

Factors determining households' preferences regarding flood risk transfer instruments

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Abstract:

Aim: The purpose of the study is to examine flood risk transfer instruments, such as flood insurance, from the households' perspective in order to determine households' preferences concerning the design and the features of these instruments as well as to indicate factors influencing and shaping these preferences.

Design / test methods: The paper presents the outcomes of the social research revealing households preferences towards dealing with flood risk. The research was preceded by the scientific literature review of the theories and heuristics which could be relevant for decision making in the flood hazard proximity. The research, based on semi-structured interviews and questionnaires, was performed in the area of three river basins in Poland, namely: the Upper Narew river basin, the Lower Warta river basin and the Soła river basin. The research areas were chosen based on their geographical, economic and socio-cultural diversity in order to include these factors into analysis.

Conclusions: Households preferences regarding flood risk transfer instruments are influenced by the households attitudes towards risk (level of risk aversity) and the perception of the level of flood hazard determined mostly by the past experiences.

Originality / value of the paper: The original and primary research presented in the paper delivers the outcomes in terms of elicited households' preferences regarding flood risk transfer instruments and identified factors influencing these preferences.

Keywords: flood risk, insurance, households preferences

JEL: D81, D01, D64, D81, D82

1. Introduction

In theory, as a society in the last decades we should have become more knowledgeable about climate change, its consequences, including the extreme events such as floods. Worldwide broadcasts of frequent natural disasters and their consequences as well as new policies implemented to mitigate and adapt to floods should have increased the societal awareness of this risk and its management measures. However, at the same time the new catastrophic events are bringing more losses worldwide (Stern 2000, Cavallo & Noy 2009) and the examples of poverty traps in the flood prone areas are not rare. Therefore the paper examines flood risk transfer instruments from the households' perspective. It presents primary research conducted in three river basins in Poland: the Upper Narew river basin, the Lower Warta river basin and the Soła river basin. The research reveals how people perceive flood risk and the existing on the Polish market flood risk transfer instruments. Moreover, the research on households' preferences related to the risk transfer instruments are analysed. This allows to define features of flood risk transfer instruments, which are desired by people living in different flood hazard zones.

The concepts used in the paper can be defined as follows. Flood risk is estimated taking into account of probability of occurrence of flood event and resulting losses determined by the vulnerability. Flood risk transfer instrument is a solution in form of a product or service, which allows to shift the risk from one entity (household) to the other (usually company or institution). Various kinds of insurance against flood (Surminsky 2010, Michel-Kerjan 2010, Handschke et al 2015, Wieringa et al 2017) or cat bonds (Cummins 2008) are examples of such instruments. Preferences concerning flood risk transfer instruments are reflecting the needs of households with that respect.

2. State-of-the-art analysis

In order to formulate informed hypotheses for research on households' preferences and factors determining them the main relevant behavioural theories concerning households' decisions were identified based on review of the state-of-the-art of scientific literature.

Kozielecki (Van der Pligt 1989) described the phenomenon of unrealistic optimism, called the Pollyanna effect, appearing when decision makers tend to emphasise and exaggerate the probability of positive outcomes of their decisions. This approach, also referred in the literature

as 'wishful thinking', could have impact on flood risk transfer preferences of households. Other behavioural theories, such as the theory of socio-cultural viability (Thompson et al 1990, Verweij & Thompson 2001) and perspective theory (Kahneman & Tversky 1979, Kahnemen et al 1982), provide insights into individual and group behaviour in risk situation. Cultural theory postulates four basic cultures – egalitarianism (community focused approach), individualism (active approach driven by self-interest), hierarchy (bureaucratic management) and fatalism (passive approach) – which correspond to the households attitudes and management attitudes, especially in the rural water sector (Koehler et al 2018). The perspective theory - a descriptive model of decision making under conditions of uncertainty, that tries to explain “economically irrational” behaviours, gives insights in particular about a rebound effect, which in view of this theory means that in the case of losses people have a lower risk aversion, so they are more likely to take risk.

The assumptions underpinning the conducted research as well as the research outcomes are in line with of the latest world-wide research findings concerning experimental economics and human behaviour dynamics. (Aerts et al 2018) In particular with the protection motivation theory stating that individuals implement measures to protect themselves from floods if they believe that the threat of the hazard they face is high and the available protective measures are effective, easy and affordable to implement. (Aerts et al 2018) In case of the research presented in the paper the measures are concerning flood risk transfer.

