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Original Research

Intergenerational educational mobility and smoking: a study of 20 European countries using diagonal reference models

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ABSTRACT

Objectives: Intergenerational educational mobility can be particularly relevant for smoking because it implies moving from individuals' family background to a new position in the social hierarchy. Existing research, however, does not provide an answer as to how the process of mobility, *per se*, is associated with the likelihood of smoking.
Study design: We used cross-nationally comparable survey data for 20 countries collected within the health module of the European Social Survey in 2014. The analytical sample consisted of 22,336 respondents aged 25–64 years.
Methods: Smoking was operationalized by daily and occasional smoking, while the intergenerational educational mobility variable was derived from a comparison of respondents' and their parents' highest levels of educational attainment. We employed diagonal reference models to examine the association of intergenerational educational mobility and smoking.
Results: In the country- and age-adjusted analysis, intergenerational downward mobility was associated with odds ratios of 1.34 (CI95 1.07, 1.68) and 1.61 (CI95 1.34, 1.93) for smoking, respectively, among men and women. Intergenerational upward mobility, on the other hand, was negatively associated with smoking but only among women.
Conclusion: Our findings provide new evidence that the process of intergenerational educational mobility is associated with individuals' likelihood of smoking and that this effect cannot be explained by conventional covariates of smoking.
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Introduction

This study investigates the effect of intergenerational mobility, in terms of educational attainment, on the likelihood of smoking. Intergenerational social mobility can be consequential for individuals' smoking behavior, chiefly because it can lead to significant upward or downward moves in the social hierarchy that can affect tobacco consumption. Existing research, however, does not provide sufficient evidence of how exactly individuals' experience of social mobility *per se* affects their likelihood of smoking. Investigating this question requires fitting statistical models that can account for the effects of family background and attained socioeconomic position, on the one hand, and that of mobility experience, on the other hand.[1,2]

Studying the role of education and educational inequalities, more generally, in smoking, is a relatively new phenomenon that emerged after the widely publicized findings on the negative links between smoking and health outcomes.[3] As shown, since the middle of the 20th century, the probability of smoking has been declining more rapidly among the higher educated than among the lower educated, thereby generating a strong educational gradient in tobacco consumption.[4] This trend appears to be more pronounced for men than for women.[5] The emerging negative relationship between education and smoking is in line with the theory

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of fundamental causes of health inequalities that predicts that once new risk factors of health become apparent, people with access to high-quality information and those with more economic, educational, and social resources are more likely to engage in protective efforts to avoid them.[6] Although evidence on the links between education and smoking is now overwhelming, the debate is still ongoing regarding the nature of this association, with some researchers finding causal effects,[7] while others were arguing that both education and smoking behavior are affected by unobserved individual and family of origin characteristics.[3] Our study aims to contribute to the literature by investigating the role of the intergenerational transmission of educational positions in the likelihood of tobacco consumption.

Theoretical links between intergenerational social mobility and smoking can be understood through the lens of social psychology. The so-called *dissociative thesis* predicts that moving away from one's social origin to a new social destination can be unsettling and disruptive because individuals are becoming less fully integrated into either of these social environments.[8] Therefore, socially mobile individuals may feel less satisfied with their lives and may experience depressive symptoms of various kinds, particularly when they move downward on the social hierarchy—the process known as 'falling from grace'.[9,10] On the other hand, an improvement in individuals' socio-economic or educational standing in comparison with their parents' positions, i.e. intergenerational upward mobility, can have a positive effect on individuals' levels of confidence, sense of control, and life satisfaction[2,11–13]—the process referred to as 'rising from rags,' and in turn, individuals' mental well-being or their locus of control could affect their smoking behavior.[12,14–16]

There are, however, only a handful of studies that look at the consequences of intergenerational social mobility on smoking. Regarding the link between intergenerational class mobility and smoking, the results are mixed. But even studies that found a significant relationship in that moving in and out of advantaged classes were associated with, respectively, lower and higher likelihood of smoking, could not establish whether this was the case because mobile individuals successfully adopted the behaviors of their new destination classes or because the experience of mobility itself led to a change in their smoking behavior.[17–20] Regarding the link between intergenerational *educational* mobility and smoking—our concern in this paper—we were able to identify only two studies, both were conducted in Finland. The main conclusions of these studies are the same: attaining higher or lower educational qualifications than one's parents attained does not affect one's smoking behavior, at least not in their early adulthood, i.e. in their twenties.[21,22] But none of the studies referred to above used adequate statistical methods that would allow us to disentangle the mobility effects from the origin and destination effects.

