Research Proposal: Homebuyers’ Attention Towards Environmental Pollution Disclosure

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# Introduction

Mandatory information disclosure, or targeted transparency, has been widely advocated by both regulators and researchers as an appealing alternative to “harder” or more restrictive forms of regulation (Sunstein 1999). In ideal scenarios, information disclosure can help to prevent misaligned incentives and asymmetric information between the demand side and the supply side, while being cost-effective and maintaining the consumer’s freedom of choice (Loewenstein et al. 2014).

However, the effectiveness of information disclosure mechanisms can be significantly challenged by the consumer’s lack of attention. There is a large and growing literature demonstrating that consumers are prone to making mistakes even if the information is readily available and easy to access, across various aspects such as in choosing optimal options for pension funds (Choi et al. 2011), buying food and beverages (Bollinger et al. 2011) or stock investing (Hirshleifer et al. 2009). In light of the current “information explosion”, attention is a scarce economic resource which requires people's efforts to allocate. Hence, it is unsurprising to witness individuals’ lack of attention and their resulting misconceptions (Loewenstein et al. 2014).

In this research, I aim to further examine the issue of information disclosure policy and the attention of information recipients, by looking at the impact of disclosed information about local environmental quality on the housing market. There are two reasons why this is pivotal: First, local pollution is one of the most important characteristics in the homebuyers’ hedonic vectors; and it can potentially be generalised for households’ perception of other types of long-term risk. Second, there are few studies on attention and information disclosure related to economic transactions that are high-stakes and infrequent such as in the housing market.

An extensive amount of literature has investigated the impact of industrial pollution on housing prices and found mixed evidence (Lindell and Earle 1983; Kohlhase 1991; Bui and Mayer 2003; Mastromonaco 2015). However, most research on this topic overlooks the moderating effect of attention, possibly due to the infrequent and elongated nature of home-buying decisions, making measuring attention challenging. Nonetheless, one issue remains clear: if people pay limited attention to the disclosed pollution information, they might not adequately consider the environmental risks in their decision-making, henceforth weakening any findings. For example, a news article[[1]](#footnote-1) highlighted that many people residing near Love Canal – the site of one of the worst toxic waste catastrophes in the U.S. - were unaware of the environmental conditions of the neighbourhoods before purchasing their properties.

In summary, the aim of this research is to (1) discover how attention can alter the empirical findings in research related to individuals’ risk perceptions and following decisions; and (2) propose a proxy measurement for attention and test for its effectiveness.

# Proposed Theoretical Model

## Empirical specification with hedonic price model

To estimate the property value, I use the conventional hedonic pricing model, which is characterised by a vector of Structural variables (e.g., number of bedrooms, property type), a vector of Neighborhood variables (e.g., local amenities, socio-economic conditions) and a vector of Environmental Quality variables (e.g, the surrounding environmental disamenities). The pricing model takes the following specifications:

*Equation [1]* also indicates the information categories that homebuyers consume before they make a purchase decision. For properties near industrial sites, one important variable in the vector is individuals’ environmental risk perception associated with neighbouring industrial sites – which is further discussed in the following parts.

## Risk perception function with attention

According to Gayer and Viscusi, individuals could formulate perception of environmental risks via both prior assessment (based on past knowledge) and disclosed information. They update their prior belief through a Bayesian learning process that results in perception expressed as:

[2]

I formulate the individuals’ perceptions of the environmental risks based on Gayer et al. (2000) and (Viscusi 1985). Assume that individuals have a prior assessment of the property’s environmental risk attribute, based on knowledge and past information. Through a Bayesian learning process, they update their prior belief, using disclosed information provided by the official environmental agency (in this case, the Environmental Protection Agency - EPA). Note that, the diffusion of information from the EPA within the local market through various channels can influence individuals’ perceptions even among those who have not read EPA documents. Subsequently, individuals have a risk perception expressed as:

With is the prior perception of the environmental risk associated with industrial sites, based on the information content of ; while is the true environmental risk, implied by the information content from the EPA. By denoting the fraction of each information source over the total information content[[2]](#footnote-2), *function [2]* can be rewritten into:

*Function [3]* indicates that, for properties near industrial sites, homebuyers’ perception of environmental risk is a weighted average of the true risk and their prior beliefs about the true risk, with the weight depending on the relative amount of information they get from each source.

