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A hybrid choice modelling approach to estimate the trade-off between perceived environmental risks and economic benefits

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Abstract

Hazardous facilities raise issues of public acceptance, largely driven by citizens' beliefs, which should be thoroughly understood to inform assessment of welfare changes and possible compensation measures for local populations impacted by their presence. Modelling the socio-psychological drivers of public acceptance would help such understanding, yet this approach is seldom used in project appraisal. The current paper aims at filling this gap, in a valuation study dealing with a military facility located in Sardinia (Italy). A hybrid choice model is applied to the data, which integrates a rich socio-psychological framework with the choice model, resulting in a complex multi-layer structure. Results show that place attachment, sense of community and trust in institutions influence the perception of environmental and health risks, and the perception of economic benefits. The latter factors are negatively correlated and directly influence the utility of the attributes characterising the alternatives, driving the preference toward the proposed scenarios. These findings have important practical implications, giving guidance to calibrate welfare compensations and to define policy measures aimed at socio-economic regeneration.

Keywords: Public acceptance; Risk perception; Benefit perception; Hazardous facilities; Military bases; Hybrid choice model

1 Introduction

Every decision affecting a territory comes with costs and benefits. The siting and management of hazardous facilities (HF) makes no exception. Nuclear power plants, chemical factories, waste storage infrastructures and many other facilities are generally considered positively for the economic growth of a country and, in some cases, they can contribute to the achievement of important objectives for the society, such as environmental sustainability. However, the distribution of the costs and benefits of a HF is often perceived as unfair by the local population, who may oppose its presence on its territory. For example, nuclear power plants help to produce green energy and to reduce greenhouse gas emissions, but their construction is sometimes strongly opposed by locals because of the risk of radioactive contamination in surrounding areas. This phenomenon is often referred to as "Not In My Backyard" (Dear 1992) or "Locally Unwanted Land Use" (Schively 2007). The distinctive feature is that such contested land uses produce negative environmental and health impacts at the local level and broadly distributed benefits at a more general level (Liu et al. 2018).

Previous literature has explored this attitude of opposition for many types of HFs, such as industrial sites (e.g. petrochemical industries as in Hung et al., 2020 or chemical factories as in Li et al., 2019), nuclear power plants (Chung and Kim 2009; Wang et al. 2020), waste-to-energy plants (Achillas et al. 2011; Liu et al. 2018), etc. Military facilities have received much less attention. In particular, military bases for war simulation, weapon testing and recruit training are not a widespread reality across countries. However, their presence consistently affects hosting communities and causes social tensions. Therefore, understanding the causes at the root of this opposition is socially and politically relevant. As other HFs, military facilities show an unequal distribution of costs and benefits over the territory. They serve to provide national security (general benefit) and create job opportunities (both general and local benefit), but most social costs are localised. The most important social cost consists in a restricted use of the land for other purposes, such as agricultural, industrial, residential, touristic and recreational uses, whereas from an environmental perspective there is a potential hazard of water and soil pollution due to residuals of military drills, with potential health impacts (Biggeri et al. 2006).
A rich literature has explored which socio-psychological factors may drive the acceptance of HFs, such as risk perception, benefit perception, trust, place attachment, environmental attitudes and many more. However, most studies focus on acceptance only (typically employing structural equation models), without going into details of the characteristics of the facility that may influence such acceptance. In this study we adopt a hybrid choice model to investigate preferences toward a HF. We define a complex model structure, with hierarchical relations and correlations among socio-psychological factors, which is not common in the discrete choice literature. This allows to test different conceptual hypotheses, especially with reference to the relation between benefit perception and risk perception. Is one of them more preponderant in influencing choices? Are they simply associated or causally related? These questions represent the core of this paper, whose aim is to analyse the socio-psychological process, possibly related to socio-economic characteristics, driving preferences toward hazardous infrastructures, in an application dealing with acceptance of a possible downsizing of an existing military facility. In such a case, the local population faces a trade-off between the loss of benefits generated by the facility (revenues directly or indirectly created by the military base) and gains in terms of reduced impacts on the environment, and reduced restrictions on land use. Getting insight on the perceived costs and benefits associated to the proposed modification, and the motivations behind, would support a well-informed decision-making process, which could be crucial to avoid conflicts and social tension among the population: for example, providing better guidance on the definition of compensations for the affected citizens or territories.
In summary, the present study is characterized by three main elements of novelty. First, from an empirical perspective, the analysis of acceptance of military facilities represents a new application,

as previous literature has mostly focused on energy- and waste-related projects or industrial sites. Second, studies investigating acceptance of HFs typically employ structural equation models. We adopt a more complex structure, namely the hybrid choice framework, which allows us to jointly explore the psycho-social and the choice processes. In addition, previous hybrid choice model applications usually include few latent variables not related among them, whereas our model have multiple layers and multiple types of relations among psychological factors. Third, from a theoretical perspective, we tested a behavioural hypothesis that was not found in previous studies, although our results confirm the relations identified by the literature on acceptance of HFs.

The paper is organised as follows: Section 2 describes socio-psychological factors potentially related to acceptance of hazardous facilities and reviews previous studies relevant to this topic; Section 3 presents the case study and the research method; the econometric methods are described in Section 4; Section 5 contains the analysis and discussion of results; finally, section 6 presents practical implications and conclusions.

2 Socio-psychological theory and hypotheses

Public acceptance of hazardous facilities, as well as other NIMBY or LULU installations, can be regarded as the result of an evaluation of costs (or risks) and benefits associated to the project. This point of view, typical of the rationalistic economic theory approach, is also shared by socio-psychological frameworks such as the Theory of Planned Action by Ajzen (1985). The socio-psychological literature has delved in depth into the relation between acceptability of hazardous objects, and risk and benefit perceptions, finding clear evidence of a strong correlation between the two constructs (de Groot et al. 2020). Finucane et al. (2000) hypothesise that this depends on the fact that people adjust their risk and benefits beliefs to fit their *a priori* view, which stems from emotions ("affect") rather than from rational motivations. Previous research has emphasised the role of trust (Poortinga and Pidgeon 2003; Siegrist et al. 2005; Bronfman and Vázquez 2011), social influence (Howell et al. 2017; de Groot et al. 2020), place attachment (Devine-Wright 2011; Strazzera et al. 2012; Van Veelen and Haggett 2017) in influencing the public acceptance of controversial technologies or facilities, as a direct effect or indirectly through the risk-benefit acceptability model. In the following we summarise the main findings and present our model hypotheses that will be tested in the empirical application.

2.1 Risk perception

Previous studies, especially in the field of risky energy technologies, have shown that risk play an important role in explaining acceptability (Greenberg and Truelove 2011; Visschers et al. 2011; Keller et al. 2012; De Groot et al. 2013; Dreyer et al. 2017; Howell et al. 2017; de Groot et al. 2020). Risk perception can be interpreted as the subjective assessment of a hazard, which in turn can be influenced by many factors (properties of the hazard, previous experience, knowledge, social context, etc.) (Sjöberg 2000; Slovic 2000; López-Navarro et al. 2013). According to the psychometric paradigm proposed by Fischoff, risk perception is influenced by both the physical characteristics of the hazard and psychological characteristics of the individual (Fischhoff et al. 1993). The psychometric paradigm has been widely applied in the literature investigating which psychological factors influence risk perception and acceptance of potentially hazardous facilities, such as controllability, perceived benefits and trust (e.g. Chung and Kim, 2009; Janmaimool and Watanabe, 2014; López-Navarro et al., 2013; Visschers et al., 2011). A higher risk perception is generally associated with lower levels of acceptance of HFs (Mah et al. 2014; Wang and Li 2016; Liu et al. 2018; Wang et al. 2020). In this study we tested two alternative hypotheses:

H1a. Risk perception directly influences preferences toward the hazardous facility.