Asymmetric information that institutions and households posses have a negative impact on the level of trust that households have in relation to the institutions that should, in their view, provide them with the public service of security. The transparency of rules, simple and effective business models and communication of the rules to people would improve this situation. The researched issue is related also to the intergenerational transfers as the decisions about the risk retainment or transfer will have consequences of the future welfare of the households.

3. Hypotheses formulation

Based on the analysis of the state-of-the-art of research concerning households' behaviour in risk situations and the research on households' preferences towards risk retainment or transfer, the hypotheses were formulated related to the factors determining households' preferences

concerning flood risk transfer instruments.

Risk transfer instruments in theory constitute an incentive for stakeholders in flood prone areas to reduce the risk. However, according the EEA the penetration of insurance against flood on the polish market is rather low, as market penetration of property insurance against natural disasters, calculated as total insurance premiums in relation to GDP in 2000-2009, is at the level of 3.8%¹. Therefore, after an initial research, four hypothesis concerning households' preferences towards risk transfer and reasons for not transferring their risk were formulated as following:

- H1: The rather low level of flood risk transfer through the insurance sector is caused by the risk aversity of households.
- H2: Households cannot afford to transfer risk due to its high price and budget constraints.
- H3: Households believe that they are not endangered by the flood hazard.
- H4: Households are used to receiving help from the government and they are passive in taking preventive measures and using risk transfer instruments, as none of the instruments is considered appropriate for them.

The research method and the outcomes are presented in subsequent chapters.

4. Research method

The research was conducted in three river basins in Poland: the Upper Narew river basin, the Lower Warta river basin and the Soła river basin. The research was performed in three river basins chosen, so that together they can be representative for socio-economic and environmental conditions in Poland. The river basin approach to defining the scope of the research was applied according the Water Framework Directive (EC/60/2000) recommendation.

All together about five hundred households took part in the research pool performed in a form of a semi-structured interviews, guided by the questionnaire, conducted with the households representatives.

The households in the research pool were classified among several groups, based on their level of flood hazard. The latest was identified based on the flood hazard and flood risk maps

¹ EEA, <http://www.eea.europa.eu/data-and-maps/figures/insurance-penetration-as-proportion-of-gdp>, access 15.06.2018.

developed in the ISOK (www.isok.gov.pl, access on 15.09.2018). Thus, the following three types of study areas were taken into account:

- areas where the probability of flooding is low as the flood occurs once every 500 years (Q 0.2%),
- areas where the probability of flood occurrence is medium as it occurs once every 100 years (Q 1%),
- areas where the probability of flooding is high as the flood occurs once every 10 years (Q 10%).

All of the households (inhabited settlements) located in the identified areas in the river basins were approached and invited to participate in the research, but the final pool number did not exceed 140 households per river basin. Also the pool happen to be balanced in terms of sex (almost equal participation of men and women) in the research and in terms of age as about 50% of respondents were between 40 and 60 years old, with about ¼ of respondents representing younger and older population. The hypotheses were tested by analysing the share of the answers to the posed questions in the research river catchments. Correlation coefficients were used in order to define the mutual relations between the variables such as the past flood experience and the higher awareness about flood hazard among the households, the past flood experience and the demand for flood risk transfer as well as the probability of flood occurrence and the willingness of the risk transfer.

5. Households' preferences regarding flood risk transfer instruments

Households located in the high flood hazard areas (defined as areas with a probability of flood occurrence higher than 1%) would be willing to transfer risk, although a certain number of them have negative experience with insurance and as a result lower trust in the (state) institutions. Residents are often upset about their helplessness and as they claim too little help from the state in the absence of the risk transfer measures, such as insurance. People usually criticize authorities and the existing technical measures. At the same time, residents not exposed to direct flood risk (areas with $Q < 1\%$ and $Q > 0.2\%$) were less willing to transfer risk. On the basis of the conducted research, it was possible to observe that the most important reason for changing the behavior and awareness of people is experience. The respondents also expressed preferences in relation to the

characteristics determining insurance schemes, such as the insurance premium prices, undertaking individual or joint mitigation measures, state involvement or the compulsory nature of insurance. It should be noted that preferences on these issues differed between the analysed catchments.

