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Does pollution perception lead to risk avoidance behaviour? A mixed methods analysis

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Abstract: This paper looks at three contaminated communities in southern Europe facing pollution from industrial and mining activity and analyses forms of avoidance behaviour, using both economic and sociological approaches. Based on a quantitative household survey, we show that avoidance behaviour is mainly explained by residential location and socio-economic characteristics. Pollution perception is not statistically correlated to most avoidance behaviour. From in-depth qualitative interviews we learn more about people's risk perception and whether and why people adopt avoidance behaviour, including discovering some inventive solutions. To conclude, our results cast doubt on the efficacy of current public advisory communications.

Keywords: pollution perception; pollution exposure; avoidance behaviour; mixed methods research

JEL codes: Q53, Q24, Q25

Word count: 10,425 words including references and tables

1. Introduction

Pollution is highly hazardous to health (Landrigan et al., 2018), but, people may reduce their exposure to pollution by adopting avoidance strategies. These can range from completely avoiding polluted areas to adapting their day-to-day behaviour in the hope of reducing their exposure.[1] However, few studies explain the determinants of these strategies. This study aims to explore how pollution exposure and pollution perception affect day-to-day behaviour in sites that are polluted from ancient mining or industrial activity. We base our results on three extensive case studies in France, Spain and Portugal. In the study areas, pollution occurs in the soil but can also indirectly be transmitted through e.g. dust in the air, water, and/or locally grown food. We focus in particular on food consumption and drinking water consumption. For our analysis, we combine sociological and economic research approaches.

The sociological literature on pollution in mining or industrial sites focuses very little on every day behaviour. We found mainly studies about the knowledge of pollution and risks (Irwin et al., 1999; Wynne, 1992).[2] Some authors have highlighted factors that hinder the expression of critical voices in the public space.[3] Few authors have attempted to describe the ordinary experience of pollution that is not necessarily told in the public space, including its corrosive effects (Corburn, 2005; Couch and Mercuri, 2007; Erikson, 1994; Freudenburg, 1997; Walker, 2012). Without systematising the analysis, Edelstein (2004) discusses aspects of the experience of living in polluted areas, finding it to be mainly negative: social practices can be hampered or prevented due to the risks involved, for example having children, inviting guests to one's home, using the water from one's well. What emerges is the way in which the social fabric is torn apart by exposure to pollution and its uncertain consequences. Gramaglia (2014) points to other personal adjustments that are taken to mitigate risk: forms of vigilance and modified social practices that are clung to in the expectation that they could be protective. Such adjustments, some of which can be termed avoidance behaviour, are inadequately documented and hence the object of our study.

[1] We use the terms 'avoidance strategy', 'avoidance behaviour', 'coping practice', 'precautionary practice' and 'averting behaviour' interchangeably in accordance with different strands of the literature.

[2] Since Love Canal and Woburn (Brown, 1997), people have begun to produce the knowledge necessary to assess the health consequences of their exposure to industrial pollution (Brown, 2007; Lerner, 2010). Some authors have described cases, where corporations and authorities tended to minimise risks (Masterson-Allen and Brown, 1990), others have focused on environmental inequalities (Walker et al., 2005) and still others have illustrated the stages that lead from the identification of a problem to the formal complaint (Cable and Shriver, 1995; Holifield, 2009).

[3] Due to precariousness (Auyero and Swistun, 2008), institutional and political constraints (Kroll-Smith et al., 2002; Zavestoski et al., 2002) or community and place attachment (Mah, 2009; Phillimore and Bell, 2013).

The economic literature on avoidance behaviour mainly focuses on air pollution (Bresnahan et al., 1997; Janke, 2014; Mansfield et al., 2006; Neidell, 2009; Sun et al., 2017), to a lesser extent on water pollution (Zivin et al., 2011) or food contamination (Shimshack et al., 2007). Literature on soil pollution is missing, with the exception of Levasseur et al., (2021) who focus on the extreme avoidance strategy of moving out of polluted areas. This research gap can be explained by a lack of data on soil pollution but also because air pollution peaks are episodic exogenous factors allowing causal inferences to be more easily established. In contrast, the chronicity of soil pollution makes its effects harder to identify. Nonetheless, existing studies provide interesting results with regard to avoidance behaviour. As early as the 1980s residents of Los Angeles, US, spent significantly less time outdoors and used more air conditioning when ozone concentrations exceeded the national standards (Bresnahan et al., 1997). In addition, several studies found socioeconomic and demographic heterogeneity in the relationship between air pollution exposure and avoidance behaviour (Mansfield et al., 2006; Shimshack et al., 2007; Sun et al., 2017). For instance, in China, Sun et al., (2017) found that air-pollution alerts caused purchases of mobile air filters and protection masks to increase, especially among higher income groups. Likewise, Mansfield et al., (2006) showed that wealthier households significantly limit children's outdoor time on days with high ozone concentration. Shimshack et al. (2007) found that educated households with young children responded particularly well to warnings about fish consumption due to potential mercury pollution. Neidell (2009) and Janke (2014) noted that the adoption of avoidance behaviours strongly depends on opportunity costs, i.e. revenue earned with the best alternative activity. In the case of soil pollution exposure, Levasseur et al., (2021) found that the willingness to move out polluted areas was the highest among the richest and wealthiest individuals. However, nonlinearities were found: middle income groups showed higher propensities to stay because of potential housing advantages that polluted areas offer (e.g. lower housing price). Besides demographic and socioeconomic heterogeneity, several studies identified pre-existing health conditions as another factor (Bresnahan et al., 1997; McDermott et al., 2006; Skov et al., 1991).[4] In this paper, we take up the fact that exposure and socio-demographic variables are important explanatory factors of avoidance behaviour.

The psychological literature has stressed the importance of individual beliefs about risks and avoidance or coping strategies. Rogers (1975) showed that next to the magnitude of the noxious

[4] They showed that those suffering from asthma, hay fever or lung disease, for example, are more likely to take action to avoid air pollution.

event and the probability of its occurrence, the perceived efficacy of a protective response is important to explain behaviour. This idea has been widely applied to health risks (see Milne et al.(2000) for a literature review) and more recently to natural risks (Grothmann and Reusswig, 2006; Richert et al., 2017). In the latter context, the experience of a negative event and socio-demographic factors have also shown to be crucial to explain protective behaviour. Awareness alone is not sufficient (Scolobig et al., 2012). Many psychological studies also highlight the fact that risk attitudes are context-dependent (Weber et al., 2002) and depend on the framing of the situation (Kahneman, 2011; Slovic, 1987; Slovic et al., 1981). Some general features have also been noted, such as a stronger risk aversion of women compared to men. In this paper, we detail the multiple facets of risk perception and their link to behaviour in a qualitative study. We focus on the link between pollution perception, exposure, socio-demographic variables and avoidance behaviour in a quantitative study.