H1b. Risk perception indirectly influences preferences toward the hazardous facility, through Economic benefit perception.

2.2 Economic benefit perception

HFs can bring various economic benefits to the host communities, such as increasing local employment and creating opportunities for satellite activities, with a positive impact on the average income in the region in which they are located (López-Navarro et al. 2013; Wang et al. 2020).

In analysing social acceptance of a wide range of technological and environmental hazards, benefit perception is positevely associated with acceptance, by Bronfman et al., 2008 (various types of hazards); Chung and Kim, 2009 (nuclear waste disposal); Wang et al., 2020, and Frantál and Malý (2017) (nuclear plants). Liu et al. (2017) find that local residents find more attractive those benefits related to local economic improvements, such as infrastructure development and job opportunities, rather than long-term and indirect social benefits. Visschers et al. (2011) and Wang and Li (2016) showed that acceptance of nuclear power stations was positively influenced by individuals' perceived benefits arising from a secure energy supply and, to a smaller extent, from climate change mitigation. Many previous studies have also tested whether there is a relationship between benefit perception and risk perception and some have suggested that benefit perception play a more important role than risk perception in acceptance of a hazardous technology (Siegrist et al. 2000, 2007; Tanaka 2004; Visschers et al. 2011; Wang and Li 2016; de Groot et al. 2020).

Some have indicated that higher perceived benefits may reduce risk perception: when the activities of a hazardous facility or a technology are perceived as beneficial, people may perceive as less important the associated risks (Alhakami and Slovic 1994; Siegrist et al. 2000). This would imply that the acceptability of a HF might be increased by stressing its benefits. Others, as de Groot et al. 2020, have shown a strong (negative) correlation between perceived risk and perceived benefits of energy technologies. Different directions of causality cannot be ruled out, such as perceived risks affecting negatively the perception of economic benefits (Siegrist et al. 2000). In this study we propose the following hypotheses:

H2a. Risk perception and benefit perception are negatively correlated.

H2b. Benefit perception directly influences preferences toward the hazardous facility

H2c. Benefit perception indirectly influences preferences toward the hazardous facility, through Risk perception.

2.3 Trust

Previous literature has explored the assumption that perceived benefits and risks may be both influenced by a third factor, and potentially correlated rather than causally linked (Siegrist et al. 2000). Social trust could serve as a third unmeasured factor and plays a key role in managing HFs. Many researchers have shown how trust influences acceptance of environmental and health hazards originating from various technologies (Flynn et al. 1992; Bronfman et al. 2009; Gutiérrez et al. 2015) and many others have found empirical evidence of a link between trust and risk perception (Chung and Kim 2009; Achillas et al. 2011; Visschers et al. 2011; Liu et al. 2018). In 2010 Earle presented a review of studies of trust in risk management in different contexts (e.g. genetically modified food, water supply, technological hazards, nuclear power and waste, others) and indicated that in most studies trust generally reduces risk perception and it is associated with higher levels of acceptance (Earle 2010). Trust can be interpreted as a shortcut to manage social uncertainty and complexity (Siegrist et al. 2000; Poortinga and Pidgeon 2003). In fact, it is assumed that most citizens do not possess the knowledge required to assess a risk, its costs and benefits (López-Navarro et al. 2013). Siegrist and Cvetkovich (2000) observed strong correlations between social trust and perceived risks for hazards about which people were not knowledgeable, whereas correlation was not significant for hazards about which people possessed more knowledge. Under the first circumstance, people have to trust others, either public institutions or private companies, relying on their competences in risk management and their truthfulness in communication. Trust in authorities can also influence the perception of economic benefits, due to a potential information asymmetry (López-Navarro et al. 2013). Data about the economic performance of an industrial facility are not always accurate and the

positive impact of a HF on the local area (e.g. induced economic activity) can only be inferred. In such situation, trust may be positively related with perceived economic benefits: the higher the level of trust in public and private institutions, the greater the perceived benefits. In light of the above, we test the following:

H3a. Trust directly influences preferences toward the hazardous facility.

H3b. Trust indirectly influences preferences toward the hazardous facility, through Economic Benefit perception and through Risk perception

2.4 Sense of community

The role of community engagement in improving public acceptance towards hazardous infrastructures has been emphasised (Mah et al. 2014; Boyd 2017; Liu et al. 2018; Wang et al. 2020); the causal links between civil engagement and trust (Putnam et al. 1994; Brehm and Rahn 1997; Uslaner 2002; Anderson 2010), and the relation between place attachment and community involvement (Kim and Kaplan 2004; Lewicka 2005) have also been investigated.

A conceptual model was developed by Brehm and Rahn (1997) where civic engagement, and interpersonal trust are tied by a reciprocal relationship, such that "the more that citizens participate in their communities, the more they learn to trust others; the greater trust that citizens hold for others, the more likely they are to participate". The theoretical framework adopted by Anderson (2010) posits that the causal relationship flows from sense of community to trust, arguing that there are many reasons why sense of community could influence trust: first, belonging to a community will generally require to build relationships with its members; second, it entails cooperation which in turn, according to Brehm and Rahn (1997) and Putnam (2000), leads to trust. de Groot et al. (2020) hypothesise that social influence has a direct effect on risk perception and benefit perception, showing that if individuals perceive higher support in their social network toward risky technologies they will consequently perceive more benefits and fewer risks. In contrast, Uslaner (2002) argues that generalised trust has moral foundations: we learn it early in life and it is not based upon experience.

In conclusion, many alternative causal links between trust and civic participation or sense of community are possible and have been tested over the years. Here, we test the following hypotheses:

H4a. Sense of community directly influences preferences toward the hazardous facility.

H4b. Sense of community influences preference toward the hazardous facility by positively affecting trust in institutions.

2.5 Place attachment

In turn, sense of community can be influenced by place attachment, which can be defined as the emotional involvement (bonds, affect, thoughts) between individuals and their socio-physical environment (Fornara et al. 2010). Devine-Wright (2009) proposed a framework to explain NIMBYism as a "form of place-protective action, which arises when new developments disrupt pre-existing emotional attachment and threaten place-related identity processes". He suggests that individuals showing a stronger place attachment may experience the change as a "disruption" or a "threat" and this may trigger negative feelings or explicit opposition toward the new development.

Place attachment has been studied extensively to explain local opposition toward projects which generate impacts on the landscape. Some studies analyse the role of place attachment in influencing the acceptance of a controversial facility directly: for example, Strazzera et al. (2012) investigate acceptability of wind energy projects, Scott and Powells (2020) consider support for hydrogen transition and Hou et al. (2019) explore people's opposition sentiment toward a waste-to-energy incinerator. This literature confirms the hypothesis proposes by Devine-Wright's framwork, showing that place attachment usually intensifies opposition toward a HF.

Other works assume that place attachment may be related to acceptance through one or more mediating factors. For example, in Liu et al. (2017) sense of place has a negative impact on benefit perception, which in turn influences trust, the main factor influencing support for a coal-fired power plant project. In Wang et al. (2020) place attachment influences both perceived benefits and perceived risks which in turn affect acceptance of nuclear power plants.