In sum, we believe that investigating the consequences of intergenerational educational mobility is an important contribution to understanding the social determinants of smoking behavior. Based on existing research, we know that education is a powerful predictor of smoking, not only in itself but also through its pivotal role in affecting individuals' labor market outcomes.[23] Using nationally representative comparative data for a large number of European countries, and fitting models specifically designed to understand the consequences of social mobility, we conduct analyses on the link between intergenerational educational mobility and the likelihood of smoking, separately for men and women. In order to test the robustness of our findings, we also perform a series of auxiliary analyses.

Methods

Dataset

We used data from the 2014 health module of the European Social Survey (ESS), which has already been analyzed quite extensively in comparative health research,[24,25] and includes countries with differing patterns of intergenerational educational mobility and varying prevalence of smoking.[26–28] More specifically, the analytical sample includes all 20 countries with available information on educational mobility and smoking and consists of 22,336 respondents between ages 25 and 64 (see online supplementary materials, Table S1, for the list of countries). The majority of individuals in the selected age-range have already completed their education and have not reached the age of retirement when the prevalence of smoking rapidly declines.

Smoking

We constructed a binary variable to capture respondents' smoking behavior. Those who reported smoking daily, or occasionally, were coded 1 on this variable, while those who did not smoke at the time of the survey, or had only smoked a few times during their entire lives, or had never smoked, were coded 0. In our pooled analytical sample, 27.6% of the respondents were smokers, but the prevalence of smoking significantly varied across countries, from as low as 13.6% in Sweden to as high as 33.2% in Spain (see Table S1 in online supplementary materials for country details). These survey estimates matched well with the official Eurostat statistics on smoking in Europe.[29]

Intergenerational educational mobility

Our main independent variable was based on the comparison of respondents' and their parents' highest levels of educational attainment. Data on parental education were not available for Hungary; and therefore this country was dropped from our analysis. We used the seven-category International Standard Classification of Education (ISCED) to measure parents' and respondents' educational attainment. More specifically, we collapsed these variables into three categories in the following way: (1) ISCED I and II—lower secondary education or less; (2) ISCED IIIa, IIIb and IV—upper secondary and advanced vocational education; and (3) ISCED V1 and V2—lower and higher tertiary education. We then constructed another three-fold variable for intergenerational educational mobility by cross-classifying parents' and respondents' highest levels of education: (1) the upwardly mobile—respondent had a higher level of education than their parents; (2) the downwardly mobile—respondent had a lower level of education than their parents; (3) the immobile—there was no difference in respondent's and their parents' educational levels. We also distinguished between short-range and long-range intergenerational mobility by splitting the upwardly and downwardly mobile groups into four subgroups: (1) one step upward, (2) two steps upward, (3) one step downward, and (4) two steps downward. In regard to parental education, we considered the qualifications of both parents, and in the case of different levels of qualification for fathers and mothers, we took the highest.

Covariates

In our statistical models, we included a range of individual characteristics as covariates, which, based on previous research, are

important determinants of smoking. Age and age squared were accounted for in all estimations. Partnership status may make a difference, as married or cohabiting persons appear to have a lower smoking rate.[30] To account for a possible effect of migration,[31] our models controlled for individuals' country of birth. Employment status was included to capture respondents' labor market involvement, which is known to affect smoking.[32] The social environment of the place of residence was operationalized as living in either a rural or an urban area.[33] Lastly, we also controlled for respondents' most recent social class positions, operationalized through a three-fold version of the European Socio-economic Classification (ESeC).[34] In addition, in order to take cross-national differences into account, as far as possible, we included country fixed effects in all of our models. Descriptive statistics for all explanatory variables in the pooled sample of men and women are shown in Table 1.

Table 1
Descriptive statistics for all the variables used in the analysis.