We adopt a mixed methods research approach (Bickerstaff and Gordon 1999, Creswell, 2014): on one hand we employ econometric analyses based on representative case-control surveys of nearly 1,200 households to quantify the association between the respondents' perception of pollution and household's eating and drinking behaviour. On the other hand we discuss and enhance the quantitative results using qualitative materials based on in-depth interviews in order to better understand the relationship between pollution perception and avoidance behaviour.

Our work has implications for public policy insofar as it identifies significant ambiguities in averting behaviour. Since these can be attributed to a misunderstanding of public health campaigns, our results provide clear guidelines for policymakers in improving prevention programmes.

We structure the article as follows: section 2 presents the quantitative and qualitative methodologies. In Section 3 we report the quantitative results and their qualitative enhancement based on in-depth interviews, and in Section 4 we discuss the quantitative and qualitative findings and provide recommendations for public policy before concluding in the final section.

2. A mixed research approach based on three case studies

In the following we first present the three case study areas we have been studying. We then describe the quantitative methodology, the setting-up of an original database and the econometric analysis. We finally discuss the qualitative methodology based on in-depth interviews.

2.1 Description of case study areas

Viviez is a small town of 1,200 inhabitants located in the Aveyron department in the South of France. In the late nineteenth century a zinc factory was established in Viviez (1855) along with a coal-fired plant. The foundry operated until 1987 when its activities were limited to finishing zinc as part of the restructuring of the Belgium-based company Vieille Montagne (later called Umicore, before it was sold to Fedrus in 2017). From 1855 to 1987 two million tons of dry waste and mud containing heavy metals (arsenic, cadmium and lead) were released and stockpiled in slag heaps and basins. As later acknowledged by regional state services, this resulted in chronic contamination of the soil and rivers – a problem that was only partially addressed when some wastelands were remediated in the 2000s.

Viviez's economic and social dynamism increased with the arrival of the zinc factory. Its influence was regional, and it competed with the capital of the Aveyron department, Rodez. Once the foundry closed its influence rapidly declined. Today the factory employs around a tenth of the workers it used to. Other smaller factories were set up, two of which process metals and recycle batteries. Although the unemployment rate is lower than in the rest of the region the Viviez area is not as economically or socially vibrant as before. Many shops have closed. Several houses are vacant. Social life also declined as the population aged.

The Sierra Minera de Cartagena-La Union is located in the province of Murcia in the southeast of Spain. It extends over around 50 km^2 between Cartagena, the Mediterranean Sea and the coastal lagoon of the Mar Menor. The extraction of silver and lead began in pre-Roman times. Exploitation by means of underground mining, with various periods of boom and bust, continued until the middle of the twentieth century when much more intensive extraction began with opencast quarries and a new system of mineral concentration by means of differential flotation. Mining ended in 1991. The scars from the most recent exploitation transformed the soils of the Sierra into a landscape of holes, artificial mountains, acid lakes and piles of mining waste (Hunink et al., 2004). In the second half of the twentieth century waste from mining concentrated by differential flotation was dumped into the Mediterranean at Portman Bay, which was filled by this waste along its 0.72 km^2 surface area, leaving major problems for the local environment and health (Banos-González and Baños Páez, 2018). In the nearby town of Alumbres, 14 different industrial facilities linked to the petrochemical industry are in operation (Banos-González and Baños Páez, 2013).

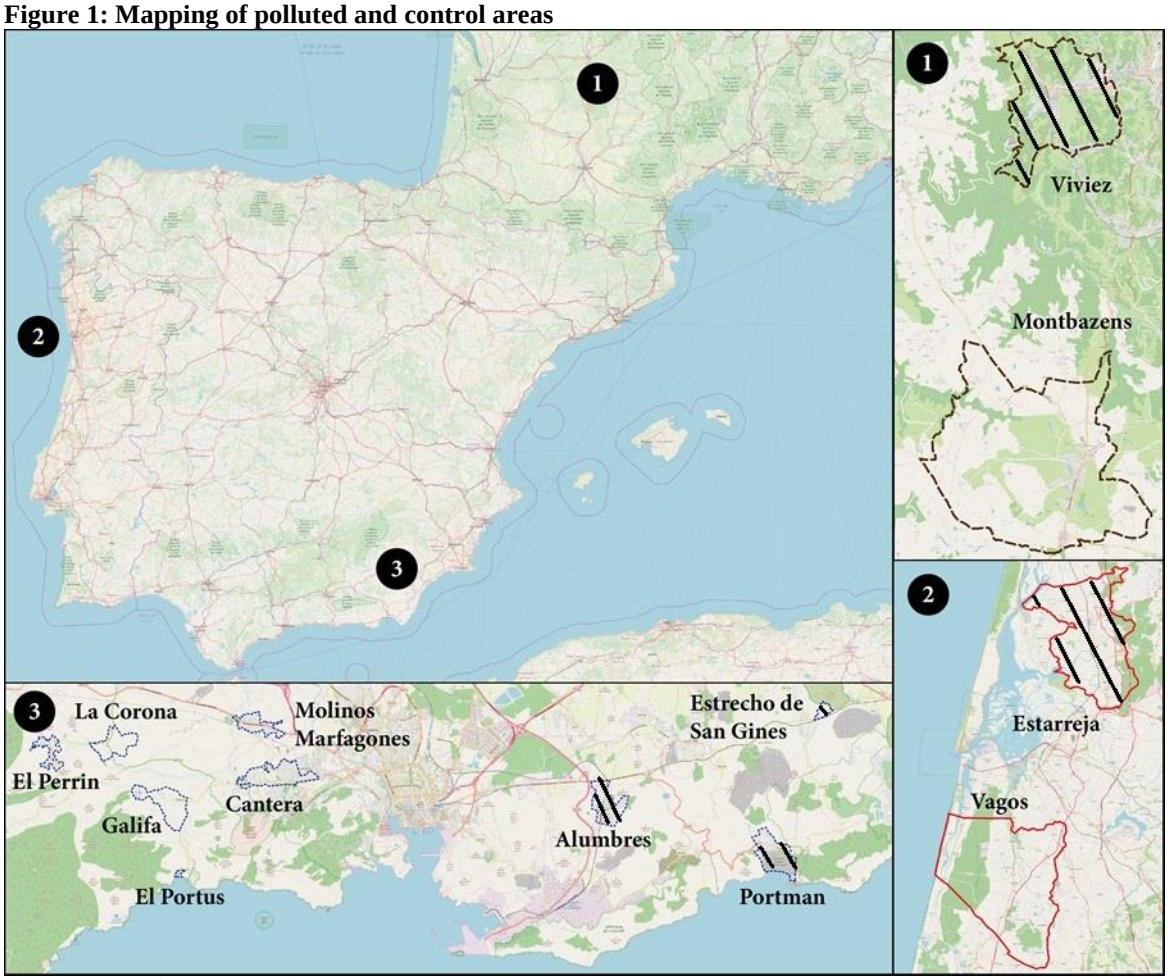
The main town of La Union has close to 20,000 inhabitants, while the small villages of Portman and Llano del Beal have 1,000 and 1,200 inhabitants respectively. The former mining area now has high unemployment and low infrastructural development. In surrounding areas, intensive agriculture has developed and some Natura 2000 sites have been created. The tourist sector has grown on the coast but not directly in the former mining areas (Conesa et al., 2008; Martínez Soto et al., 2016).