Another stream of research also shows that place attachment is positively tied to community participation (Kim and Kaplan 2004; Lewicka 2005).

In line with this literature we propose:

H5a. Place attachment directly influences preferences toward the hazardous facility.

H5b. Place attachment influences preference toward the hazardous facility by positively affecting sense of community.

3 Case study

3.1 Context

Military bases in Sardinia are a legacy from the post-World War II period, imposed to some Italian regions in order to honour the international agreements signed as a defeated country (Codonesu 2013). At present, over 35000 ha of Sardinian land are under military easement and during military exercises navigation and fishing are limited in more than 20000 km^2 of Sardinian waters (Codonesu 2013; RAS 2020). In the period 2000-2004 it was reported that approximately 60% of military activities and constraints in Italy weighed on Sardinia (GU Serie Generale n.52, 04-03-2005).

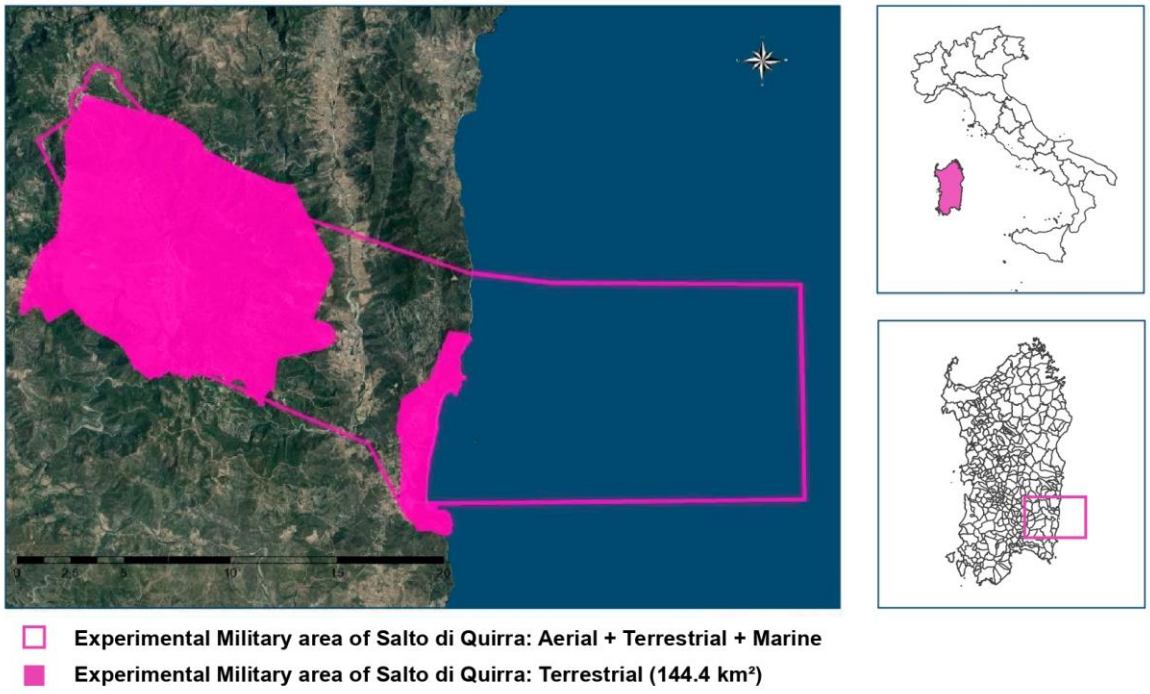

Figure 1. PISQ area and municipalities affected (adapted from Balletto et al. 2020)

Facilities and buildings pertain to both Italian and NATO Army, Air Force and Navy. There are three main military bases: Capo Frasca, Capo Teulada and Quirra. This study focuses on the latter, known as Poligono Interforze Salto di Quirra (henceforth, we will refer to this military facility as PISQ), located in South-East of Sardinia. It was installed in 1956 and its territory was devoted to a number of different activities, including military training, war simulation, weapon testing and space research. Now it covers approximately 144 km^2 and it is the largest experimental site in Europe for the experimentation with new weapons and rocket launching (Calia et al. 2020). As shown in Figure 1, the territory of the PISQ comprises both an inland and a coastal area. The first one involves several municipalities, especially Villaputzu, Villagrande, Perdasdefogu and Ulassai, whereas the coastal area of Capo San Lorenzo covers an area of approximately 1100 ha in the municipality of Villaputzu. In past years the PISQ has employed on average 700 military workers and 275 civilian workers (logistic and technical support, cleaning, maintenance etc.) (Calia et al. 2020). Before the creation of the PISQ, the inland area was scarcely populated, there were poor infrastructures and it was mainly

characterised by a subsistence economy based on agri-pastoral activities. Agricultural production was more developed in the coastal area. Under such circumstances, the installation of the military facility was welcomed with enthusiasm, as it brought technological innovation, jobs, services and infrastructures, allowing economic and social development for local communities: infrastructures for utilities, health and education systems were available in these territories earlier than elsewhere in Sardinia; the real estate market grew to satisfy the demand for housing coming from the military personnel, that also generated important economic flows and jobs opportunities; moreover, frequent contacts with people from other parts of Italy and the rest of the world stimulated cultural openness and intellectual growth. Its representation in the local media was that of an opportunity for modernisation, social change and economic growth (Esu and Maddanu 2018). The perception of military bases in Sardinia started to change in the following decade, which was characterised by a wave of protest and anti-militarist movements. Local newspapers growingly published articles on social issues, conditions of marginality and economic dependence (Esu and Maddanu 2018). From 1980s public attention focused on risks related to military activities, ranging from air crashes and accidents (until the early 2000s) to environmental and health risks, with the emergence of the phenomena known as Quirra Syndrome (Esu and Maddanu 2018). From those years on fear has spread about the dangers to public health potentially arising from military activities, but these suspects have been mainly based on anecdotal evidence, considering that epidemiological studies have not yet proved whether the occurrence of specific diseases in subjects living near the PISQ area is significantly higher (Biggeri et al. 2006). However, the explosions of disused munitions and rocket launching produces loud noises, smoke and odour. These are environmental stressor with potentially negative effects on health, well-being and quality of life (Axelsson et al. 2013).

Another source of concern is represented by the socio-economic conditions of the territory. Many of the benefits linked to the military base have substantially diminished after 2005, when the military enrolment regime changed from mandatory to voluntary, leading to a shrinking effect on the military population (Calia et al. 2020). This had several negative consequences: the real estate market crashed and the economic activities suffered a consistent reduction. The local economy of the communities around the PISQ shows different levels of frailty and dependency on the military presence; some municipality do not have development opportunities related to agriculture, tourism or industry and might be incapable of reacting positively to defence cutbacks (Calia et al. 2020). Such differences might be extremely important in determining public acceptance of the installation and in orienting preferences towards a potential military downsizing.

