 (0.000)*	-0.001 (0.001)	-0.001 (0.000)	-0.001 (0.000)***	0.001 (0.001)	-0.002 (0.000)***	0.002 (0.000)***	-0.003 (0.001)***	-0.004 (0.001)***	-0.004 (0.000)***	-0.001 (0.000)***	-0.002 (0.000)***
<b>student</b>	-0.017 (0.001)***	-0.017 (0.001)***	0.007 (0.001)***	-0.014 (0.001)***	-0.019 (0.001)***	0.008 (0.001)***	-0.015 (0.001)***	0.001 (0.000)***	0.000 (0.000)	0.002 (0.000)***	0.002 (0.000)***	0.002 (0.000)***	0.001 (0.000)***
<b>unable to work</b>	0.001 (0.000)***	0.001 (0.000)***	0.001 (0.000)***	0.003 (0.000)***	0.003 (0.000)***	0.001 (0.000)**	0.002 (0.000)**	0.045 (0.003)***	0.041 (0.003)***	0.039 (0.003)***	0.054 (0.003)***	0.036 (0.003)***	0.039 (0.003)***
<b>retired</b>	0.033 (0.003)***	0.037 (0.003)***	0.041 (0.001)***	0.036 (0.003)***	0.038 (0.003)***	-0.022 (0.001)***	0.037 (0.003)***	0.000 (0.000)	0.001 (0.000)*	0.000 (0.000)	-0.000 (0.000)*	0.000 (0.000)	0.001 (0.000)***

A negative sign means that the considered variable contributes to increase pro-poor inequality; i.e. for a given level of the variable, smoking is prevalent among the poorer.

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 5. Smoking inequality: female subsample**

	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
EDA index	0.035	0.045	0.054	0.035	0.031
Standard error	0.006	0.005	0.006	0.005	0.005
Significance	***	***	***	***	***
	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
EDA index	0.012	0.014	0.021	0.016	0.027
Standard error	0.005	0.005	0.006	0.006	0.006
Significance	**	***	***	**	***
	<b>2010</b>	<b>2011</b>	<b>2012</b>		
EDA index	0.013	0.024	-0.006		
Standard error	0.008	(0.005)	(0.006)		
Significance	*	***			

Negative values of EDA index mean that smoking is prevalent among the poor  
EDA index ranges from -1 (only the poorest smoke) to 1 (only the richest smoke)  
Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 6. Contributions of different socio-demographic characteristics to the EDA index. Female subsample. Standard errors in brackets**

	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012
<b>living standards index</b>	0.047 (0.005)***	0.049 (0.004)***	0.022 (0.004)***	0.056 (0.005)***	0.060 (0.004)***	0.007 (0.003)**	0.023 (0.005)***	0.030 (0.005)***	0.024 (0.004)***	0.036 (0.006)***	0.039 (0.005)***	0.027 (0.004)***	0.018 (0.005)***
<b>age</b>	0.030 (0.002)***	0.028 (0.002)***	-0.030 (0.001)***	0.027 (0.002)***	0.033 (0.002)***	-0.012 (0.000)***	0.023 (0.002)***	0.012 (0.003)***	0.005 (0.003)*	-0.002 (0.003)	0.007 (0.003)**	-0.003 (0.003)	-0.000 (0.003)
<b>single</b>	-0.000 (0.000)	0.002 (0.000)***	-0.001 (0.000)***	0.003 (0.001)***	0.003 (0.001)***	-0.007 (0.000)***	0.004 (0.001)***	0.004 (0.001)***	0.002 (0.000)***	0.004 (0.001)***	0.003 (0.001)***	0.003 (0.001)***	0.004 (0.001)***
<b>widow</b>	-0.001 (0.000)***	-0.000 (0.000)	0.007 (0.001)***	-0.000 (0.000)	-0.001 (0.000)	-0.001 (0.000)***	-0.002 (0.000)***	-0.001 (0.001)	-0.001 (0.000)*	-0.001 (0.001)**	-0.000 (0.000)	-0.000 (0.001)	-0.001 (0.001)
<b>divorced</b>	0.000 (0.000)	0.000 (0.000)	0.002 (0.000)***	0.001 (0.000)**	-0.000 (0.000)*	0.001 (0.000)	-0.001 (0.000)***	-0.002 (0.000)*0	-0.002 (0.000)***	-0.003 (0.000)***	-0.003 (0.000)***	-0.003 (0.000)***	-0.004 (0.001)***
<b>loweduc</b>	-0.007 (0.002)***	-0.004 (0.002)	-0.000 (0.001)	-0.008 (0.002)***	-0.009 (0.002)***	-0.000 (0.001)	-0.002 (0.002)	-0.010 (0.002)***	-0.004 (0.002)**	-0.006 (0.002)***	-0.008 (0.002)***	-0.006 (0.002)***	-0.007 (0.002)***
<b>higheduc</b>	-0.003 (0.001)***	-0.005 (0.001)***	-0.002 (0.001)***	-0.006 (0.001)***	-0.007 (0.001)***	-0.002 (0.001)***	-0.005 (0.001)***	-0.009 (0.001)***	-0.009 (0.001)	-0.012 (0.001)***	-0.009 (0.001)***	-0.010 (0.001)***	-0.011 (0.001)***
<b>unemployed</b>	0.000 (0.000)*	0.001 (0.000)***	-0.000 (0.000)	0.001 (0.000)***	0.000 (0.000)***	0.001 (0.000)	0.000 (0.000)**	0.001 (0.000)***	0.001 (0.000)***	0.000 (0.000)	-0.000 (0.000)	0.000 (0.001)	0.000 (0.000)
<b>housewife</b>	0.003 (0.001)***	0.004 (0.001)***	0.003 (0.001)***	0.009 (0.001)***	0.006 (0.001)***	0.003 (0.001)***	0.006 (0.001)***	-0.011 (0.001)***	-0.011 (0.001)***	-0.013 (0.001)***	-0.010 (0.001)***	-0.012 (0.001)***	-0.010 (0.001)***
<b>student</b>	-0.009 (0.001)***	-0.010 (0.001)***	0.006 (0.000)***	-0.012 (0.001)***	-0.011 (0.001)***	0.006 (0.000)***	-0.011 (0.001)***	0.003 (0.000)***	0.001 (0.000)***	0.003 (0.000)***	0.003 (0.000)***	0.003 (0.000)***	0.002 (0.000)***
<b>unable to work</b>	0.001 (0.000)***	0.001 (0.000)***	-0.000 (0.000)	0.001 (0.000)***	0.001 (0.000)***	-0.000 (0.000)*	0.000 (0.000)**	0.024 (0.002)***	0.028 (0.003)***	0.035 (0.002)***	0.026 (0.002)***	0.036 (0.002)***	0.028 (0.002)***
<b>retired</b>	0.014 (0.001)***	0.017 (0.001)***	-0.020 (0.000)***	0.016 (0.001)***	0.012 (0.002)***	-0.017 (0.000)***	0.018 (0.001)***	0.005 (0.001)***	0.002 (0.000)***	0.001 (0.001)***	0.000 (0.000)	0.001 (0.000)***	0.002 (0.000)***

A negative sign means that the considered variable contributes to increase pro-poor inequality; i.e. for a given level of the variable, smoking is prevalent among the poorer.

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%