6. Determinants of households' preferences towards flood risk transfer

The theory suggests that households' behaviour and their actions depend on their personal features and the rules set by the institutions as well as on households' experiences of how the rules are implemented.

The hypothesis on the risk aversity of households being the reason for not transferring the risk through the insurance sector was negatively verified. Low level of households' risk aversity was defined as retention of flood risk by the respondents, e.g. lack of willingness to transfer this risk, declared by at least half of the respondents, in particular by respondents exposed to this risk. A significant part of the respondents (on average around 40%) claimed that they transfer the risk through insurance or would gladly transfer the risk of flooding to the insurance sector, but this is not possible due to the lack of an appropriate insurance offer. And in the areas defined in the study as being threatened with flood hazard (with a probability of a flood occurrence of 1%) practically 80% of respondents indicated that they transfer the risk through insurance or would willingly transfer the risk of flooding to insurance sector, but this is not possible.

Concerning the second hypothesis the results related to affordability of flood risk transfer indicated that, on average, 40% of respondents cannot afford to transfer risk due to its high price and its budget constraints.

Price elasticity of flood insurance demand is determined by the fact that the close direct substitute to the active flood risk transfer by the households is the government bail-out in case of the catastrophe. Moreover, the cost of risk transfer was in general not considered high in the households budgets. Therefore, the price elasticity of demand can be considered high. The income elasticity was also proven to be high.

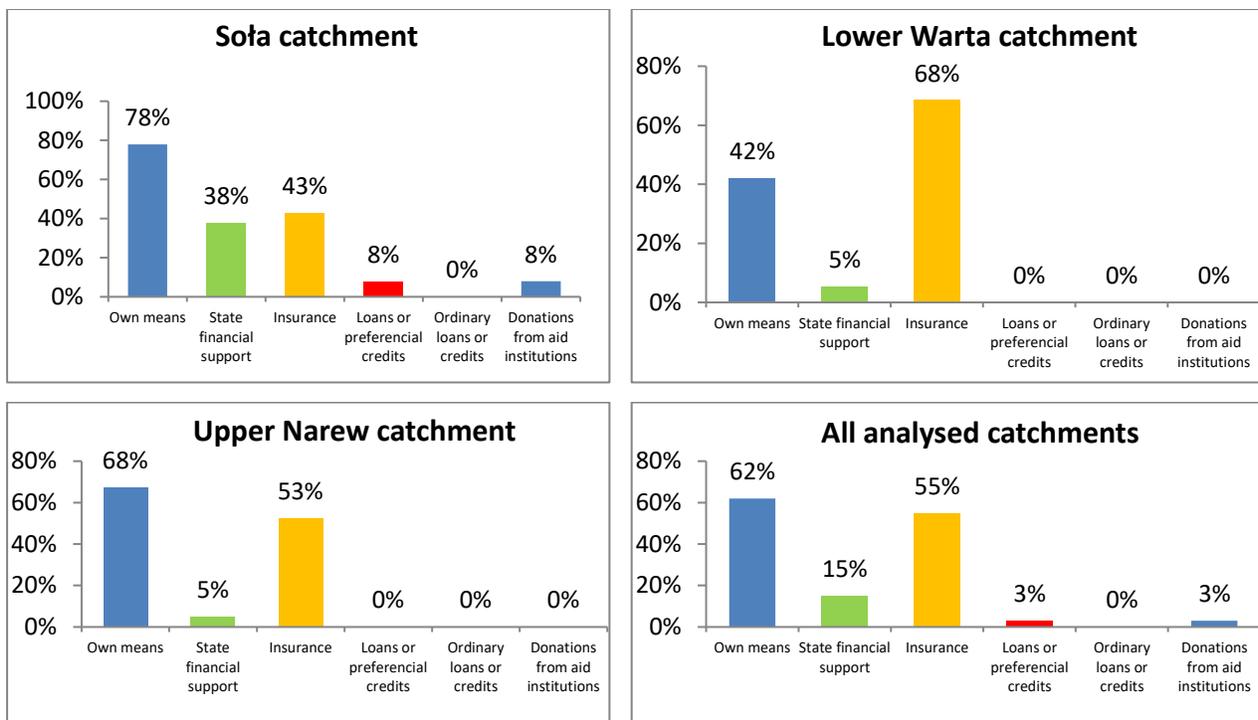
Third hypothesis on that the households believe that the flood hazard does not concern them was verified positively looking at the data of actual estimated flood hazard indicated on the maps (ISOK) and comparing it with risk level perceived by the households. In particular, a significant

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part of the respondents in areas with a flood risk between Q1% and Q10% believed that the risk of flooding did not concern them.