3.2 The qualitative study

Two main research stages preceded the choice experiment. First, the relationship between the PISQ and the surrounding territory was explored through in-depth interviews with privileged interlocutors, such as mayors, economic operators and other stakeholders. Then, the same topics were investigated in two focus groups with citizens of the municipalities that most are affected by the presence of the PISQ: Perdasdefogu and Villaputzu. These qualitative approaches have highlighted several useful elements to define which attributes were relevant for the choice exercise, as well as some recurrent psychological paths. More specifically, it appears relevant a trade-off between health and economy: those who are interested in economic benefits and praise the PISQ for its contribution to the local development are more prone to underestimate risks for health and environment and vice versa. For example, participants in the focus group from Perdasdefogu manifested particular interest in the economic advantages linked to the PISQ and there is a shared perception that the local economy depends on it. Its closure would lead to dramatic consequences and even a partial downsizing is experienced as a threat, also in the light of the poor alternative opportunities offered by the territory: an inland area with poor agricultural vocation. Therefore, business ventures in agro-food and tourism are not considered as a realistic option for citizens from Perdasdefogu, who would prefer new investments in the public sector. With reference to health issues, participants blame the local press for the superficial reporting of inquiries concerning the "Quirra Syndrome". Nevertheless, they consider important some form of control on military activities, to avoid environmental and health risks.

On the other hand, citizens from Villaputzu are more sceptical about the contribution of the PISQ to local economic development, especially in the coastal area of Capo San Lorenzo. In general, there is a different perception of the opportunity cost associated with the military bases. Most participants observe that the territory offers many opportunities insufficiently explored, both in the agri-food and tourism sectors. The use of the beach known as Spiaggia di Murtas for recreational and tourism purposes coexists with the military easement. During the summer, military training exercises in the beach are suspended, but at the time of the focus groups it was not guaranteed whether and how long the break would have taken place each year. In such a situation, the possibility to plan investments and to develop related business activities was strongly narrowed and according to participants from Villaputzu, this limited the development of the territory and the local economy. At the same time, citizens expressed worries about environmental and health risks, due to a poor control over the activities carried out at the military facility.

3.3 The choice experiment

A choice experiment survey was carried out to valuate alternative management scenarios for the PISQ

military area. Given their relevance in the in-depth interviews and focus group discussions, the following attributes were selected for the Choice Experiment (in parenthesis the name that will be used for indicating the attributes hereafter):

- Number of jobs (*jobs*), expressed in terms of percentage reduction in the number of people employed by the PISQ. We considered three levels of reduction: 0, 25 or 50%.
- Length of the training break (*break*): as mentioned above, military exercises are suspended during the summer. We included three levels: 3 months, 4 months and 6 months.
- Alternative land uses (*landuse*): two land use alternatives were proposed in this context: the use of the beach for tourism purposes during the break of military activities; use of the land for agriculture, livestock and forestry. Therefore, we consider two levels: tourist use; tourist and agricultural use.
- Type of control over military activities (*control*), envisaging two options: public control under the responsibility of the regional agency for environmental protection, in agreement with the control unit of the PISQ (that is, the access to the facility is conditioned on the approval of the military authority); a public and totally independent form of control.
- Increase in local taxes *(tax*), expressed as percentage increase with four levels: no increase, 10, 20 or 30% increase. Such tax increase was plausible as the municipalities under investigation receive monetary compensation for the military constraints on their territory, to be used for public works or social services. In case of a downsizing or closure of the military facility these compensations would be likely reduced and the local government may need to increase local taxes to provide the same services and realise planned investments.

The attributes and levels are summarised in Table 1 (in *italic*, status quo levels).

The Choice Experiment used a MNL-d efficient design, with prior values from a pilot survey with 24 individuals. The design consisted in 36 combinations divided into 6 blocks.

Table 1 Attributes and levels of the CE exercise

Attribute	**Levels**
% of jobs lost due to downsizing	*No reduction* 25% reduction 50% reduction
Length of the break of military exercises	*3 months* 4 months 6 months
Alternative land uses	*Neither tourism or agricultural uses* Tourist services Tourist services and Agricultural use
Type of control over military activities	*Public but limited by the military authority* Public and independent

% annual increase in local taxes	*No increase* 10% increase 20% increase 30% increase

Each respondent faced 6 choice cards, in which s/he was asked to choose between three alternatives: two downsizing scenarios and an opt-out alternative, consisting in the closure of the military facility. An example of a choice card is shown in Table 2.

Table 2 Example of Choice Card

Attribute	**Scenario A**	**Scenario B**	**Opt-out**
% of jobs lost due to downsizing	No reduction	25% reduction	I prefer the closure of the PISQ
Length of the break of military exercises	3 months	6 months	
Alternative land use	agriculture and tourism	tourism	
Type of control over military activities	public and independent	public but limited by the military authority	
% annual increase in local taxes	20% increase	0% increase	

The questionnaire consisted of three sections. The first part contained the CE exercise, preceded by an explanation of the attributes and levels characterising the alternatives. Then, several Likert scale questions were included to elicit a series of socio-psychological perception and beliefs, such as the perception of economic benefits related to the presence of the PISQ, environmental and health risk perception, place attachment and relationship with fellow citizen. The third part was aimed to elicit demographic and socio-economic characteristics of the respondent.

With reference to socio-psychological variables, on the bases of the findings from the focus groups and the literature review, we selected the following five factors: *Place attachment, Sense of community, Trust in institutions, Environmental and health risk perception* and *Economic benefits perception.* As mentioned earlier individuals tend to show recurrent psychological associations and processes, especially with reference to the last two constructs. Whether it is a simple association or a causal relationship (and its direction) is one of the objectives of this study. The impact of risk perception and benefit perception on the acceptance of hazardous sites is widely explored in the literature and it is often associated with trust, which can have a role in reducing perceived risk. The factor *Sense of community* was intended to understand whether people perceive fellow citizens as supportive, collaborative and respectful. In our hypothesis this would positive influence the ability to trust others and public institutions. *Place attachment,* in turn, may increase the bond with the socio-physical space in which the individuals live and, therefore, sense of community.

3.4 Descriptive statistics

The survey was administered face-to-face between February and August 2015 to a total of 446 residents in four municipalities: 160 Villaputzu, 108 Villagrande, 106 Perdasdefogu and 72 Ulassai. The different number of sampled respondents is due to differences in population and extension of land occupied by the facility. As described in the previous respondents were asked to indicate whether they preferred an alternative management scenario for the HF or its closure. 23% of respondents always chose this option in all scenarios, indicating a strong opposition toward the presence of the facility on their territory. These observations were not included in the estimation of the choice model. Therefore, the dataset used for the analysis includes 343 individuals. Table A.1 in Appendix presents descriptive statistics of four main demographic variables, presenting a comparison between the sub-sample mean and the reference population mean. Table A.2 describes additional socio-economic variables relevant for this study, whereas Table A.3 show Likert scales included in the questionnaire to elicit socio-psychological beliefs and perceptions. The selection of the statements of each scale was based on the results of the Principal Component Analysis and the Cronbach's Alpha Test. Responses were given on a 5-step Likert scale, from "Completely disagree" to "Completely agree", with the only exception of the scale for *Trust* (ranging from "No trust" to "Full Trust").

