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The political economics of social health insurance: the tricky case of individuals' preferences[*]

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Abstract
Social health insurance systems can be designed with different levels of state involvement and varying degrees of redistribution. In this article we focus on citizens' preferences regarding the design of their health insurance coverage including the extent of redistribution. Using a microeconomic model we hypothesize that the individual's preferred options are determined by the relative income position and the relative risk of falling ill. Only individuals who expect to realize a net profit through the implicit redistributive transfers will favour a public insurance coverage over a private one. We test this hypothesis empirically using three distinct approaches. The first two are based on survey questions focusing on the type of coverage and the degree of redistribution respectively. The third is based on a discrete choice experiment thus accounting for trade-offs and budget constraints. The data is from a representative sample of 1.538 German individuals who were surveyed and participated in the DCE in early 2012. We find that the model has to be rejected. There is a wide consensus that redistributive elements should be an integral part of the social health insurance system and could even be extended. However, there are also preferences for health insurance coverage that can be individually optimized.

Keywords: social health insurance; preferences; discrete choice experiment
***JEL*:** H23, H51, I13, C93

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1 Introduction

Insuring the risk of illness is fundamental for individuals. Therefore, all industrialized countries have found ways to ensure that anybody does have access to at least basic health care services if needed. However, the degree to which the risk of illness is socialized varies substantially. While for example in the UK all expenditures of the National Health Service are financed through general tax revenues, in Switzerland it is first of all each individual's own responsibility to pay for health insurance. Public subsidies are only granted when needed. In consequence, across countries the degree of redistribution that is triggered through the design of the respective health insurance system varies substantially. In Germany, as in many other countries, scarce funding is a ubiquitous topic in health care financing. Thus, politicians wonder on a regular basis if the budget should be increased by funneling more tax money into the system or if the individuals should rather bear a higher burden directly by themselves. Citizens have the means to accelerate reforms but also to deter any change to the system. As Grignon (2012, p. 666) puts it: "Even the most groundbreaking academic research and bestinformed public policies may have little impact if the proposed changes take for granted what people want rather than reflect their deeply held convictions and preferences." This makes this topic also interesting from a public choice perspective.

Standard public choice models such as the ones presented in Breyer (2001) or Kifmann (2005) that are based on rational, utility maximizing individuals put the focus on the ratio between an individual's relative income position and an individual's relative risk to fall ill. Assuming a general linear income tax and disregarding the risk of falling ill, all individuals with more than the average income will oppose further taxation for the purpose of redistribution, as they will be net losers of the system. They can obtain private insurance cover more cheaply than the public one. However, if their relative risk of falling ill is higher than their relative income position, they are likely to be favorable towards publicly financed insurance coverage implying an increase in redistribution as they might benefit irrespectively of their "disadvantageous" income position. So the distribution of both parameters will influence the outcome of a popular vote on the type of health insurance as well as on the degree to which redistributive elements should be incorporated.

We want to test empirically if the proposed relationship between income, risk of illness and preferences for insurance type and redistribution holds. A common challenge for such tasks is that respondents are usually not exposed to a budget constraint and are not forced to face trade-offs when voicing their opinion about the goals and the quantity of redistribution. This is likely to lead to biased results. Our data are based on a discrete choice experiment (DCE) that was conducted in the field with a representative sample of more than 1,500 German individuals, thereby accounting for budget constraints and trade-offs.

Our results are twofold. First of all, using two standard variables that are based on a question without budget constraint and trade-offs the data seem to support the predictions of the microeconomic model. However, when we use data from the DCE, the results just point into the opposite direction. Even people who – according to the theory – should oppose public health insurance and the resulting higher degree of redistribution prefer an extension of the welfare state. These findings are robust no matter if individual or family level indicators are used.

In the following we first present a brief review of the literature. In section 3 the model sketched out above is elaborated on in more detail. Section 4 provides the background to the DCE, the survey and the descriptive properties of the data. Furthermore we line out the econometric models. In section 5 we present the results. Section 6 concludes with a brief discussion and summary.

2 Literature

Literature on the peculiarities of health insurance fills whole libraries. While Cutler and Zeckhauser (2000) provide a succinct overview on the key topics, this field of research has further diversified over the past decade. Thus, a comprehensive review of the literature is beyond the scope of this article. As at the same time almost no literature exists that applies an approach similar to ours, we want to use the following paragraphs to relate our quite specific research question to the neighboring fields of interest, including theoretical, experimental and empirical perspectives.