The municipality of Estarreja is located in the region of Central Portugal. Its only city, Estarreja, has 7,500 inhabitants. The municipality hosts a chemical complex producing mainly ammonium sulphate, nitric acid and ammonium nitrate but also synthetic resins (PVC). Along with the Sines complex, it is one of the most important petrochemical sites in Portugal. It is also part of one of the largest wetland systems in the country with a natural habitat of great diversity, which is subject to environmental protection. The factories and chemical plants brought employment and economic growth on one hand while severely impacting the environment and altering the landscape on the other. Since the establishment of chemical industry in the mid-1930s and until the beginning of the twenty-first century the area's soil, surface water and groundwater were subject to intensive contamination.

The 2000s saw the establishment of ERASE – an association of industry and local authorities under the stewardship of the Portuguese Environment Agency that undertakes remediation projects in the area. The municipality has made substantial investments for culture and leisure in the town of Estarreja (such as the Estarreja Cine-Theatre, the ESTAU Urban Art Festival and a town carnival) and communicates on the high ecological values present in the coastal area (e.g. BioRia project). Although several contamination issues remain in the area, and are consistently identified by the scientific community, there is almost no public debate on the topic of pollution.

In short, we study industrially polluted areas at different stages of development: (i) ex-mining towns (Portman and Estrecho de San Ginès), (ii) heavy-metal industry in technological transition (Viviez) and (iii) active chemical complexes (Estarreja and Alumbres).

Figure 1: Mapping of polluted and control areas



Source: OSM, authors' computations. Polluted areas are hatched on the map. Figure already published in Levasseur et al. (2021).

All three study sites are hot-spots of pollution, as documented by the literature in geochemisty and mineralogy (for Viviez (Durand et al., 2015; Sivry et al., 2010); for Estarreja (Inácio et al., 2014b; Patinha et al., 2015) and for the Sierra Minera (Blondet et al., 2019; Pérez-Sirvent et al., 2016). Nonetheless, there is no systematic mapping of risk areas or quantified public information about pollution levels. Certain official precaution guidelines were issued to the public in the three study areas. In 2011 the French public health agency recommended that inhabitants consume less food produced or grown locally, for example home-grown fruit and vegetables, local farming and wild food (derived from hunting, gathering, fishing), following an epidemiological study conducted in the area (Durand et al., 2011). In addition, it is highly discouraged by public health and environmental protection agencies to drink well water in areas near mining and industrial sites. Note that tap water is not affected by pollution in the case study areas as it comes from sources outside the polluted areas. However, well water is polluted in many places.

2.2 Quantitative approach

2.2.1. An original case-control database

Between October 2018 and January 2019 we conducted comparative household surveys among 1,194 families in France, Portugal and Spain. These were designed to gather information on the socio-demographics, perceptions and behavioural patterns of residents living in polluted areas and neighbouring but cleaner control areas (Figure 1). This case-control database, called Comparative Survey on Pollution Exposure (CSPE), is representative of three polluted European areas: Viviez in France (156 households and 293 individuals), the municipality of Estarreja in Portugal (300 households and 739 individuals) and three villages of the Spanish Sierra Minera (Portman, Estrecho de San Ginès and Alumbres) located to the east of Cartagena (228 households and 557 individuals). The control areas are Montbazens in France (138 households and 309 individuals), the municipality of Vagos in Portugal (200 households and 437 individuals) and a group of villages (Portus, Galifa, Perin, La Corona, Cantera and Molinos Marfagones) located to the west of Cartagena in Spain (172 households and 452 individuals). The control areas were selected using region-specific literature (Banos-González and Baños Páez, 2013; Durand et al., 2011; Guihard-Costa et al., 2012; Inácio et al., 2014a).

The objective of our quantitative model is to measure the potential effects of pollution perception on avoidance behaviour in mining and industrial areas highly contaminated by toxic

chemicals and heavy-metal residue. We focus on two types of behaviour that residents of such areas may adopt to protect themselves: (i) food consumption habits (e.g. home-grown food, wild food, local food and organic food), (ii) water consumption habits (e.g. bottled water, tap water and well water). We measure pollution perception as the intensity of pollution in the respondents' location, measured with a five-point Likert scale. We also collected information on the main source of pollution (industry, mining, automobile, other) showing that most people in contaminated areas identify mining and industry as main source of pollution.

2.2.2. Econometric models

Although one can reasonably assume that lower pollution exposure is negatively correlated with pollution perception and the adoption of avoidance behaviour, this is not systematically the case. For example, people may live in polluted areas because they are not alerted about health issues and so are less likely to adopt avoidance behaviour. Moreover, the potential presence of uncertainty regarding the appropriateness of avoidance behaviours makes the relationship between pollution perception and consumption outcomes ambiguous. Indeed, people living in polluted areas may collectively adopt actions based on public health recommendations, but also based on personal beliefs. Hence, to clarify the links between residential location, pollution perception and avoidance behaviour, several econometric regressions based on ordinary least square (OLS) estimations are run.

First, Equation 1 regresses the level of pollution perception P for an individual i (i.e. the respondent) on residential location T (cases vs. controls), a set of observed individual, socioeconomic and demographic factors, such as age, gender, attitude towards risk and level of education (X) and a residual term (ε_i) containing unobserved characteristics, such as individual awareness and geographical location in the municipality.

$$\boldsymbol{P_i = \alpha_0 + \alpha_1 T_i + \alpha_2 X_i + \varepsilon_i} \qquad \textbf{(Eq.1)}$$

Then, Equation 2 regresses avoidance behaviour (Y) on the indicator of pollution perception (P), the area indicator of the residential location (T), an interaction term between pollution perception and residential location ($P*T$), the set of observed individual, socioeconomic and demographic factors (X) and a residual term (ε_{i1}) containing unobserved characteristics, such as individual awareness and family history. We introduced an interaction term between pollution perception and residential location ($P*T$) in order to estimate how avoidance behaviour changes when pollution perception increases among polluted areas only. This

approach allows to investigate potential heterogeneous effects of pollution perception on avoidance behaviour according to residential location.

$$\boldsymbol{Y_i = \beta_{30} + \beta_{31}P_i + \beta_{32}T_i + \beta_{33}(P_iT_i) + \beta_{34}X_i + \varepsilon_{i3}} \quad \textbf{(Eq.2)}$$