	Percentage/mean (SD)
Smoking	
Yes	27.6%
No	72.4%
Number of cigarettes/day	3.72 (7.52)
Parents' education	
Tertiary education (ISCED V1 & V2)	16.6%
Upper-secondary education (ISCED III & IV)	42.5%
Lower-secondary education or less (ISCED I & II)	40.9%
Respondents' education	
Tertiary education (ISCED V1 & V2)	29.5%
Upper-secondary education (ISCED III & IV)	52.7%
Lower-secondary education or less (ISCED I & II)	17.8%
Intergenerational educational mobility	
Downward mobility (one step)	8.3%
Downward mobility (two step)	0.5%
Immobile	52.2%
Upward mobility (one step)	32.6%
Upward mobility (two step)	6.4%
Control variables	
Gender	
Male	46.9%
Female	52.1%
Age in years	45.3 (11.3)
Age-square	2177.79 (1022.75)
Partnership status	
Never married or cohabited	26.1%
Married or cohabited	58.5%
Separated	0.8%
Divorced	11.9%
Widowed	2.7%
Living area	
Rural area	34.8%
Urban area	65.2%
Migration status	
Migrant	7.2%
Non-migrant	92.8%
Employment status	
Not employed	27.7%
Employed	72.3%
Class position (most recent) (ESeC)	
Salariat class	43.0%
Intermediate class	34.3%
Working class	20.2%
Out of labor market	2.5%

Note. Sample size is 22,366 for all variables.
ESeC, European Socio-economic Classification; ISCED, International Standard Classification of Education; SD, standard deviation.
Source. Authors' calculations based on data from the European Social Survey (2014).

Statistical analysis

As intergenerational educational mobility is measured through comparing parents' and respondents' education, i.e. (a) mobility effect, the impact of both parents' and respondents' educational attainment, i.e. (b) origin effect and (c) destination effect, cannot be incorporated simultaneously in a conventional regression framework. A diagonal reference model provides a way of disentangling the three effects so that the impact of intergenerational educational mobility can be examined over and above the influence of parents' and respondents' educational attainment *per se*.[35]

In a diagonal reference model, the immobile groups are assumed to represent the typical behavior of individuals at that educational level and are set as reference groups for smoking. The smoking behavior of the mobile groups, whose own educational level is either higher or lower than that of their parents, is estimated from the smoking behavior of two reference groups: one is the immobile group at origin, and the other is the immobile group at destination. Over and above this, the mobility effect is identified as the remaining systematic difference between the mobile and the immobile groups (equation (1)):

$$log\left(\frac{prob\left(Y_{ijk}=1\right)}{1-prob\left(Y_{ijk}=1\right)}\right)=w*u_{ii}+(1-w)*u_{jj}+\beta_1 Up_{ij}+\beta_2 Down_{ij}\quad(0\le w\le 1)\qquad(1)$$

In equation (1), Y_{ijk} equals 1 if individual k in cell ij is a smoker and 0 if a nonsmoker, and i and j refer to parents' and respondents' education, respectively. $\hat{u}_{ij}$ is the estimated probability of smoking in cell ij, which is predicted by a weighted combination of u_{ii} and u_{jj}, the respective probability of smoking among the immobile members of educational groups i and j. W is the origin weight, indicating the relative importance of parents' education in the estimation of $\hat{u}_{ij}$, and (1-w) represents the relative importance of respondents' own education. In addition to position effects, mobility effects are estimated, with the two terms Up_{ij} and $Down_{ij}$ indicating upward or downward mobility, respectively.

Considering that short-range mobility may differ from long-range mobility in affecting smoking behavior, Equation (2) is constructed to estimate the impact of four types of intergenerational mobility experience: one step upward, two steps upward, one step downward and two steps downward. In addition, the above-described covariates were included in all estimations. We used list-wise deletion to exclude cases with missing information as none of the included variables had missing values for more than 1% of the sample. Model estimations were conducted through the 'Diagref' package in Stata 15.

$$log\left(\frac{prob\left(Y_{ijk}=1\right)}{1-prob\left(Y_{ijk}=1\right)}\right)=w*u_{ii}+(1-w)*u_{jj}+\gamma_1 Up1_{ij}+\gamma_2 Up2_{ij}+\gamma_3 Down1_{ij}+\gamma_4 Down2_{ij}+\sum\delta X_{ijk}\quad(0\le w\le 1)\qquad(2)$$

Table 2
Prevalence of smoking by parents' and respondents' educational attainment (%).

