



Contributions of risk preference, time orientation and perceptions to breast cancer screening regularity



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ABSTRACT

Disparities in breast cancer screening are often explained by socioeconomic factors, although a growing body of papers show that risk preference, time orientation and perceptions may explain mammography use. The aim of this paper is to estimate the relative contribution of socioeconomic factors, risk preference, time orientation and perceptions to disparities in breast cancer screening regularity. These determinants are elicited in an experimental laboratory from 178 women aged between 50 and 75 years in France in 2013. The results reveal that risk aversion accounts for 30% of the variance in screening regularity, which is greater than that attributable to socioeconomic determinants (20%), perceptions (11.5%) or time orientation (2%). These results suggest that further investigation on the relationship between risk aversion and screening behaviors is needed to design more comprehensive public health interventions.

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1. Introduction

Breast cancer is the principal cause of mortality from cancer among women and especially among those aged 50 and older. As early diagnosis allows treatment at an earlier stage, it induces a better survival prognosis. Most European countries have implemented breast cancer screening programs (Altabelli and Lattanzi (2014)) that usually provide free mammogram every 2 years to women aged 50 to 69 or 74 because mammography is an effective breast cancer detection technique for this age group. The efficiency of these programs in terms of mortality reduction is conditional on screening participation. Although the European Guidelines indicate a reference uptake rate of 70–75%, uptake rate ranges from 39% in Poland to 80% in the Netherlands (as of 2010), and most European countries' uptake rates are below 70% of the eligible population.

Screening attendance disparities are usually attributed to socioeconomic characteristics (Devaux (2015) and Wübker (2014)). Less educated or poorer women tend to screen less than their richer or more educated counterparts. Psychologists and experimental economists express the view that risk and recovery chance perceptions, risk preference and time orientation may also explain

screening disparities (Carman and Kooreman (2014)), Chapman (2005), Katapodi et al. (2004) and Picone et al. (2004)).

As the decision to screen is a trade-off between delayed or immediate benefits (higher survival chances if found sick or relief if found healthy) and immediate costs (financial costs, physical pain), the weight an individual attaches to short-term or long-term consequences may matter in how she weights costs and benefits. Time orientation refers to how an individual values distant outcomes relatively to present ones. A future-oriented individual would value the screening benefit more than a present-oriented individual (Orbell et al. (2004) and Orbell and Kyriakaki (2008)). How the benefits and costs of screening are weighted in the decision-making process may also depend on each individual's attitude toward the risk associated with screening's outcomes. The source of risk is the uncertainty about the true health state prior to screening. Theoretical models studying the relationship between risk aversion and disease screening yield mixed predictions. Risk aversion in screening decisions has received little attention in empirical research despite its potential relevance in screening decisions. The probability of being sick determines the likelihood of the outcome's occurrence and the probability of surviving partly determines the outcome value if an individual is found to be sick. It could be argued that individual decision-making relies on subjective probabilities instead of the objective probabilities because of

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the lack of knowledge of information on the prevalence and risk factors. Personal assessments of their risk and recovery chances seem to be central to the decision to screen.

As these determinants have never been jointly investigated, their individual effects and contributions to screening disparities remain unknown. Revealing which type of determinant best explains breast cancer screening disparities would make it possible to highlight the direction toward which the research agenda and public intervention to increase uptake rate may need to be oriented. In addition, previous studies attempt to explain the likelihood of having ever screened or screened in the past two years, but no studies investigate the determinants of screening regularity. This is all the more important because it is regular screening that diminishes breast cancer mortality by 20% on average for women older than 50 (Independent UK Panel on Breast Cancer Screening (2012)).

This paper assesses the relative contribution of socioeconomic and health characteristics, risk preference, time orientation and perceived risk and recovery chances in explaining breast cancer screening regularity among French women. We conducted a survey in the laboratory among French women aged 50–75 years, a group for which a national screening program exists in France. Despite the small sample size ($N = 178$), conducting a survey in the laboratory enables us to elicitate risk preferences with an incentive-compatible measure. Although the correlation between risk aversion and primary prevention (smoking cessation, dieting for instance) has been widely investigated, only Picone et al. (2004) study the relationship between risk aversion and secondary prevention (cancer screening) using a hypothetical income-related question and find weak results. Rather than suggesting that risk preference is not an important factor of cancer screening decision, as it has almost not empirically been studied, it is likely that the measure employed to date have not captured how risk preference enters an individual's screening decision. This paper is a first attempt to estimate the relationship between cancer screening and risk preference elicited with an incentive-compatible measure with monetary payoffs.