2.2.3. Sample and variables

Since this study looks at individual perceptions of pollution exposure, the survey uses one adult respondent per household. To measure pollution perception (*P*) we asked each respondent to evaluate on a 5-point Likert scale the level of pollution in his/her living area. The variable for residential location *T* is a binary- variable that identifies whether an individual lives in a polluted area or in a control area (see Figure 1). As mentioned earlier, our outcome indicators (*Y*) measure household behaviour related to food consumption and drinking water. Note that regarding food consumption outcomes, each indicator takes the value 1 when the food source (i.e. home-grown food, wild food, local food and organic food) represents more than 25% of the total food consumption of the household and 0 otherwise. In total, we have seven binary-response consumption variables (four related to food consumption and three to water consumption) that are separately regressed according to Equation 2.[5]

Finally, following other studies in the literature (Mansfield et al., 2006; Neidell, 2009; Sun et al., 2017), we control each regression including a comprehensive set of demographic (i.e. age, ethnicity and marital status of the respondent, number of children in the household, length of residence, country of residence) and socioeconomic (i.e. education of the respondent and his/her parents, wealth index of the household, property size and whether there is a garden) characteristics.[6] We also control for the respondent's attitude to risk, given that general risk-takers are more likely to take concomitant risks regarding pollution exposure and any health-related behaviour. The survey measured attitude towards risk on a 5-point Likert scale, varying from a very low to a very high willingness to take risks in general. As shown by Dohmen et al.

[5] Each food item is independent and is analysed in separate regressions. Table A1 in the Appendix reports the survey questions asked to respondents for the outcome variables. In the survey, water consumption was collected in a categorical way (water tap, bottled water, or well water) and food consumption was collected in an ordinal way using four ordinal categories (less than 25%, between 25 and 50%, between 50 and 75%, and more than 75% of the total food consumption). We systematically transform these variables in binary-response indicators for more consistency among eating and drinking outcomes, in addition to make the interpretation of results simpler. We also tested ordinal logit estimates using the four ordinal categories of each food item as outcome indicator. As the results were similar, we only report linear probability estimations based on OLS.

[6] The wealth index is the sum of any of the following assets that are owned by the household: principal home (homeownership), second home, car, air conditioning system, computer, mobile phone and financial assets. The wealthiest households have a score of 7 while the most deprived have a score of 0.

(2011), such measurements of general risk attitude (or aversion) are a good all-round predictor of risk-related behaviour.

2.3. Qualitative approach

The research began with qualitative interviews conducted in the three case study areas. A common interview framework was devised, with a large number of open-ended questions so as to incorporate socio-cultural specificities. The aim was to understand perceptions, viewpoints and practices in several areas: knowledge of the historical development of the industry, knowledge and personal experience of pollution, personal health status and opinion on the health status of the broader community, consequences of pollution for the habitability of the area, expectations, opinion on the quality of social and changing domestic relationships, consumption habits and leisure practices (gardening, sports, hunting and fishing, observation or artistic use of the landscape).

The interviews lasted from 30 minutes to three hours. We gathered around thirty per site, across several categories, namely institutional actors (e.g. representatives in municipalities, civil protection and universities), members in various associations (community, leisure or environmental) and residents. Snowball sampling was applied until saturation. First, we identified the main stakeholders through documentary research and press review. We met them and, in some particular cases, could interview them in situ, i.e. while they were showing us the area concerned by contamination problems. Then we ask all them if they could name residents who had taken a stand on the issue of contamination or refused to do so in order that we could question them too. We also spent time in public spaces creating opportunities to meet further respondents to make sure that our panel was as diverse as possible.

The empirical material collected was then transcribed and thematically analysed using inductive approaches. After discussing the raw data within our multidisciplinary team, we agreed on common categories to classify statements about perceptions, health hazards and adaptive behaviour. There was no secondary coding, because of language differences, but regular exchanges that allowed everyone, in their country of origin, to work on a common matrix. Differences and similarities were systematically recorded and made sense of. We tried to compare and bring together, when appropriate, domestic, consumption and outdoor practices in three locations with different ecological contexts (semi-arid to Mediterranean and oceanic settings). If thematic codes with the larger number of mentions were considered the most significant, we also paid attention to less frequent or more discrete phenomena. New categories were created when needed, so unexpected elements could be integrated in the analysis.

The earliest results fed into the design of the standardised questionnaire used in the quantitative survey. Further qualitative results helped in the interpretation of the econometric results. It should be noted that in some cases it was not possible to carry out the interviews. Certain respondents feared that publicising their concerns about environmental and health risks could have negative consequences for them. These refusals were taken into account in our analysis.

3. Quantitative and qualitative results

3.1. Summary statistics

The summary statistics in Table 1 show significant differences in eating and drinking behaviour between polluted and control areas. Households in polluted areas consume less home-grown food but more wild food products than their control counterparts. They also drink more bottled water and use less tap water. However, simple mean-comparison tests between polluted and control areas can be biased by the presence of heterogeneity in the sample explaining both residential location and consumption preferences. Indeed, as reported in Table 1 there are significant mean differences across the demographic and socioeconomic characteristics of the population. In fact, individuals living in control areas are significantly wealthier than individuals living in polluted areas, while polluted areas disproportionally host underprivileged individuals. The latter are likely to have low information about risks; many of them are less educated or have a family with a foreign origin (although the polluted cities we studied were not specifically populated by minorities). On the other hand, houses are significantly larger in polluted areas, suggesting that underprivileged individuals have access to more affordable houses. Indeed, as discussed by Levasseur et al. (2021), residential choice in polluted areas is also motivated by the possibility of access to larger houses. These observations help us to clarify the analyses in terms of environmental justice in the European context (Levasseur et al. 2021).

Table 1: Mean- and proportion difference tests between polluted and control areas regarding dependent and independent variables

	Polluted areas		Control areas		Difference	
	N	Mean	N	Mean		
Homegrown food consumption (%)	677	0,21	505	0,31	-0,10	***
Wild food consumption (%)	680	0,11	504	0,06	0,05	***
Local food consumption (%)	664	0,42	501	0,42	0,00	
Organic food consumption (%)	673	0,15	503	0,16	-0,01	
Water bottle consumption (%)	681	0,56	510	0,45	0,11	***
Well water consumption (%)	681	0,09	510	0,11	-0,02	
Tap water consumption (%)	681	0,35	510	0,44	-0,09	***
Hours of ventilation (summer)	682	12,86	509	12,31	0,55	
Hours of ventilation (winter)	682	3,18	509	2,78	0,40	**
Pollution perception (5-point Likert scale)	681	3,53	510	2,09	1,45	***
Between 18 and 29 yo (%)	681	0,08	510	0,11	-0,02	
Between 30 and 44 yo (%)	681	0,21	510	0,19	0,02	
Between 45 and 64 yo (%)	681	0,37	510	0,37	0,00	
Male (%)	684	0,40	511	0,49	-0,09	***
Foreign origins (%)	684	0,08	511	0,05	0,03	*
In couple (%)	679	0,58	509	0,61	-0,03	
Number of children	684	0,31	511	0,32	-0,01	
Attidude against risk (5-point Likert scale)	679	2,09	506	2,10	-0,01	
Obtained at least a high-school grade (%)	676	0,13	508	0,19	-0,06	***
Parental education (at least high-school level) (%)	642	0,19	499	0,23	-0,04	*
Wealth index (0-to-7 score)	684	3,54	511	3,62	-0,08	***
Housing size (room number)	676	6,02	508	5,50	0,52	***
Having a garden (%)	681	0,52	510	0,63	-0,11	***
Lenght of residence (in years)	675	41,13	493	33,44	7,69	***
France (%)	684	0,23	511	0,27	-0,04	*
Portugal (%)	684	0,44	511	0,39	0,05	*

Notes: Significance levels of mean- and proportion-differences: ***1%, **, 5% and *10%.
Source: CSPE database (2019).