Parents' education	Respondents' education		
	Lower secondary or less	Upper secondary	Tertiary
Lower secondary or less	35% (3200)	27% (4522)	17% (1435)
Upper secondary	46% (658)	33% (6072)	16% (2767)
Tertiary	43% (114)	33% (1198)	16% (2400)

Note. Smoking is defined as daily or frequent smoking. ISCED—International Standard Classification of Education. The sample is based on the pooled European Social Survey (2014) data, $n = 22{,}336$; cell Ns shown in brackets.
Source. Authors' calculations based on data from the European Social Survey (2014).

Results

Descriptive associations

Table 2 shows the prevalence of smoking in nine groups of individuals, defined by the joint distribution of parents' and respondents' highest levels of education. The three cells on the diagonal represent the immobile, and the six off-diagonal cells represent the mobile. The following points of importance should be noted. First, among the immobile, there is quite a clear educational gradient: the lower the level of qualification, the higher the prevalence of smoking, although the difference between the primary and the secondary educated is barely significant. Second, smoking is much less likely among the upwardly mobile than among the downwardly mobile. For example, while only 17% of the tertiary educated who came from lower secondary educated backgrounds reported daily or frequent smoking, the corresponding figure among the lower secondary educated who came from tertiary-educated backgrounds is as high as 43%. Third, this also means that the prevalence of smoking among the upwardly mobile is always lower than the prevalence of smoking among the immobile counterparts at the same level of parental education. Likewise, the downwardly mobile are always more likely to be regular smokers than their immobile counterparts at the same level of parental education. But we are not able to determine from these descriptive statistics how far the emerging pattern is generated by position effects or by independent mobility effects, and we do not know the extent to which the importance of these effects may differ between men and women. In order to address these questions, we now turn to multivariate analyses using diagonal reference models.

Diagonal reference models

Table 3 shows the estimated odds ratios from diagonal reference models, separately fitted for men and women (for pooled gender estimates see Table S2 in online supplementary materials).

In Model 1, the estimates of u_{11}, u_{22} and u_{33} indicate the odds of regular smoking among the three immobile groups at each educational level. The findings echo those in Table 2, in that, a lower level of education is associated with a higher likelihood of smoking, for both men and women. But we do see significant gender differences regarding the estimated weights for parental education. As is apparent, in the case of men, this statistics is not significant at any conventional level (0.220 (CI: 0.000, 0.450)). In the case of women, however, the origin weight is statistically significant not only in Model 1 (0.459 (CI: 0.311, 0.606)) but in all of our models. This means that for men, parental education is clearly less important than their own education in affecting the probability of smoking, while for women, the relative importance of parental and their own education is fairly similar. In regard to the effect of individuals' mobility experience, the results, again, echo the descriptive statistics. Over and above the position effects, the downwardly mobile are significantly more likely than the immobile to be regular smokers, for both men and women. But, while in the case of men, moving upwards on the educational hierarchy does not appear to decrease the likelihood of smoking, in the case of women, it does.

Model 2 further elaborates on the mobility effects by distinguishing short-range (one step) and long-range (two steps) educational mobility in both directions. The effects fail to reach statistical significance among men, but they are mostly significant among women, showing that, the longer the range of upward mobility, the lower the likelihood of smoking, while the opposite applies to long-range downward mobility. For example, for women who came from tertiary-educated backgrounds, but they themselves only attained lower secondary education, the risk of smoking is more than twice as high as among their immobile counterparts, and this results from the experience of long-range downward mobility, rather than from their educational attainment *per se*.

Model 3 adds a series of covariates, the effects of which are in line with previous studies. For instance, married, employed, rural residents and migrant women have lower odds of smoking, while divorced, unemployed, individuals living in urban areas, and migrant men, in particular, have higher odds of smoking. The model also includes respondents' most recent social class positions that are known to be affected by both their own and parental education. As expected, those in the intermediate and working classes are more likely than those in the managerial and professional salariat to be regular smokers. But, and more importantly, for our purposes, controlling for these individual characteristics does not alter our main results: the effects of mobility experience remained essentially the same for both men and women.

To summarize, the results in Table 3 allow us to make two main conclusions. First, regarding position effects, the origin weight was clearly lower for men than for women in all models, suggesting that, for men, their own education is a more important factor than their parents' education, in predicting whether or not they smoke. Second, the intergenerational mobility effects were much less pronounced in the male sample than in the female sample, indicating that for women, not only parental education is a more important predictor of smoking than for men, but their actual mobility experience also plays a bigger role.