- *Place Attachment:* it comprises six items encompassing feelings toward the town the individual live in. A higher score on this scale implies stronger attachment, dependence, identity and belongingness. The Cronbach's Alpha is 0.88, indicating good reliability.
- *Sense of community:* it consists of four items measuring the respondent's opinion of fellow citizens; when some of the items are appropriately reversed, a higher value of this scale is related to a better opinion of the people of the town in which the respondent lives. The Cronbach's Alpha is 0.72, indicating acceptable reliability.
- *Trust in institutions:* it includes four items asking respondents to self-report their level of trust in local and national institutions, such as the municipality, the military apparatus, the local health authority and the National Institute of Health. The Alpha value for this scale is equal to 0.82. Higher scores on this scale show a higher level of trust in institutions.
- *Environmental and health risk perception*: it comprises six items concerning the perception of risk for the environment and personal and public health. The Cronbach's Alpha is equal to 0.93, implying a high level of internal consistency and reliability of the scale.
- *Economic benefits perception:* it consists of seven items referred to the perception of economic consequences related to the presence of PISQ. Some items concern the past and present contribution of the PISQ to local economy, whereas other questions focus on the potential closure of the military facility. This scale also appears highly reliable, with a

Cronbach's Alpha value of 0.93. Higher scores in this factor indicate a perception of the PISQ as beneficial and important for the local economy and an opposition toward its closure.

In summary, these statistics confirm what emerged from focus groups: those who are worried about the health and the environment tend to lessen the benefits of the PISQ and, on the other hand, those who are worried about the potential negative consequences the closure of the PISQ would have on the local economy perceive as less risky its activities.

4 The econometric methods

4.1 Structural Equation Models

Structural equation modelling (SEM) is a sophisticated set of techniques widely employed in social sciences to explore the causal relationship between variables. It includes many multivariate procedures, such as factor analysis, regression analysis and discriminant analysis (Hox and Bechger 1998). The early beginnings of SEM could be traced back to Spearman's work, who is often cited for conceiving factor analysis (Spearman 1904), but a more structured idea of SEM was developed by Wright's studies on path analysis (Wright 1918, 1921, 1934, 1960a, b).

Latent variables could be theoretical constructs, such as attitudes, perceptions or motives of human behaviour (Tarka 2018). Of course, these variables cannot be observed and can only be measured indirectly. SEM takes into account the measurement error and allows to jointly estimate all the relationships. The model can be graphically visualised via a path diagram where links between the variables are represented by path coefficients. A path model with latent factors can include both observed variables (e.g. socio-economic characteristics of the respondent) and latent variables, directly or indirectly related among them. It can be statistically represented by a set of matrix equations of the form:

$$X^* = h(X; \gamma) + \eta$$

where X are observable explanatory variables of X^* or, potentially, other latent variables related to X^* and γ are parameters capturing the effect of X on X^*, whereas η is a random disturbance term.

4.2 Hybrid Choice Models

Choice modelling has been extensively applied in many disciplines (transport, food, health and environmental economics) to study individual choices. It is based on random utility theory proposed by McFadden (1974) and Luce's (1958) probabilistic utility theory. Utility can be disaggregated into a deterministic and a random component as in the following:

$$U_{int} = V_{int} + \varepsilon_{int} = \beta' x_{int} + \varepsilon_{int} \quad (1)$$

where V_{int} represents the component of utility that the individual *n* derive from choosing alternative *i* in the choice situation *t*. V_{int} is a function of preference parameters β and explanatory variables x_{int}, whereas ε_{int} represents the stochastic component of utility. Depending on assumptions made on the distribution of this component, different econometric models can be estimated. For example, the multinomial logit (MNL) model is based on the assumption that errors are independently and identically distributed (IID) following a Gumbel distribution.

Under this assumption, the probability that decision maker *n* chooses y_i in the scenario *t* is expressed as:

$$Prob(y_{int}|x_{nt}) = P_{nt} = \frac{\exp(\beta' x_{int})}{\sum_{j=1}^{J} \exp(\beta' x_{jnt})} \quad (2)$$

and the probability of observing a specific sequence of choices is calculated as the product of these probabilities:

$$P_n = \prod_{t=1}^{T} P_{nt} = \prod_{t=1}^{T} \frac{\exp(\beta' x_{int})}{\sum_{j=1}^{J} \exp(\beta' x_{jnt})} \quad (3)$$

The MNL model does not allow for heterogeneity in tastes across respondents (although some variation may be allowed by interacting preference parameters and alternative specific constants with socioeconomic variables) and thus, the preference parameters are fixed. Recent developments have attempted to better address the issue of preference heterogeneity and to enrich the behavioural component of discrete choice models. Proposed by Ben-Akiva et al. (1999, 2002b) Hybrid choice models (HCM) allow for the integration of latent constructs in the utility functions. More specifically, a linear structural equation usually characterises the latent variable:

$$LV_n = \gamma' z_n + \eta_n \quad (4)$$

where z_n is a vector of socio-economic and demographic characteristics of the respondent and γ is a vector of parameters capturing the effect of such characteristics on the latent variable LV_n, whereas η_na random disturbance component assumed to be normally distributed across respondents, i.e. $\eta_n \sim N(0,1)$.

In its simplest formulation HCM integrates the latent variable through interaction with explanatory variables x_{int} in the deterministic component of utility, that is:

$$V_{int} = \beta' x_{int} + \lambda' LV_n x_{int} \quad (5)$$

where λ is a vector of parameters capturing the impact of the latent variable on the preference for the characteristic x_{int}. This expression for V_{int} will substitute $\beta' x_{int}$ in equations (2) and (3).

Latent constructs are based on attitudinal indicators, which usually employ Likert scales and can be therefore modelled through measurement equations. Let I_n a measurement variable, function of the latent variable LV_n and a random component ν_n, as in:

$$I_n = \zeta' LV_n + \nu_n \quad (6)$$

where ζ' is a vector of parameters measuring the association between the indicator I_n and the latent variable. Since I_n is not observed, we need to model the probability of observing the answers $i_1, i_2, .. i_M$ indicated by individuals on a given Likert scale question. It is assumed that $i_1 < i_2 < .. i_M$, and

$$i = \begin{cases} i_1 \; if & -\infty < I_n \leq \tau_1 \\ i_2 \; if & \tau_1 < I_n \leq \tau_2 \\ & \vdots \\ i_M \; if & \tau_{M-1} < I_n < +\infty \end{cases} \quad (7)$$

where $\tau_1, \tau_2 \ldots, \tau_{M-1}$ are threshold parameters to be estimated through an ordered probabilistic model.

The probability of observing the specific answer i_m in a Likert scale is expressed as:

$$L_{I_n} = Prob(i_m) = Prob(\tau_{m-1} < I_n < \tau_m) = Prob(\tau_{m-1} < \zeta' LV_n + \nu_n < \tau_m) = Prob(\tau_{m-1} - \zeta' LV_n < \nu_n < \tau_m - \zeta L' V_n) = F(\tau_m - \zeta' LV_n) - F(\tau_{m-1} - \zeta' LV_n) \quad (8)$$

where F is the distribution function (e.g. logistic). Then, the probability of observing a sequence of answers from *k* psychometric items is calculated as follows:

$$PL_{I_n} = \prod_{k=1}^{K} L_{I_n^k} \quad (9)$$

Summing up, a HCM will consists of at least three model components: the structural equation model, the measurement equations and the choice model. The joint log-likelihood of such model is expressed as:

$$\sum_{n=1}^{N} ln \int_{\eta} \left(P_n \times PL_{I_n}\right) \times \mathrm{g}(\eta) d\eta \quad (10)$$

where P_n is the probability of observing a specific sequence of choices in choice situations $t = 1,2, \ldots, T$, conditional on the preference coefficients β and the latent variable LV_n; whereas PL_{I_n} is the likelihood of observing the sequence of answers to a set of attitudinal questions, with τ representing the vector of threshold parameters and ζ being the parameter capturing the association between the indicator and the latent construct LV_n. Of course, if more latent variables are included in the model multiple integrals would be involved and the computation would become more complex. This integral does not have a closed form solution and thus requires to be approximated through simulation. This model can be adapted to the needs of the study, allowing for the choice component to be either a Multinomial Logit, a Mixed Logit or a Latent Class. Here, we adopt a Mixed Logit (MXL) model, allowing for heterogeneity in tastes across respondents.