3.2. Estimation results

OLS results for Equation 1 are shown in Table 2. As expected, residential location is the major predictor of the level of pollution perception reported by the respondent. In line with Barton Laws et al. (2015), living in a polluted area increases by 1.4 the 5-point score of pollution perception. Moreover, men tend to report lower levels of pollution perception than women, as shown in previous studies (Barton Laws, M., Yeh, Y., Reisner, E., Stone, K., Wang, T., Brugge, 2015).

Table 2: OLS regressions of Equation 1

DEPENDENT OUTCOME : Respondent's pollution perception index	
Living in a polluted area	1.461***
	(9.64)
Aged 18-29	0.044
	(0.32)
Aged 30-44	0.102
	(0.71)
Aged 45-64	-0.002
	(-0.02)
Gender (male)	-0.116*
	(-1.82)
Foreign origins	0.068
	(0.70)
In couple	0.124
	(1.59)
Number of children	0.015
	(0.47)
Attitude towards risk (5-point Likert scale)	0.045
	(1.51)
Obtained at least a high-school grade	0.064
	(0.80)
Parents' level of education (at least high-school)	0.021
	(0.29)
Wealth index (0-7 score)	-0.005
	(-0.15)
Property size (number of rooms)	-0.001
	(-0.05)
Having a garden	-0.047
	(-0.41)
Length of residence	0.001
	(0.39)
France	-0.125
	(-0.57)
Portugal	-0.015
	(-0.05)
Constant	1.973***
	(11.82)
Observations	1,081
R-squared	0.323

Note: t-test are in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Source: CSPE database (2019)

OLS results for Equation 2 regarding food and water consumption items are shown in Table 3. Once controlled for observed characteristics (including demographic characteristics and socioeconomic backgrounds) and residential location, the results lead us to nuance our initial

assumptions regarding the link between pollution perception and risk avoidance behaviour. For instance, the reduction of home-grown food appears to be more driven by collective pollution exposure (i.e. *T*) than individual pollution perception (i.e. *P*). For a fixed level of pollution perception, we find that living in polluted areas significantly decreases the probability of consuming a lot of home-grown food by 14 percentage points, i.e. over 25% of the total food consumption. However, variation in pollution perception has no significant effect on home-grown food consumption. Besides, pollution perception does neither play on organic or wild food consumption nor the source of water consumption (tap, bottle or well).

The sole estimates where we found a significant link between pollution perception and food consumption concerns local food intake which increases with the level of pollution perception among polluted areas (although the consumption of local food is significantly lower among polluted areas than control areas). This counter-intuitive result might be due to a misunderstanding about what local food means by respondents (food can be understood as local at a municipal level, at a regional level, and even at a national level), even if this notion was explained in the survey question (see Table A1 in the Appendix). Another explanation might be the presence of inconsistent preferences regarding the source of pollution. One can prefer to consume local but contaminated food, rather than imported food with a high carbon footprint or locally contaminated food rather than industrial food contaminated with pesticides.

Then, our comprehensive set of covariates allows a better understanding of the demographic and socioeconomic drivers of food and drinking behaviour. To check for the absence of multicollinearity problems, we calculated variance inflation factors, which were systematically low. Interestingly, regardless of the area or perceived exposure to pollution, younger adults tend to consume more home-grown and wild food than older adults. By contrast, middle- and later-middle-aged adults, as well as those living in a couple, have a significant preference for organic food and bottled water. Education is also an important predictor of food consumption. While higher parental education decreases the probability of consuming home-grown and wild food, educated adults have a significant preference for local and organic food, which is consistent with the existing literature on the tastes of social classes (Shafie and Rennie, 2012).[7] Similarly, being of foreign origin increases the probability of consuming wild food. Interestingly, adults who describe themselves as risk-takers have a preference for tap water.

[7] In alternative estimates using household income in PPP as indicator of material resources (not reported here), we also observed that household income increases the consumptions of wild food, local food and bottle water.

Finally, we also analysed the interaction between pollution exposure, pollution perception, and a household wealth index to explain avoidance behaviour (reported in Table A2 in the Appendix).[8] In most cases, we did not find economic heterogeneity in risk avoidance behaviour among inhabitants from polluted areas, except for bottled water consumption (which increases with the wealth index more in polluted areas than in control areas, independently of the level of pollution perception). Hence, we cannot really conclude about the presence of inequality regarding avoidance behaviour in Europe. This result could be due to a misunderstanding about the need to switch to bottled water which may be overall stronger in the population that lives in polluted areas.

To sum up, once controlled for socioeconomic and demographic factors, we can assume that the adoption of avoidance behaviour is overall driven by residential location. In our sample, pollution perception has no effect on avoidance behaviour outcomes. In other words, residents from polluted areas would collectively adapt their behaviours based on information provided by local authorities and public health recommendation (e.g. reduction of home-grown food consumption), but also on personal beliefs (e.g. increase in local food consumption, and bottled water consumption for wealthier households).

[8] Other measures of economic status based on household income in PPP were also tested. Moreover, we tested various model specifications (with and without control variables related to sociodemographic factors such as having a foreign origin, having a garden, housing size, and education).