Moderating effects of partnership status

As we have seen, intergenerational mobility experience is a stronger predictor of smoking for women than for men. We have also shown that partnership status had a significant effect on smoking behavior: the married, or those who live in cohabitation, were less likely to be regular smokers than the single or the divorced. It is then conceivable that the effects of mobility experience differ by partnership status. This could particularly be the case for women, as existing evidence suggests that partnered women's health-related outcomes are likely to be affected by their spouses' economic and social positions, in addition to their own socioeconomic status.[36] To explore this possibility, we conducted further analyses by interacting our mobility variable with the variable of partnership status—more specifically, with a binary indicator that separates those who were married or lived in cohabitation when interviewed from those who were not with the variable of mobility experience. Fig. 1 shows the estimated odds ratios for the interaction effects (full results are reported in Table S3 in online supplementary materials). As is apparent, the estimates for the 95% CIs always cross the reference line of 1, indicating that

Table 3
Effects of intergenerational educational mobility on smoking among men and women in Europe, odds ratios from diagonal reference models (DRM) with 95% confidence intervals in parentheses.

	Men			Women		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Weight for parental education	0.220 [0.000, 0.450]	0.168 [0.000, 0.491]	0.258 [0.000, 0.611]	**0.459** [0.311, 0.606]	**0.429** [0.267, 0.590]	**0.417** [0.246, 0.587]
Mobility effects (ref. = immobile)						
Upward mobility	0.869 [0.740, 1.020]	–	–	**0.707** [0.626, 0.799]	–	–
		–	–		–	–
Downward mobility	**1.342** [1.073, 1.678]	–	–	**1.607** [1.339, 1.928]	–	–
		–	–		–	–
Upward mobility (one step)	–	0.885 [0.730, 1.073]	0.863 [0.740, 1.008]	–	**0.705** [0.625, 0.795]	**0.735** [0.653, 0.828]
	–			–		
Upward mobility (two steps)	–	0.985 [0.648, 1.496]	0.916 [0.645, 1.300]	–	0.817 [0.622, 1.074]	0.913 [0.699, 1.193]
	–			–		
Downward mobility (one step)	–	1.282 [0.977, 1.682]	**1.319** [1.041, 1.671]	–	**1.546** [1.281, 1.867]	**1.437** [1.195, 1.728]
	–			–		
Downward mobility (two steps)	–	1.426 [0.726, 2.800]	1.580 [0.854, 2.925]	–	**2.244** [1.231, 4.091]	**1.931** [1.040, 3.585]
	–			–		
Estimated effect for immobile by level of education						
u_{11} (Tertiary)	**1.685** [1.534, 1.851]	**1.685** [1.534, 1.851]	**1.412** [1.275, 1.564]	**1.538** [1.397, 1.693]	**1.530** [1.390, 1.685]	**1.429** [1.283, 1.591]
u_{22} (Upper secondary)	**1.204** [1.113, 1.303]	**1.206** [1.107, 1.314]	**1.177** [1.078, 1.285]	**1.353** [1.243, 1.474]	**1.377** [1.259, 1.505]	**1.364** [1.244, 1.496]
u_{33} (Lower secondary or less)	**0.493** [0.445, 0.546]	**0.492** [0.443, 0.547]	**0.602** [0.536, 0.675]	**0.480** [0.432, 0.535]	**0.475** [0.426, 0.529]	**0.513** [0.456, 0.578]
Covariates						
Partnership status (ref. = single)						
Married or cohabited	–	–	**0.668** [0.599, 0.746]	–	–	**0.504** [0.449, 0.566]
	–	–		–	–	
Separated	–	–	0.974 [0.599, 1.584]	–	–	**1.953** [1.264, 3.017]
	–	–		–	–	
Divorced	–	–	**1.353** [1.152, 1.589]	–	–	**1.208** [1.040, 1.403]
	–	–		–	–	
Widowed	–	–	0.863 [0.593, 1.257]	–	–	0.824 [0.646, 1.050]
	–	–		–	–	
Employment status (ref. = not employed)	–	–	**0.765** [0.683, 0.857]	–	–	**0.857** [0.774, 0.949]
	–	–		–	–	
Living area (ref. = rural area)	–	–	**1.189** [1.080, 1.307]	–	–	**1.274** [1.154, 1.407]
	–	–		–	–	
Migration (ref. = non-migrant)	–	–	**1.209** [1.020, 1.435]	–	–	**0.729** [0.601, 0.885]
	–	–		–	–	
Class (ref. = the salariat)						
Intermediate class	–	–	**1.470** [1.313, 1.646]	–	–	**1.158** [1.035, 1.295]
	–	–		–	–	
Working class	–	–	**1.657** [1.468, 1.871]	–	–	**1.531** [1.327, 1.767]
	–	–		–	–	
Never worked	–	–	0.897 [0.614, 1.309]	–	–	0.830 [0.634, 1.087]
	–	–		–	–	
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Age and Age-squared	Yes	Yes	Yes	Yes	Yes	Yes
Model statistics						
Akaike information criterion	12,888.1	12,891.2	12,533.9	12,773.2	12,774.0	12,103.0
Bayesian information criterion	13,070.2	13,087.8	12,818.0	12,958.4	12,974.0	12,390.8
Number of observations	10,494	10,494	10,494	11,872	11,872	11,872