The theoretical grounding of our approach stems from works such as Gouveia (1997), Breyer (1995) and Kifmann (2005) who elaborate on different aspects of social and (supplemental) private health insurance from a public choice perspective. While their respective focus varies, they all develop their analysis from the same basic model that we apply, as explained in detail in section 3. On a rather abstract level their findings are that the amount of public and private health insurance consumed or defined in a constitutional process depends primarily on the characteristics *risk of illness*, *individual income* and the d*istribution of these parameters* within the society in combination with the *voting mechanism* in place. These results make it intuitive why health reforms pertaining to questions of (social) health insurance are so difficult to implement. Just as another example Pauly (2002) discusses the non-existence of universal health insurance in the US from a similar public finance and public choice perspective. However, such theoretical analyses are always prone to criticism as strong assumptions regarding the relevant parameters and their distribution have to be made and results are often contingent upon these assumptions.[4] Experimental and empirical studies are needed to test the hypotheses derived from theory.

Most of the experimental evidence available relates to questions such as how much are individuals willing to pay for private health insurance and which factors determine this willingness-to-pay (e.g. Buckley et al. 2012). Aspects of public choice or regarding attitudes towards special setups of social health insurance are usually only covered indirectly when the role of informal institutions, beliefs or values such as solidarity and altruism are investigated. While experimental data has contributed significantly to a better understanding of individual behavior, the participants of these experiments are usually not representative for the general public and the settings are fairly abstract. This makes a transfer to real world policy advice difficult.

Traditional empirical studies, taking advantage of observed behavior and revealed preferences are therefore closer to the *real world*. In the context of health insurance the RAND experiment contributed heavily to research on topics such as the relation between health insurance

[4] As an example see the controversy between Zweifel and Breuer (2006b), Mcguire (2006), van de Ven (2006) and Zweifel and Breuer (2006a) as well as the analysis by Kifmann and Roeder (2011) regarding the efficiency of different health insurance setups.

and the demand for health care (e.g. Manning et al. 1987) or demand for health insurance itself (e.g. Marquis and Holmer 1996). However, the focus of this experiment was primarily on different versions of private insurance contracts (e.g. with varying coinsurance rates) and the resulting implications, not so much the general design and characteristics of the (social) health insurance system.

There are other studies such as the ones by Sudit (1988) and Martinussen (2008) that are closer to our aim by investigating attitudes – in their case the attitudes of medical students and professionals respectively – towards the welfare state and national health insurance. They find that ideology as well as self-interest are significant determinants of these attitudes. However, self-interest is not necessarily in all cases the predominant factor. There is another group of articles that cover questions of preferences with regard to health insurance, including for example Kerssens and Groenewegen (2005), Zweifel et al. (2010) and Vroomen and Zweifel (2011). These studies try to elicit preferences by using discrete choice experiments. However, their focus is on the composition of health plans, i.e. the preferences regarding the services covered, the coinsurance and the premiums.

The study which is closest to our topic is probably the one by Loh et al. (2012). The authors analyze in a cross country study which type of health insurance system citizens would choose if they were given the opportunity to decide. They develop a construct to capture the attitude towards social health insurance on the basis of a number of different survey questions that relate to attitudes towards taxation, government, businesses, insurance etc. The results indicate that compared to citizens from China and the United States German citizens have the strongest attitude towards social health insurance. However, the sample consists only of university students, which limits representativeness of the results. Furthermore, due to the chosen approach the study lacks a clear theoretical grounding for two reasons: Firstly, no underlying theory of the decision making process is defined. Secondly, attitudes do not reflect trade-offs and budget constraints which makes them only in part useful for the derivation of policy implications. Nevertheless, the study by Loh et al. (2012) serves as a starting point for our analyses. As German citizens exhibit a strong attitude towards social health insurance, we aim at investigating the determinants that constitute these attitudes and preferences.

In this paper we want to contribute to the existing literature through a rigorous theory based approach complemented by an empirical strategy that is consistent with micro-economic theory and allows investigating citizens' preferences regarding the design of health insurance systems.

3 The Model

Health care financing in Germany as well as in most countries of the EU is characterized by considerable parts of income redistribution (see Breyer and Haufler 2000). The redistributive character typically results from income related contributions and need based levels of benefits. This implies redistribution from high income individuals to the poor and redistribution from the healthy individuals to the sick. As these are the dominant redistribution channels and key characteristics of social health insurance, they should also be decisive for utility maximizing, rational individuals when voting on the design of a specific health insurance system.