Table 3: OLS estimates of food and water consumption items on pollution perception, exposure and covariates (Equation 2)

	Home-grown food	Wild food	Local food	Organic food	Water bottle	Well water	Tap water
Pollution perception (P)	-0.021	-0.003	-0.011	-0.023	0.015	-0.019	0.004
	(-1.13)	(-0.27)	(-0.50)	(-1.38)	(0.70)	(-1.37)	(0.21)
Living in a polluted area (T)	-0.141**	0.073	-0.223***	-0.028	0.016	-0.021	0.005
	(-2.07)	(1.53)	(-2.69)	(-0.45)	(0.21)	(-0.41)	(0.06)
P*T	0.012	-0.006	0.059**	0.018	0.014	0.009	-0.022
	(0.53)	(-0.38)	(2.09)	(0.84)	(0.50)	(0.50)	(-0.89)
Between 18 and 29 yo	0.126**	0.107***	0.147**	0.060	0.097	-0.009	-0.088
	(2.23)	(2.70)	(2.16)	(1.17)	(1.48)	(-0.21)	(-1.47)
Between 30 and 44 yo	0.117**	0.081**	0.094	0.097**	0.073	0.025	-0.098*
	(2.47)	(2.43)	(1.63)	(2.26)	(1.31)	(0.71)	(-1.93)
Between 45 and 64 yo	0.064*	0.014	0.032	0.046	0.026	0.009	-0.035
	(1.92)	(0.61)	(0.79)	(1.51)	(0.66)	(0.34)	(-0.96)
Gender (male)	-0.019	0.022	-0.035	0.004	-0.024	0.021	0.003
	(-0.76)	(1.25)	(-1.14)	(0.19)	(-0.82)	(1.13)	(0.10)
Foreign origins	-0.048	0.075**	0.057	0.023	0.128**	0.001	-0.130**
	(-0.92)	(2.03)	(0.88)	(0.49)	(2.08)	(0.03)	(-2.30)
In couple	0.006	0.020	-0.003	-0.002	0.086***	0.021	-0.107***
	(0.21)	(1.04)	(-0.10)	(-0.09)	(2.69)	(1.03)	(-3.66)
Number of children	0.000	-0.002	-0.004	-0.019	-0.029	-0.002	0.031
	(0.02)	(-0.12)	(-0.17)	(-0.97)	(-1.17)	(-0.14)	(1.37)
Attitude against risk (5-point Likert scale)	-0.010	0.001	-0.002	-0.005	-0.005	-0.018**	0.023*
	(-0.88)	(0.10)	(-0.11)	(-0.51)	(-0.39)	(-2.03)	(1.85)
Obtained at least a high school grade	-0.001	-0.020	0.111**	0.115***	-0.019	0.002	0.017
	(-0.03)	(-0.77)	(2.51)	(3.49)	(-0.45)	(0.07)	(0.45)
Parental education (at least high-school level)	-0.086**	-0.054**	0.041	-0.042	0.009	-0.017	0.008
	(-2.49)	(-2.24)	(0.99)	(-1.34)	(0.22)	(-0.66)	(0.22)
Wealth index (0-to-7 score)	-0.011	0.002	-0.004	0.004	0.003	0.001	-0.005
	(-1.09)	(0.25)	(-0.30)	(0.39)	(0.28)	(0.17)	(-0.43)
Housing size (room number)	0.010	0.004	0.037***	0.006	0.013	0.001	-0.014
	(1.24)	(0.79)	(3.87)	(0.77)	(1.44)	(0.10)	(-1.64)
Having a garden	0.108***	0.000	0.002	0.066**	0.065*	-0.023	-0.042
	(3.83)	(0.02)	(0.06)	(2.55)	(1.96)	(-1.07)	(-1.38)
Length of residence	0.003***	0.000	0.001	-0.000	-0.000	-0.001**	0.001*
	(4.35)	(0.64)	(0.93)	(-0.38)	(-0.34)	(-2.15)	(1.89)
France	0.249***	-0.041	0.074	0.157***	-0.489***	-0.125***	0.615***
	(6.42)	(-1.49)	(1.56)	(4.43)	(-10.72)	(-4.26)	(14.70)
Portugal	0.306***	0.027	0.183***	0.091***	-0.282***	0.020	0.262***
	(8.89)	(1.11)	(4.36)	(2.90)	(-6.98)	(0.77)	(7.08)
Constant	-0.017	-0.023	0.084	0.024	0.485***	0.230***	0.285***
	(-0.22)	(-0.41)	(0.89)	(0.34)	(5.32)	(3.91)	(3.40)
Observations	1,071	1,076	1,061	1,068	1,077	1,077	1,077
R-squared	0.201	0.046	0.094	0.075	0.168	0.052	0.264

Note: t-stat are in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. Source: CSPE database (2019).

3.3 Qualitative enhancement

The qualitative data allows us to clarify our analyses and to illustrate them with extracts from testimonials. In Viviez, the residents are aware that they live in a particular place, industrial and polluted, and that this can affect their health. Our survey highlighted polarised opinions though: some see the risks as having reduced over time as industrial processes evolved and were better controlled. Others think the danger is still high and that traces of pollution cannot be erased.

> I have always said that I have always tried to annoy the successive sub-prefects or prefects into cleaning up these gardens. […] I had a hard time admitting that this working population, which for years – decades – suffered from air pollution – pollution from work… People even died on the job. […] And these people are going to be put under a lot of pressure in the area where they were born, where they lived and to which they are attached. I didn't think it was normal. [Male (town councillor, Viviez)].

Yet, during the interviews the residents remained reserved about the impact of pollution on their daily lives. It was not an issue they had reflected upon. Nonetheless, in the course of the discussion examples were given, almost in the tone of the anecdote. We noted: heightened personal hygiene (hands and nails), giving up gardening and growing food, refusing gifts of home-grown food from neighbours, a tendency to buy organic products, where possible from greengrocers further afield, higher consumption of bottled water (despite the town spring being located in a protected area), particular house-cleaning practices (although still not in line with official advice), the relocation of sport and leisure activities, such as mushroom picking, hiking and jogging. We also spotted certain unique behaviour. One resident said he had dug up and changed the earth in his garden himself, fearing it could be polluted. Another individual confessed to still drinking well water despite this now being forbidden.

Viviez's residents do what they can to cope with pollution as a trade-off between the need to protect themselves and a desire to preserve what they think they can of their way of life, as the examples below show.

> We pick cherries on the hill, all that. But growing potatoes in the garden so that they would be less toxic, as a neighbour suggested to me? I said no. Never. I'm square about it – no. I have some flowers, some grass, that's it. [Male (retiree, Viviez)].

> Whether there is pollution or not, we live where we can, and we deal with it. We protect ourselves from it as far as we can, which means that… Well, it's true that when it smells bad we close the windows. We also avoid tap water. We spend our leisure time elsewhere,

> and it's true that for retirement I don't think we're going to stay too long – if we can help it. If we have the means to move away, we will move away. [Male (engineer, Viviez)]

Some, including the mayor, believe the recommendations for day-to-day behaviour are not sufficient to tackle the pollution problem:

> At the end of the thing [the epidemiological study led by the national health agency] they said 'you should wash your hands and mop up'. They were fooling us. That's the problem with the state. They said, 'you have to wash your hands and mop up, and goodbye, we're out of here'. [Male (town councillor, Viviez)].

Our qualitative enquiry in Portman and El Llano del Beal showed yet other reactions in the face of pollution. While in Portman the focus is on the recovery of the bay, filled with mining residue, in El Llano del Beal a whistle-blower focused residents' attention on the risk faced by schoolchildren exposed to mining waste. In a context of increased press coverage of the issue, some residents speak out more freely their awareness, others regret the negative publicity, fearing it will do more harm than good. There is both a feeling that things have improved since the mine closed and that people have been abandoned in the face of risk that the authorities have tended to minimise.