Note. Estimation with statistical significance at the 0.05 level or higher are marked in bold.
Source. Authors' calculations based on data from the European Social Survey (2014).

the effects of mobility experience are not modified by partnership status, either for men or women.

Robustness checks

We have also conducted a series of robustness checks for our main findings, and the results are shown in the online supplementary materials. First, we replaced the dependent variable of the analysis: we took account of the number of cigarettes that the respondents smoked in a typical day (see Table S3). Second, rather than investigating the likelihood of daily and occasional smoking, we limited our attention to daily smoking only, as the outcome variable (see Tables S4–S5). Third, instead of using a dominance approach to measuring parents' education, we only used the information on father's education (see Table S6). Fourth, we used more refined, seven-category variables, to measure the respondents' and parents' education, and adjusted the variables of mobility experience accordingly (see Table S7). Fifth, we fit diagonal reference models without accounting for country fixed effects (see Table S8). Finally, we conducted the analyses separately for two age groups—25–44 years and 45–64 years (see Table S9). The findings from all these auxiliary analyses were very much in line with what we report in our main analysis.

Discussion

Using nationally representative samples from 20 European countries, we found that both parental education and individuals' own education were important predictors of smoking among women, while, among men, their own education was a

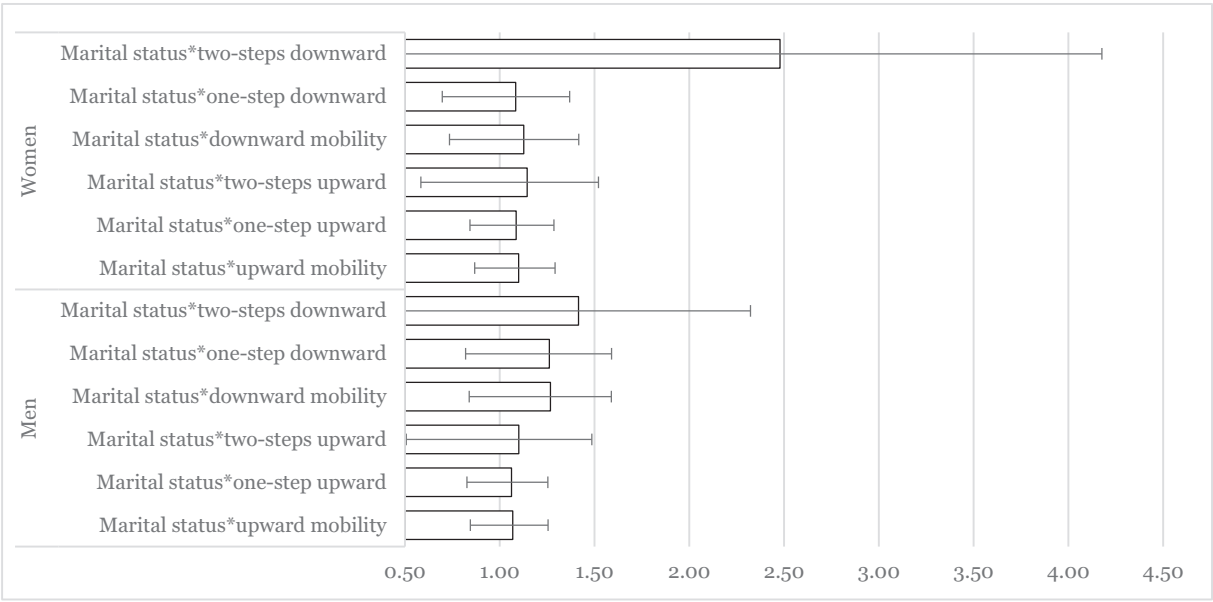

Fig. 1. Effects of intergenerational educational mobility on smoking among men and women in Europe, odds ratios with 95% confidence intervals from diagonal reference models (DRM) with interactions between marital status and mobility. *Note.* Estimations account for the main effects and all other controls shown in Table 3. *Source.* Authors' calculations based on data from the European Social Survey (2014).