5 Model estimation and results

A graphical representation of the empirical model is presented in Figure 2. Table 4 shows the results of the choice and structural equation components of the HMXL model. The measurement component is reported in Table A.4, in Appendix.

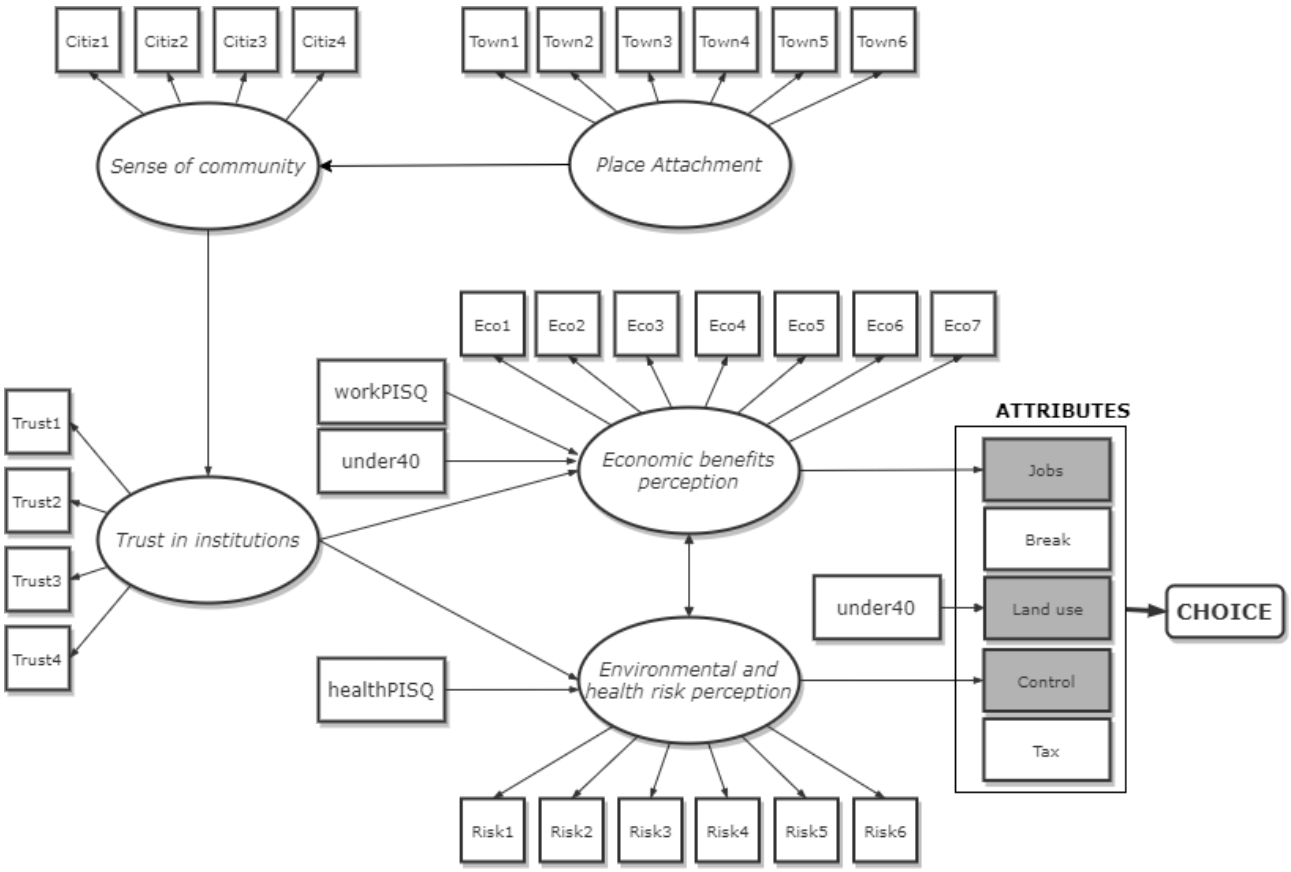

Figure 2 Empirical hybrid model structure

The model was estimated in R, with the package Apollo (Hess and Palma 2019a, b). The coefficients *jobs*, *break*, *control* and *landuse* are assumed to follow a Normal distribution, whereas the parameter *tax* is assumed to be fixed, as its standard deviation was not significant in previous tests. The estimation was run using 2000 scrambled Sobol draws in R. The means of all preference parameters are significant at 1% level and with the expected sign. On average respondents perceive a disutility from the loss of jobs provided by the military facility. However, the standard deviation of this attribute is relatively large, implying that some individuals may not be negatively affected by this circumstance or even welcome the reduction of military employees in their territory. On the other hand, the means of the parameters *break, landuse* and *control* are positive. At the time of the interviews military activities were suspended for three months during the summer (from 20th June to 20th August). A positive sign of the coefficient *break* indicates that respondents favour the extension of this period of

suspension of military activities. A longer break allows locals to use the territory for other purposes: citizens can enjoy the beach and the marine area (usually off-limits) and small businesses can profit from seaside tourism. *landuse* is a categorical attribute, equal to 1 if the alternative management of the military facility includes the use of the territory for tourism purposes and equals 2 if the alternative management includes tourism and the use of the land for agricultural purposes. The attribute *control* is a dummy variable indicating the type of control over military activities. Its sign is positive and highly significant, indicating that individuals would, on average, favour a public and independent form of control over military activities. Finally, the coefficient of *tax* is negative, implying a greater disutility from higher increases in local taxes.

A three-step procedure was adopted to select the best specification for the HMXL model. First, a series of SEM models have been estimated to investigate the multiple hypotheses presented in Section 2, encompassing all possible relations between factors and between factors and socio-economic factors. The best model was selected on the basis of goodness of measures, such as the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). Table 3 summarises the hypotheses tested and the respective results.

Table 3 Hypotheses tested in the structural equation model

Hypothesis	Path	Result
H1a	Risk perception → Preferences	Accept
H1b	Risk perception → Economic benefit perception → Preferences	Reject
H2a	Risk perception ↔ Economic benefit perception	Accept
H2b	Economic benefit perception → Preferences	Accept
H2c	Economic benefit perception → Risk perception → Preferences	Reject
H3a	Trust → Preferences	Reject
H3b	Trust → Economic benefit perception & Risk perception → Preferences	Accept
H4a	Sense of community → Preferences	Reject
H4b	Sense of community → Trust	Accept
H5a	Place attachment → Preferences	Reject
H5b	Place attachment → Sense of community	Accept

Then, we obtained the expected value of the latent variables and we estimated a hybrid model with the sequential approach. In this study we included them in the discrete choice model by interaction with the characteristics of the scenarios. If a sequential procedure is adopted, an endogeneity issue may emerge if the errors (unobserved effects) of the latent attitudinal model are correlated with the errors (unobserved effects) of the choice model, thus leading to biased and inconsistent estimates (Ben-Akiva et al. 2002a; Bolduc et al. 2005; Daly et al. 2012). A simultaneous modelling approach

produces more efficient estimates, but it entails a rather complex estimation procedure, so that according to some researchers the sequential procedure with the MIMIC model can be deemed an acceptable second best to (Raveau et al. 2010). We suggest that this approach could be proficiently adopted for guiding model selection. The joint estimation approach is more time-consuming and this hinders the researcher from carrying out several tests on the many possible model specifications. The sequential approach, thus, can help selecting a model that best represents the complex psychological process influencing decision-making. After identifying the best models with the sequential approach we proceed testing them with the hybrid joint structure, to assess the robustness of results[1]. Finally, the best specification of the HMXL model was selected on the bases of AIC and BIC indicators and the significance of coefficients.