We found it difficult to identify major changes in practices due to pollution: the residents garden (but not much due to the semi-arid climate and lack of space); they walk, do sports and pick herbs and wild fruits in the Sierra, such as capers and figs. They also fish in the sea near mine drainage outlets. Nonetheless we spotted some risk-avoidance behaviour: some interviewees told us they had started to hesitate with regard to eating fish or they chose species they thought were less exposed to contaminants. Some avoided taking their children to the beach or practised heightened personal and domestic hygiene. Overall it is a feeling of powerlessness and resignation that distinguishes the residents of this place.

In Estarreja no one denies that industrial activity severely polluted the region from the 1950s to the 1970s. However, the authorities choose to refer to the facts in the past tense, thereby treating them as an historical issue. What is lacking in the discourse is that recent studies have found high levels of contamination to remain in soil and water.

Yet former factory workers and farmers are all too aware of the present-day ramifications of an industry that operated with no environmental concern. :

> At the time I worked [at Unitec] there was no great care taken with the discharge. As time goes by all this is more closely watched, but there are still fields below the cattle that are

> contaminated with mercury and where we cannot produce anything. [Male (farmer, following 42 years in a chemical factory, Estarreja)].

Some farmers were only able to talk pointedly about the pollution and the violence of industry's impact on nature on our second visit. We also identified frustration and a reluctance to express feelings about contamination, as well as a sense of resignation.

> The misfortune has all joined in the same corner […] sulfate, nitrate, benzene, nitrobenzene […] the water is all contaminated. [Male (retired farmer, ill, born and living in rural Estarreja)].

Yet, the general population was neither likely nor at ease talking about pollution today.

> Pollution is a non-question for my generation. People who were children of the pollution and now have children, they don't remember anything; it's far away in the past. [Female (young mother, Estarreja)].

The local community's dependence on industry and the process of environmental remediation has helped to dilute the memory of the worst pollution and turn the public's attention to more positive features, such as improved schools, cultural facilities, roads, healthcare and sports facilities, and protected leisure areas.

Deeper into the conversation we obtained more detailed information about the response to risk. Some farmers said they avoided watering the cows with water from the wells as they considered them to be contaminated. In the same areas some farmers are eager to get the water tested. It is also common to restrict the use of drip irrigation to avoid burning the crops.

> We use well water only to water the grass and wash the car […] the contamination level is high; the water can't be consumed or used for animals or watering the garden. [Male (café owner, E15)].

A few interviewees told us they do not eat their neighbours' produce or they avoid drinking local milk or growing vegetables. This point is all the more important as many inhabitants of the area have gardens and grow their own food. However, we also met some people who still boil the well water and use it for cooking or washing themselves.

One can observe that the pollution and the associated risk to health are very seldom discussed within the social interactions of the community. The government takes a laissez-faire stance; no policies have been put in place to provide information on day-to-day behaviour, agricultural practices or potential health impacts. Companies compensated some of the farmers who claimed

to have suffered contamination, but no collective awareness or action exists among the members of this community. The risks are faced at the individual level and avoidance practices are based on tacit knowledge.

4. Discussion

Our study is based on a mixed research approach (Creswell, 2014), where quantitative and qualitative methods are intertwined. In-depth qualitative surveys were designed so as to favour the collection of testimonies in the freest possible way. Qualitative surveys helped to identify the issue of day-to-day responses to pollution and aided the design of the quantitative survey (type of data to be collected, formulating questions appropriately for the respondents). The quantitative survey allowed measuring the link between socio-economic factors, perceptions and avoidance behaviour.

As expected from the literature (Edelstein, 2004), we noted two types of responses to pollution: mobilization and coping practices. In the investigations we have carried out, we focused on the latter, showing that that they are less a matter of symbolic distancing than of a concrete attempt to reduce the exposure. We revealed several forms of practical coping behaviour, in particular avoidance behaviour.

With the quantitative survey, we showed that exposure was an important explanatory factor for avoidance behaviour, next to some socio-demographic variables, while risk perception was rarely correlated to consumption habits. However, we found that living in a polluted area reduces by 14 percentage points the probability of consuming a lot of home-grown food. In comparison with the existing literature that focused on air pollution exposure, we observed little socioeconomic heterogeneity in risk avoidance behaviour (except for bottled water consumption which is higher among the wealthiest living in polluted areas).

In contrast to the literature on air pollution (Bresnahan et al., 1997; Mansfield et al., 2006), where avoidance behaviour is described as a reaction to particular pollution alerts, the reaction to more permanent sources of pollutions is more complex to apply, and therefore harder to measure. In our case studies, guidance on how exactly to adapt consumption habits is lacking. The qualitative survey highlighted the variety of attitudes and reactions. It showed that, in this very uncertain context where guidance is lacking, inhabitants are tempted to tinker with their own avoidance practices. For example, some people have decided to stop gardening, but sometimes allow themselves to pick mushrooms or wild fruits in their free time (even in areas

they know are polluted as in Viviez). Similarly, people who are dependent on water from their wells imagined intermediate solutions: they avoid drinking water from their wells or watering their livestock, but continue to wash with it. Moreover, the qualitative survey identified some specific avoidance or coping practices. For example, one Viviez resident said he had bought a small second home further up the river so that his children could swim safely. While pollution was not necessarily the main reason for the purchase, it had influenced the choice of the location of the property.

Overall, we note the diversity of avoidance practices, some of which can only be documented with qualitative surveys (e.g. owning a secondary home to escape pollution). Nonetheless, certain behaviours appear to be statistically apparent but did not appear spontaneously in personal testimonies (e.g. reducing home-grown food consumption, and drinking bottled water for the wealthiest).

5. Conclusion

Our results show that people living in contaminated areas may take action to reduce the risk to health. However, avoidance behaviour is not always easy to detect neither with quantitative nor with qualitative approaches. Indeed, we have seen that pollution exposure significantly decreases the consumption of home-grown food and local food, but pollution perception tends to increase local food consumption among polluted areas, which might be risk to health if this food is collected on polluted soil. Likewise, wealthier people living in polluted areas tend to use bottled spring water as a substitute for tap water. This may reveal a misunderstanding of the public guidelines with regard to lowering exposure to environmental risk.

Our work leads to several recommendations. The first is to encourage health authorities to thoroughly investigate residents' behaviour so as to provide targeted advice. Practices that the authorities believe to have been abandoned may remain; others exist but are unknown to the authorities, and may expose the population. Clearly, each site has its own dangers. While consumption of contaminated wild plants and fruits, which the authorities ignore is an issue in the Spanish site, our Portuguese site is concerned by the use of well water that the authorities know little about. Finally, knowledge of risks should not be viewed only as a top-down process; it can also be upward. Some avoidance behaviour adopted by residents should be publicised (clean locations to collect wild food), others may be less helpful and should be abandoned. In any case, a dialogue is necessary to ensure that information is shared among the authorities and the population, for truly effective, and legitimate, risk management.