Finally, the hypothesis of getting used to receiving help from the state budget and passivity in taking preventive measures and using risk transfer instruments, as none of them is considered appropriate was verified negatively. In general respondents indicated possible actions and expressed willingness to transfer flood risk. In Figure 1 the share of answers to the multiple choice question on how the respondents' flood losses were financed in the past, are presented.

Figure 1. Sources of flood losses financing



Source: own elaboration

As it can be observed own financial means and insurance are the most common ways to finance flood losses. The share of respondents using the financial support from the state varies vary much between the catchments as well as the reliance on the catastrophe insurance. As explained during the questionnaire follow-up in-depth interviews the reasons are to the great extent related to the different level of trust to the state and insurance institutions.

7. Discussion

Rafsgaard et al 2013 argues that attitudes towards risk change in time due to the gained experience. This aspect was not included within the scope of the conducted research as the households were interviewed only one time. However, the conducted research shows that there is a significant correlation between the past flood experience and the higher awareness about flood hazard among the households (expressed by the accuracy of assessing the flood hazard probability zone) as well as between the past flood experience and the demand for flood risk transfer.

Study Van Buuren et al 2016 explores the path dependence phenomenon, that proves that contemporary decisions are taken based on historical preferences and actions as well as on past knowledge and experiences, even if innovative practices become available. The conducted research cannot disprove this observations and such approach was observed among the respondents.

Both the methods for flood hazard and risk estimation as well as business models for offering flood insurance are dynamically changing over time. This may cause the households preferences to be also dynamically adjusted based on new knowledge and rising awareness. For that very important is the education about flood hazard and about the improvement of resilience capacity.

Additional research on the same subject was also conducted by the author in the Przemsza river basin in Poland and it revealed that the most common reasons for risk transfer are the risk aversion of households and making the transfer of risk mandatory. However, on the other hand the reasons for the lack of the risk transfer are the following: low risk awareness of households, lack of their knowledge about the risk transfer opportunities, the notion of unprofitability of risk transfer, low income or high income of residents. Also, the reaction and decisions of the governments taken after the event of a flooding (e.g. compensation payments) shape the attitude of inactivity of households towards risk transfer due to the belief that in the event of a flood the victim will receive support and financial assistance in the reconstruction of property from the government. Prevailing over the years the low awareness of households concerning flood risk, which manifests itself in their reckless decisions on habitation in the high flood hazard areas, is surprising, especially because many communities included flood hazard and risk in the special

planning documents. Moreover, the property insurance, which is mandatory in cases of financing investments from bank loans, make flood hazard explicit in the insurance contracts.

8. Conclusions

The analysis shows that households' behaviour and their actions depend on their personal features and the rules set by the institutions as well as on households' experiences of how the rules are implemented. In particular, households preferences regarding flood risk transfer instruments are influenced by the households attitudes towards risk (level of risk aversity) and the perception of the level of flood hazard determined mostly by the past experiences. Respondents, in the case of flood losses with low probability, indicated quite low risk aversion and expressed willingness to retain risk. A positive correlation between the probability of flood occurrence and the willingness of the risk transfer was observed.

The outcomes provide information about the households' preferences and can be further utilised in the creation of policy instruments at various administrative levels and business models in the insurance sector. These research can inform and guide policy makers in terms of households' preferences towards the flood risk instruments in the future. In particular, the provided analysis of households preferences towards flood risk transfer informs about the factors relevant for the decision making processes under flood risk and climate related uncertainty. The research adds to the field of households' behaviour analysis and making choices about risk related to natural hazards in the welfare economics.

The identified further challenge in the field of risk transfer is the development of effective and systemic methods of its transfer.

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