Accordingly, from a public choice perspective, individuals' income position and health status are of particular importance, because these two components might influence individuals' voting behavior and in consequence the extent of public spending for health care. These considerations are the basis of the microeconomic models presented by Kifmann (2005) or Breyer (2001) which build on the works of Gouveia (1997), Epple and Romano (1996) and Breyer (1995). The models analyze determinants that influence the size of the public health insurance system. In this paper we use a specific part of these models to test whether the proposed relationship between income, risk of illness and preferences for insurance type and redistribution holds.

Within this framework (see Kifmann 2005, p. 285; Breyer 2001, pp. 2–5), individuals only differ with respect to market income y and the probability to fall ill p.[5] Each individual can only consume two different – homogeneous – goods: medical care h and consumption good c. Medical care h is the sum of private medical consumption m and the level of publicly provided medical care g. Consequently, individuals' utility is given by:

$$U = u(c) + p * v(h). \tag{3.1}$$

The utility from medical care $v(h)$ is only relevant if the individual falls ill.[6] Public spending for medical care g is financed via a linear tax schedule $\tau(y)$. Thus, an individual's contribution to the health care budget amounts to $\tau(y)=\beta y$, with the tax rate β. When voting for a specific health insurance system, each individual takes his personal income-health ratio into account. That is, the ratio of his own contribution in relation to the average contribution of the population $y/\bar{y}$ and his own risk of illness compared to the average risk of illness in the population $p/\bar{p}$. Hence, individuals' relative income-health ratio can be written as (see Kifmann 2005, p. 289; Breyer 2001, p. 5):

$$T(y, p) = \frac{y/\bar{y}}{p/\bar{p}}. \tag{3.2}$$

The government's budget constraint can be obtained by:

$$g\bar{p}\gamma = \beta\bar{y} \qquad \text{with } \gamma = \frac{c}{h}. \tag{3.3}$$

On the left side, government's spending are determined by the quantity of state provided medical care g, average risk of illness within the society $\bar{p}$ and the price-ratio γ. These expenditures are financed by taxes. In equilibrium the expenditures must be equal to the average contributions, i.e. $\beta\bar{y}$.

Thus, the optimal size of governments provision of medical care g^* for individual i with characteristics (y,p) is given by (see Gouveia 1997, p. 232; Breyer 2001, p. 4):

[5] There exists a continuum of individuals. Market income y and the probability to fall ill p are exogenous and observable. Moreover, the model abstains from incorporating the effects of taxation, moral hazard and adverse selection (see Breyer 2001, p. 2).

[6] Both components of individuals' utility are increasing and concave.

$$g^*(y,p) = \begin{cases} H[T(y,p)\gamma; y, p] & \text{if } T(y,p) \leq 1 \\ 0 & \text{otherwise.} \end{cases} \tag{3.4}$$

In this case, $H(\cdot)$ describes an individual's demand function for medical services in the state of illness and $T(\cdot)$ an individual's income-health ratio. The interpretation of (3.4) is as follows: In case of illness, a rational, utility maximizing individual will opt for an positive optimal state provided level of medical care g^* if his individual income-health ratio is smaller than or equal to one (see Kifmann 2005, p. 289). This is because this individual will benefit from the redistribution that is inherent within the social health insurance. From an individual perspective, he is a net winner of this system and has a strong incentive to expand the level of state provided medical care g. On the contrary, individuals with an income-health ratio greater than one are net losers of a redistributive health care system and will receive private insurance m more cheaply than state provided. Therefore, these individuals will oppose publicly provided health insurance.

According to this result, we aim to test the following hypothesis: Do individuals with an income-health ratio greater than one oppose state provided health insurance and does this behavior go along with a lower preference for redistribution?

4 Empirical Strategy

4.1 Conceptional Framework

While the income-health indicator is rather straight forward to calculate, the component which is supposed to capture the preference for public or private provision of insurance is not as easy to define. The question should not refer to a particular existing private or public insurance, as personal experiences or other confounding factors which are of no concern for the question at hand might influence the results. At the same time the redistributive aspect that is implicitly inherent in a public insurance coverage should be clear to the participants. In total we use three approaches to test if the proposed relationship between income, risk of illness and preferences for type of health insurance coverage and the implicit levels of redistribution holds.

The first one tries to bear a rather close resemblance to the microeconomic model. The approach uses a typical survey question which allows participants to voice their opinion on a specific topic. The respondents are asked if they thought that health insurance should provide optimal coverage for their individual risk of illness or if health insurance should rather provide an equal basic coverage for everybody. Rather than using the connoted terms private and public the question tries to capture the essence of both types. The degree of redistribution is only implicitly built into the question. As outlined in more detail in section 4.3, a standard probit approach is applied to test the relationship between this variable and the income-health indicator.