much more significant predictor. But even when individuals' origins and destinations were accounted for in diagonal reference models, in terms of educational attainment, it was apparent that their actual mobility experience also mattered, at least in the case of women. More specifically, women who attained higher levels of education than their parents were less likely than their immobile counterparts to be regular smokers, and this is both due to the benefits of more education and to the extra bonus of upward mobility. Similarly, those who attained a lower level of education than their parents were more likely to smoke, which is associated with less education and with the experience of downward mobility. Further, the size of the downward mobility effects was, overall, larger than that of the upward mobility effects. These findings remained robust, regardless of how we specified our models.

There might be different reasons for the observed gender difference in the effects of parental education and intergenerational mobility experience on smoking. One explanation could be related to gender differences in the rates of educational expansion and how it is linked to health-related behaviors.[37,38] For example, having a university degree when a large majority of women still have only primary education might be associated with different patterns of health behavior, including smoking, as compared to having a university degree when more women than men attain tertiary education. Also, it is well established that women's smoking habits have been significantly affected by the general liberalization of norms regarding women's behaviors.[39] Moreover, sociological literature suggests that intergenerational upward and downward mobility might have an effect not only on health-related behaviors but also on various social norms, attitudes, and beliefs, which, in turn, can affect the likelihood of smoking.[40,41] But our null finding suggests that potential explanations related to the moderating effects of individuals' partnership status are not in operation,[36] at least not in the countries and time period covered by our research.

As discussed in the Introduction, social gradient in smoking is well established not only in terms of individuals' own educational and socio-economic status but also in terms of their social origins.[42,43] Those coming from less advantaged parental backgrounds tend to have a higher prevalence of smoking in their adult lives,[44,45] even if their contemporaneous characteristics are the main explanations for their behavior. According to WHO estimates, at the beginning of the 2000s, approximately 100,000 children worldwide began smoking on a daily basis.[46] On the other hand, evidence suggests that, in many parts of the world, concerns about intergenerational mobility are acute, and even in mature European democracies overcoming adverse circumstances rooted in social origins in adult life poses a major societal challenge.[47] Although studies have identified some health implications of intergenerational upward and downward mobility,[48,49] it has been unclear how educational mobility across generations is associated with the likelihood of smoking. Ours is one of the first large-scale studies on this topic.

One of the apparent strengths of the present study is that it establishes empirical regularities regarding the links between parental education, own education, and intergenerational educational mobility, on the one hand, and smoking behavior on the other, in a large number of European countries. But this also means that with our research design we could not not identify country-specific differences in these complex associations—in other words, our focus was on commonalities rather than differences across countries. It is for future research to investigate how far the established links between intergenerational educational mobility and smoking habits vary cross-nationally and to what extent these are moderated by contexts, institutions, and policies of various kinds. For example, the degree of economic inequality or the degree of educational inequality in relation to social origins or tobacco control policies might affect this link. Although our outcome variable accounted for the smoking of cigarettes, as well as rolled tobacco, the survey that we used did not allow us to expand our analyses to other forms of smoking, such as pipes, cigars, and electronic cigarettes. This is a clear limitation of the paper, considering the significant rise in e-cigarettes' use in recent years. Also, since the data-set used in this study was cross-

sectional, the direction of causality cannot be ascertained. Finally, another limitation of our study is that we were not able to 'unpack' the actual mechanisms through which intergenerational upward and downward educational mobility, respectively, reduce or increase the likelihood of smoking. It is for future studies to investigate this issue.

Author statements

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Ethical approval

Not required (this study did not require ethical approval as it used publicly available secondary survey data).

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Competing interests

None declared.

Contributors

AG devised the study. AG and YZ conducted the analyses and wrote the manuscript. EB wrote the manuscript. All authors have approved the final article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.12.009.

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