Table 4 Discrete Choice and Structural Equation Component of the HMXL model

Discrete choice component			**Structural equation component**	
	Means (St. err)	*St.Dev. (St. err)*		*Means (St. err)*
Jobs	-0.749*** (0.083)	0.967*** (0.101)	*Town → Citiz*	0.481*** (0.102)
Break	0.200*** (0.056)	0.268** (0.123)	*Citiz → Trust*	0.510*** (0.060)
Land use	0.584*** (0.083)	0.282** (0.119)	*Trust → Risk*	-0.297*** (0.039)
Control	0.833*** (0.101)	0.832*** (0.120)	*healthPISQ → Risk*	0.495*** (0.115)
Tax	-0.476*** (0.054)	-	*Trust → Eco*	0.419*** (0.068)
*Jobs*Eco*	-0.184*** (0.042)		*workPISQ → Eco*	0.292** (0.134)
*Control*Risk*	0.459*** (0.074)		*under40 → Eco*	-0.531*** (0.119)
*Land use*Under40*	0.369*** (0.109)		*Risk ↔ Eco*	-1.286*** (0.097)
Goodness of Fit measures				
Number of observations			2058	
Draws			2000 (scrambled Sobol)	
Estimated parameters			155	
Log likelihood (whole model)			-12203.17	
Log likelihood (Choice)			-1174.783	
AIC			24716.34	
BIC			25588.91	

Results for the structural equation and the discrete choice components of the HMXL model are presented in Table 4. Consistently with our expectations place attachment positively influences sense of community. Respondents with a stronger emotional bond with their town tend to show a higher sense of community. In turn, individuals perceiving higher solidarity, collaboration and support among fellow citizens tend to trust more institutions, and more specifically the municipality, the

[1] The final SEM specification exhibits a CFI and a TLI of 0.97, a RMSEA equal to 0.05 and a SRMR equal to 0.08.

military apparatus, the local health authority and the National Health Institute. Trust in institutions influences both the perception of economic benefits and the perception of health risks. As discussed in Section 2, since most people do not have the ability and information needed to assess the risks and benefits of a hazardous infrastructure, they can take decisions and manage the uncertainty only by trusting the information provided by institutions. Thus, the higher the level of trust in the relevant institutions the higher will be the perceived benefits and the lower the perceived risks. As concerns the relation between perceived economic benefits and perceived health risks, two alternative relations have been tested: a negative correlation; a hierarchical relation flowing from perceived risks to perceived benefits. Comparison of the goodness of fit measures of both the SEM and HMXL model led us to prefer the model with a negative correlation, implying that the higher the perceived risks the smaller the perceived benefits, and *vice versa*. This relationship is highly significant and particularly relevant in absolute terms.

Finally, three covariates resulted significant in the structural equations. Not surprisingly, perceived environmental and health risks increase for those respondent who experienced health problems potentially related to the activities carried out at the PISQ. On the other hand, perception of economic benefits is higher for individuals with a working relationship with the PISQ and smaller for younger respondents.

The perceptions of economic benefits and health risks enter the utility function through interaction with the attributes characterising the alternatives. Of course, several interactions were tested and we selected the best model on the bases of statistical significance and economic interpretation. Two relations resulted robust: the interaction between *jobs* and perceived economic benefits (*Eco*) and the interaction between *control* and perceived environmental and health risks (*Risk*). These terms are the core of the hybrid model, because they concern the influence of latent variables on utility. The findings are reasonable, but not surprising. Individuals showing a higher perception of economic benefits will be more affected by the loss of jobs, whereas individuals with a higher perception of environmental and health risks will be more interested in a public and independent form of control over military activities.

It can be noticed that the socio-economic variable *under40* was both included as covariate in the structural equation of *Eco* and interacted with the attribute *landuse* in the utility function. In fact, we tested both direct and indirect effects of the observed variables on the utility function (as indicated by Vij and Walker, 2016). We found that younger respondents perceive the presence of the military base as less beneficial than the rest of the population and, at the same time, they are more interested in alternative land use prospects for the territory under military easement. In the past, the PISQ

brought considerable benefits to the territory, directly (through job opportunities) and indirectly (through induced economic activity). This situation changed with the end of the mandatory military enrolment regime, which drastically reduced the military population. Of course, the economic sectors that benefited from this presence (e.g. real estate market, food services, shops) were significantly affected. Currently, the military base contributes to the local economy with the payrolls of military employees, but this mainly concerns older individuals. In fact, only 30% of respondents who work or worked at PISQ are younger than 40 years old. Therefore, this part of the sample mostly did not benefit from employment opportunities at the military base and would be interested in other economic development prospects, such as tourism or agriculture.

To be refined and completed with welfare estimates.

6 Conclusions

This study contributes to the literature investigating the psychological process driving acceptance of hazardous infrastructures. It confirms that the HMXL model is a robust and flexible approach to analyse the role of latent constructs and socio-economic variables and at the same time to model continuous preference heterogeneity. We defined a model with multiple latent variables and multiple layers. This is not commonly observed in the literature adopting the hybrid choice model framework. Results indicate that a stronger place attachment has a positive impact on sense of community which in turn, positively influences trust in institutions. The latter will increase the perception of economic benefits, and decrease the perception of environmental and health risks. As regards the final part of the path we tested different model specifications and our findings show that the nature of the relation between these perceptions is an association, rather than a hierarchical relation flowing from perceived risks to perceived benefits.

We suggest that this complex psychological structure could have not been identified without the aid of the sequential modelling approach for estimating the hybrid choice model. It produces less efficient estimates, but on the other hand it requires considerably less time and this allows the researcher to test a wider range of model specifications. Of course, this statement is based only upon the authors' experience. A Monte Carlo experiment would be needed to provide a robust proof. Future work could further explore this hypothesis.

To be completed with further discussion and policy implications.

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Appendix

Table A.1 Descriptive statistics on demographic variables

	Villaputzu	Villagrande	Ulassai	Perdasdefogu
Sample				
Age (Mean)	45.29	46.69	49.74	48.92
Family components (Mean)	3.12	3.44	2.93	3.01
Men (%)	51.2%	56.5%	56.9%	66.7%
HighEdu (%)	9.8%	24.9%	23.6%	4.6%
Population				
Age (Mean)	46.3	45.9	46.9	47.4
Family components (Mean)	2.15	2.45	1.91	2.31
Men (%)	49.7%	50.2%	49.1%	51.0%
HighEdu (%)	4.6%	10.3%	8.1%	4.6%

Table A.2 Descriptive statistics of variables used in this study

Variable name	Variable description	Villaputzu	Villagrande	Ulassai	Perdasdefogu
under40	1 if the respondent is younger than 40 years old	41.3%	34.3%	33.3%	24.5%
workPISQ	1 if the respondent (or one of his/her relatives) works or worked at PISQ	31.3%	5.6%	16.7%	66.0%
healthPISQ	1 if the respondent has relatives or friends with health problems potentially related to the "Quirra Syndrome"	33.8%	12.0%	13.9%	3.8%

Table A.3 Descriptive statistics on socio-psychological factors used in this study.