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Data availability statement

Data not available due to legal restrictions. Participants of this study did not agree for their data to be shared publicly.

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APPENDIX A

Table A1: Labels of food and water consumption variables in the survey

Survey question asked to the respondent	Pre-coded categorical response
At home, do you consume home-grown food from your garden or those from a neighbour? If yes, what proportion this home-grown food does represent in your total food consumption?	0"Less than 25%"; 1"Between 25 & 50%"; 2"Between 50 & 75%"; 3"More than 75%".
At home, do you consume wild food from hunt, fishing or gathering? If yes, what proportion this wild food does represent in your total food consumption?	0"Less than 25%"; 1"Between 25 & 50%"; 2"Between 50 & 75%"; 3"More than 75%".
At home, do you consume bought food that grew or was produced inside the municipality borders (bought in a supermarket, a grocery or directly from farmers)? If yes, what proportion this local food does represent in your total food consumption?	0"Less than 25%"; 1"Between 25 & 50%"; 2"Between 50 & 75%"; 3"More than 75%".
At home, do you consume organic food? If yes, what proportion this organic food does represent in your total food consumption?	0"Less than 25%"; 1"Between 25 & 50%"; 2"Between 50 & 75%"; 3"More than 75%".
At home, what source of water do you usually use to drink?	0"Water tap"; 1"Bottled water": 2"Well water".

Source: CSPE database (2019)

Table A2: Economic heterogeneity in the relationship between pollution exposure and avoidance behaviour (OLS estimates)

	Home-grown food	Wild food	Local food	Organic food	Water bottle	Well water	Tap water
Pollution perception (P)	-0.019	0.023	0.029	-0.053	0.030	-0.042	0.012
	(-0.41)	(0.72)	(0.53)	(-1.26)	(0.56)	(-1.23)	(0.25)
Living in a polluted area (T)	-0.247	0.236*	0.069	-0.185	-0.307	0.115	0.193
	(-1.41)	(1.92)	(0.33)	(-1.15)	(-1.50)	(0.87)	(1.03)
Wealth index (W)	-0.016	0.017	0.033	-0.014	-0.010	-0.012	0.023
	(-0.59)	(0.88)	(1.02)	(-0.59)	(-0.32)	(-0.61)	(0.78)
P*T	0.030	-0.063	-0.012	0.071	0.054	-0.020	-0.034
	(0.50)	(-1.51)	(-0.17)	(1.31)	(0.77)	(-0.43)	(-0.54)
T*W	0.031	-0.047	-0.085	0.045	0.095*	-0.041	-0.055
	(0.67)	(-1.44)	(-1.49)	(1.06)	(1.74)	(-1.15)	(-1.09)
P*W	-0.001	-0.008	-0.011	0.008	-0.005	0.007	-0.002
	(-0.06)	(-0.91)	(-0.77)	(0.77)	(-0.36)	(0.74)	(-0.13)
P*T*W	-0.005	0.017	0.021	-0.015	-0.012	0.008	0.004
	(-0.33)	(1.48)	(1.07)	(-1.07)	(-0.64)	(0.70)	(0.21)
Between 18 and 29 yo	0.126**	0.110***	0.150**	0.056	0.099	-0.009	-0.090
	(2.23)	(2.77)	(2.20)	(1.10)	(1.50)	(-0.21)	(-1.49)
Between 30 and 44 yo	0.118**	0.080**	0.094	0.097**	0.077	0.022	-0.099*
	(2.49)	(2.41)	(1.63)	(2.25)	(1.39)	(0.62)	(-1.95)
Between 45 and 64 yo	0.065*	0.014	0.030	0.046	0.029	0.009	-0.038
	(1.94)	(0.60)	(0.74)	(1.51)	(0.74)	(0.36)	(-1.06)
Gender (male)	-0.019	0.022	-0.036	0.004	-0.022	0.021	0.001
	(-0.74)	(1.26)	(-1.16)	(0.18)	(-0.74)	(1.10)	(0.04)
Foreign origins	-0.049	0.073**	0.057	0.025	0.125**	0.001	-0.126**
	(-0.92)	(1.98)	(0.89)	(0.51)	(2.04)	(0.01)	(-2.23)
In couple	0.005	0.021	-0.001	-0.003	0.082**	0.022	-0.104***
	(0.17)	(1.07)	(-0.02)	(-0.13)	(2.55)	(1.06)	(-3.54)
Number of children	0.001	-0.002	-0.006	-0.018	-0.026	-0.003	0.029
	(0.06)	(-0.16)	(-0.25)	(-0.94)	(-1.06)	(-0.20)	(1.30)
Attitude against risk (5-point Likert scale)	-0.011	0.001	-0.000	-0.006	-0.007	-0.017**	0.024**
	(-0.92)	(0.14)	(-0.01)	(-0.56)	(-0.52)	(-2.01)	(1.98)
Obtained at least a high school grade	0.001	-0.020	0.105**	0.116***	-0.011	0.003	0.008
	(0.03)	(-0.77)	(2.35)	(3.49)	(-0.25)	(0.09)	(0.20)
Parental education (at least high-school level)	-0.086**	-0.054**	0.042	-0.042	0.008	-0.017	0.009
	(-2.49)	(-2.23)	(1.01)	(-1.34)	(0.20)	(-0.65)	(0.24)
Housing size (room number)	0.009	0.005	0.039***	0.005	0.011	0.001	-0.013
	(1.14)	(0.95)	(4.03)	(0.64)	(1.22)	(0.23)	(-1.49)
Having a garden	0.110***	0.000	0.000	0.066**	0.070**	-0.025	-0.045
	(3.87)	(0.02)	(0.01)	(2.55)	(2.11)	(-1.18)	(-1.47)
Length of residence	0.003***	0.000	0.001	-0.000	-0.000	-0.001**	0.001*
	(4.36)	(0.61)	(0.93)	(-0.36)	(-0.31)	(-2.23)	(1.90)
France	0.247***	-0.038	0.081*	0.154***	-0.498***	-0.122***	0.620***
	(6.31)	(-1.37)	(1.71)	(4.32)	(-10.90)	(-4.14)	(14.80)
Portugal	0.304***	0.026	0.189***	0.091***	-0.293***	0.021	0.272***
	(8.74)	(1.06)	(4.46)	(2.89)	(-7.22)	(0.79)	(7.32)
Constant	0.005	-0.081	-0.066	0.096	0.555***	0.276***	0.169
	(0.04)	(-0.94)	(-0.44)	(0.86)	(3.86)	(2.98)	(1.28)
Observations	1,071	1,076	1,061	1,068	1,077	1,077	1,077
R-squared	0.201	0.048	0.097	0.076	0.174	0.056	0.268

Note: t-stat are in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Source: CSPE database (2019).