## Refine the theoretical risk perception function with attention

One key assumption of the risk perception function in *Section [2.2]* is that people can update their perception seamlessly from the disclosed information. This is not necessarily true, as discussed above. Gabaix (2019) introduces the “attention-augmented decision utility” – in which individuals aim to make decisions based on (1) information about attributes and (2) their attention to attributes. Following Gabaix (2019), I propose a revision to the Bayesian risk perception in *Function [3]*, incorporating a parameter for the degree of attention:

where is the attention to environmental risk associated with industrial sites. When , the individual “does not think about the risk”, and makes decisions based on their prior risk assessment . When m = 1, the individual pays full attention to the problem and perceives the true risk of the industrial site . When , the individual perceives partially the true risk. *Function [4]* can capture the perception of behavioural agents naturally, and my research will focus on how to operationalise it with the hedonic pricing model.

# Proposed empirical research direction

## Data collection

## Industrial pollution

For information disclosure about industrial pollution, I will exploit the Toxic Release Inventory (TRI), a database reporting the location and the amount of environmental contamination of industrial facilities in the U.S. This database is the result of EPCRA - one of the most prominent mandated disclosure policies. It is supervised by the Environmental Protection Agency (EPA), collecting information on the release, management, and disposal of toxic chemicals by industrial facilities. There are two features which make the Toxic Release Inventory desirable: (1) it is among the richest public data sources in the world on industrial pollution, with nearly 30 years of reported data, and importantly, (2) it has a wide presence in the media – the primary source of information for households.

## Housing data

For housing price data, I will use the U.S. Home Mortgage Disclosure Act (HMDA) dataset. The HMDA dataset is publicly available and provides important information on property location, property price, loan value and the originated mortgage interest rate. More importantly, each property in HMDA has a census tract, which can be mapped using GIS to measure the neighbourhood demographics and amenities.

I will also look for other datasets from property listing websites such as Zillow. The advantages of such sources include more frequent data on property prices and property characteristics, but one problem is that they are mostly proprietary data.

## Attention measurement

One key challenge to my research is the measurement of attention. Oftentimes, attention is measured using survey or process-tracking methods (e.g., Mouselab or eye-tracking) (Gabaix 2019). These physiological methods can be highly accurate, yet they usually require costly resources and perhaps are not useful to measure attention over a long period (months to years). Researchers in finance have instead proposed using other proxy measurements, internet search frequencies (Da et al. 2011) or users’ engagement data from trading platforms (Barber et al. 2022) to measure the attention of investors, but mostly with liquid assets such as stocks, or more recently, cryptocurrency. For highly illiquid assets such as property, it might require more complex and aggregated methods to measure buyers’ attention over a long period of time.

The outlined theoretical model in *Section [2.3]* implies that one important objective in my research is to measure homebuyers’ attention towards environmental risk associated with industrial facilities. I propose the use of internet search frequency (Google Trend), which captures the *revealed attention*: if you search for some information on the internet, you are undoubtedly paying attention to it. In addition, Bui & Mayer (2003) highlight the importance of media as households’ primary source of information, instead of the raw data releases of the Toxic Release Inventory. Henceforth, news headlines about topics related to environmental risk can also be used as a proxy for unconscious attention.

## Proposed research design

The impact of the information disclosure of TRI sites on risk perceptions enters the hedonic price model through the change in price gradients before and after the EPA releases the TRI database. However, the number of facilities reported in TRI is not fixed but has constantly changed each year. Specifically, from 2004 to 2022, there were a total of 33,680 facilities appeared in the TRI database, but only 3,052 of which stayed on the list every year. That means there are many industrial facilities “came and went” from the TRI list.

I will examine properties surrounding these industrial sites, and exploit the change in prices before and after the release of TRI information linked to these sites. Differences in house prices between the two periods might be attributed to the disclosure of pollution information of the neighbouring sites. I will filter the sites based on two criteria (1) they should stay on the TRI list long enough to influence the residents’ perceptions – possibly more than 5 years (2) their release is classified as “carcinogen” – can cause cancer since such release cause higher.

However, such changes in TRI list might not always be exogenous for house buyers. For example, a large and newly constructed industrial site promptly appears on the TRI list once operational. However, it was already expected to improve the local economic condition during its construction. So there are shifts in market perceptions regarding the industrial site, evident in both pre and post-TRI release periods.

* I need to find better design

# Proposed research timeline

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2. I denote the fraction of each information source over the total information content as [↑](#footnote-ref-2)