Factor name	Item description	Villaputzu	Villagrande	Ulassai	Perdasdefogu
Town	I feel attached to this town	3.78	4.69	4.56	4.56
	I would be sorry to leave this town	3.56	4.30	4.26	4.12
	I miss this town when I am away	3.56	4.30	3.86	4.16
	I feel I belong to this town	3.71	4.57	4.44	4.39
alfa = 0.8791	I like this town	3.60	4.58	4.57	4.58
	I identify with people living in this town	2.87	4.05	3.42	4.02
Citiz	People in this town do not respect the environment	3.47	3.56	2.08	2.33
	My fellow citizens are not supportive	3.28	3.76	3.22	3.96
alfa =0.7172	Residents seem to take care of the town	2.80	3.08	3.13	3.79
	My fellow citizens do not easily collaborate	3.43	3.10	3.19	2.47
Trust	The municipality	1.94	2.60	2.38	3.12
	Military apparatus	2.14	2.16	1.97	3.52
alfa = 0.83	The local health authority	2.52	2.61	2.63	3.28
	National Health Institute	2.42	2.69	2.68	3.34
Risk	Activities carried out by the PISQ pose a serious risk for me	3.25	3.37	3.46	1.57
	Negative consequences of the activities carried out by the PISQ will also affect future generations	3.57	3.84	4.06	2.21
	I believe that the presence of the PISQ causes environmental degradation and pollution	3.40	3.97	3.97	1.47
	I believe that the activities carried out by the PISQ are not risky for health	2.41	1.87	1.89	3.97
alfa= 0.9325	I am worried about what materials and substances have been used so far in the PISQ	3.69	4.28	4.39	1.85
	I believe the so called Quirra Syndrome does not exist	2.53	2.08	1.97	4.22
Eco	I think that the PISQ could still represent an opportunity for the future of my town	2.90	2.93	2.71	4.36
	The installation of the PISQ contributes to the development of my town	3.33	2.12	2.21	4.39
	I believe that, overall, the PISQ generates more disadvantages than advantages	3.20	3.33	3.50	1.66
	I believe that the presence of the PISQ is not so relevant for the economy of this territory	2.67	3.06	2.89	1.64
	I would like the PISQ to increase its activities	2.22	2.25	2.13	4.36
alfa = 0.93	I believe that if the PISQ were to close, the economy of my town would be strongly affected	2.77	2.11	2.17	4.53
	Given the choice, I would opt for the complete closure of the PISQ	2.79	3.29	2.86	1.26

Table A.4 Measurement Component of the HMXL model

Coefficients of the Measurement Equations

	τ_1	τ_2	τ_3	τ_4	ζ
Town01	-10.041***	-8.100***	-5.317***	-1.814***	4.886***
	(1.164)	(0.940)	(0.670)	(0.378)	(0.614)
Town02	-4.135***	-3.454***	-1.884***	-0.290	2.251***
	(0.335)	(0.296)	(0.221)	(0.181)	(0.230)
Town03	-4.805***	-3.586***	-1.712***	0.346*	2.458***
	(0.398)	(0.313)	(0.219)	(0.188)	(0.242)
Town04	-7.353***	-6.172***	-3.869***	-1.181***	4.181***
	(0.706)	(0.621)	(0.446)	(0.298)	(0.494)
Town05	-6.820***	-5.686***	-3.189***	-0.859***	3.193***
	(0.635)	(0.529)	(0.349)	(0.244)	(0.340)
Town06	-3.436***	-2.386***	-0.642***	0.777***	2.031***
	(0.289)	(0.233)	(0.172)	(0.169)	(0.216)
Citiz01	-2.187***	-0.442***	0.898***	2.152***	0.977***
	(0.193)	(0.132)	(0.140)	(0.190)	(0.152)
Citiz02	-3.415***	-2.378***	-0.448***	1.861***	1.607***
	(0.300)	(0.232)	(0.161)	(0.213)	(0.197)
Citiz03	-3.299***	-1.695***	0.407**	2.857***	1.775***
	(0.303)	(0.208)	(0.171)	(0.275)	(0.224)
Citiz04	-1.690***	-0.558***	0.645***	1.977***	0.998***
	(0.167)	(0.134)	(0.137)	(0.181)	(0.148)
Trust01	-1.576***	0.092	1.502***	3.040***	1.125***
	(0.164)	(0.136)	(0.161)	(0.239)	(0.131)
Trust02	-1.560***	-0.339**	1.467***	3.156***	1.611***
	(0.184)	(0.162)	(0.183)	(0.258)	(0.167)
Trust03	-4.452***	-1.007***	2.666***	6.125***	3.780***
	(0.518)	(0.315)	(0.391)	(0.671)	(0.468)
Trust04	-3.877***	-1.188***	2.618***	5.308****	3.511***
	(0.436)	(0.297)	(0.365)	(0.556)	(0.412)
Risk01	-1.518***	0.049	2.472***	4.228***	2.020***
	(0.190)	(0.166)	(0.228)	(0.329)	(0.179)
Risk02	-2.029***	-1.048***	0.847***	2.388***	1.993***
	(0.204)	(0.175)	(0.174)	(0.225)	(0.179)
Risk03	-2.161***	-0.431*	2.330***	4.698***	3.516***
	(0.287)	(0.241)	(0.300)	(0.433)	(0.316)
Risk04	-2.447***	-0.867***	0.970***	2.405***	2.187***
	(0.234)	(0.180)	(0.182)	(0.228)	(0.185)
Risk05	-3.034***	-1.488***	0.897***	2.822***	3.163***
	(0.307)	(0.244)	(0.230)	(0.298)	(0.279)
Risk06	-1.932***	-0.609***	1.507***	3.060***	2.569***
	(0.230)	(0.195)	(0.214)	(0.278)	(0.223)
Eco01	-4.212***	-2.700***	-0.958***	0.978***	1.437***
	(0.344)	(0.264)	(0.205)	(0.204)	(0.155)
Eco02	-2.946***	-1.980***	-0.595***	1.116***	1.259***
	(0.259)	(0.222)	(0.186)	(0.191)	(0.133)
Eco03	-4.263***	-2.703***	-0.251	1.512***	1.468***
	(0.341)	(0.260)	(0.199)	(0.223)	(0.146)
Eco04	-3.731***	-2.283***	-0.758***	0.885***	0.972***
	(0.294)	(0.205)	(0.162)	(0.166)	(0.112)
Eco05	-2.542***	-1.384***	0.618***	1.732***	1.384***
	(0.247)	(0.208)	(0.192)	(0.220)	(0.143)
Eco06	-3.694***	-2.188***	-0.481**	1.385***	1.892***
	(0.353)	(0.286)	(0.239)	(0.255)	(0.215)
Eco07	-6.150***	-4.072***	-1.781***	-0.599***	1.579***
	(0.544)	(0.361)	(0.245)	(0.217)	(0.183)