Decomposing the variance of screening regularity reveals that the main contributors are risk preference (30%) and socioeconomic characteristics (20%). Finally, perceptions account for 11.5% of screening regularity variance.

The remainder of the paper is organized as follows. Section 2 provides information on the functioning of breast cancer screening in France and reviews the literature on the relevant determinants affecting breast cancer screening. Section 3 presents the data and econometric strategy used. Section 4 reports the results, and section 5 discusses them and concludes.

2. Background and literature review

2.1. Background on breast cancer screening

In France, breast cancer screening includes a clinical breast exam and a mammogram, which is an X-ray of the breast tissue that provides detailed images of the breast from 2 angles (frontal and profile). The mammogram is performed and analyzed by a radiologist. Mammogram screening is considered an effective means for detecting breast tumors for women older than 50 years of age. In France, the population-based breast cancer screening program was extended nation-wide in 2004 and provides free breast cancer screening every two years to all women aged 50–74 years. In addition to the organized breast cancer screening program, women can screen spontaneously - so-called opportunistic screening - by obtaining a prescription from a physician. Such exams have almost the same medical content as the organized screening, but

opportunistic screening is not free. Organized and opportunistic screenings coexist and can be undertaken by all women aged 50–74 years, but a distinction between the two is not made in this study. The national program uptake rate has stagnated at 52% of the eligible population since 2008, and opportunistic screening is evaluated to reach 10% of the eligible population in 2008 (Haute Autorité de Santé (2011)).

2.2. Literature review on screening determinants

2.2.1. Risk preference

Ehrlich and Becker (1972) distinguish self-protection (activities diminishing the probability of a loss) from self-insurance (activities diminishing the size of a loss) activities. Breast cancer screening regularity corresponds to self-insurance because it decreases the size of the health loss by increasing the likelihood of detection at an earlier stage, for which treatment may be less invasive. Breast cancer screening regularity may also be considered as self-protection because it decreases the likelihood of occurrence of the worst loss (death) by allowing detection of tumors, which maybe taken away before they develop into advanced metastatic cancers. A body of theoretical papers studies the relationship between self-insurance, self-protection and risk aversion. Dionne and Eeckhoudt (1985) initially proved that risk aversion has a positive impact on self-insurance. But, it has been shown that as soon as the efficiency of self-insurance is unsure, the relationship between risk aversion and self-insurance is ambiguous (Briys et al. (1991)). This refers to the likely situation where cancer screening does not decrease the size of the health loss with certainty. Furthermore, both articles document that the relationship between risk aversion and self-protection is ambiguous, regardless of the efficiency of the self-protection activity. Eeckhoudt and Gollier (2005) explains this result by referring to higher-order risk aversion namely prudence, as defined by Kimball (1990). The rationale is that self-protection has a cost and if the loss occurs i.e. if she has cancer, her utility is reduced both by the loss (due to the disease) and by the upstream costs of self-protection. Self-protection is hence impacted by risk aversion but also by prudence. A prudent individual prefers to face a loss (only due to the disease) with a higher probability than a bigger loss (due to the disease and self-protection costs) with a smaller probability. Therefore, a prudent individual is not always willing to invest in self-protection that would diminish the occurrence of a loss, as she prefers to save this spending to cover the loss in case it occurs. Being risk averse but prudent may lead to lower self-protection. Lastly, if screening is considered as a self-insurance-cum-protection activity (reduces both the probability of death and the size of the health loss), Lee (1998) and Grimm and Treibich (2016) also find it has an ambiguous relationship with risk aversion.

Another conceptual feature of cancer screening relies on the fact that cancer screening potentially delivers a bad news, which may provoke anxiety or stress. These emotions may be anticipated during the decision making process (Köszegi (2003) and Loewenstein et al. (2001)). The additional information triggered in cancer screening has an instrumental value (leading to better treatment choice) and an anticipated emotional value. Bousquet (2016) models the decision to screen for cancer by disentangling the effect of risk aversion on the instrumental and emotional values of information. She finds that when the individual is very information averse, risk aversion has a negative effect on the likelihood to screen. In addition, Picone et al. (2004)'s model reveals that when treatment is not sufficiently effective to cure the disease, risk-averse individuals are less willing to pay for screening than are risk-neutral individuals. Overall, theoretical predictions suggest an ambiguous effect of risk aversion on cancer screening.

Some empirical work focus on the relationship between risky

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