The second approach is very similar to the first one. In this case the individuals were asked if they thought that the government should spend much more, a little bit more, just the same, a little bit less or much less for the sick. This puts the focus on the redistributive component. Referring to the microeconomic model this question is used as a proxy if the individual would rather favor public or private health insurance coverage. This is plausible as according to the

theory it is only the implicit redistribution inherent in a public insurance system which makes it appealing to individuals with an income-health indicator of less than one.

However, there is doubt that any of the two questions can provide valid results. Respondents tend to be more generous in granting subsidies to others as long as they do not have to bear the burden of financing it. And as long as there is no limited budget that they have to allocate to different groups of beneficiaries – e.g. the sick vs. the poor vs. the unemployed – they are not forced to prioritize between competing interests. Neither a budget constraint nor such trade-offs can be captured by such straight forward survey questions.

For this reason the third approach tries to mitigate these concerns by using a study design which forces respondents in a quasi-experimental setting to make choices between different scenarios. These scenarios are presented in the context of a discrete choice experiment (DCE). While typical survey questions are limited to decisions on separate topics, DCEs in the contrary offer the possibility to model a simultaneous choice of social benefits and their respective contributions. DCEs are frequently used in market research to evaluate consumers' preferences regarding characteristics of a specific good or product. In our context – as we will elaborate in more detail later on – the good is a redistribution scheme with the sick as one potential group of beneficiaries.

The DCE method is based on a characteristics approach which has its theoretical underpinning in the new demand theory of Lancaster (1966). Individuals taking part in a DCE have to decide for one out of two (or sometimes more) alternatives. Each alternative, i.e. each good, encompasses the relevant attributes – i.e. the characteristics defining the good – as well as the desired attribute levels – i.e. the quantity of each attribute – that affect the utility of the consumer (see Louviere and Street 2000, p. 2). The definition of the alternatives presented to the respondent is crucial, as it allows implementing trade-offs, i.e. an alternative can only have a higher level of a specific attribute on the expense of one or some other attributes. Furthermore, including the price as one attribute imposes the budget constraint.

A utility maximizing individual will always choose the alternative with the highest utility. Thus, an individual will only choose a given alternative l if the utility derived from this alternative exceeds the utility derived from another alternative j (see Ben-Akiva and Lermann 1985, p. 57; Louviere and Street 2000, p. 62).

$$V_{il} > V_{ij} \quad \Leftrightarrow \quad v_l(p_l, b_l, y_i, s_i) > v_j(p_j, b_j, y_i, s_i) \qquad \forall\, j \neq l. \tag{4.1}$$

with the indirect utility function of individual i, v_i. The utility function consists of the price of the respective alternative p_l, the attributes b_l, the individual's income y_i and his socio-demographic characteristics s_i.

In the course of the experiment, each respondent has to make repeated choices between the status quo and varying alternatives, which allows estimating the individual indifference curve. In this context it is very important that the individual is driven to "jump forth and back" between the different alternatives indicating a higher or lower utility level (see Zweifel et al. 2010, p. 4). As the estimated parameters of the indirect utility function reflect the marginal

utilities of the respective attributes, the $MRS_{n,m}$ is given by (see Lancsar et al. 2007, p. 1741):[7]

$$MRS_{b_n}^{b_m} = -\frac{\partial v_l(p_l, b_l, y_i, s_i)/\partial b_m}{\partial v_l(p_l, b_l, y_i, s_i)/\partial b_n} = -\frac{\hat{\delta}_{b_m}}{\hat{\delta}_{b_n}}. \tag{4.2}$$

Furthermore, if we substitute ∂b_n by the price attribute ∂p_l the *MRS* can be interpreted as marginal willingness-to-pay (MWTP).[8] That is the MWTP of individual *i* for an additional unit of b_n expressed in units of individuals' income. We will refer to this measure of preferences in section 5.

The observed choices of each individual during the experiment constitute the data basis for the following econometric analysis. As we cannot directly observe individuals' utility, we have to treat this utility as latent construct. Thus, the indirect utility function of individual *i* is extended by an error term ε_{il} which is due to the fact that there are clearly attributes or motives that cannot be observed but are nevertheless important for individuals' decision making. According to the Random Utility Theory (see McFadden 1974; 1981 and Manski 1977) the utility function is stochastic and additively split in a deterministic observable part $w_l(\cdot)$ and a stochastic component ε_{il}:

$$V_{il} > V_{ij} \Leftrightarrow w_l(p_l, b_l, y_i, s_i) + \varepsilon_{il} > w_j(p_j, b_j, y_i, s_i) + \varepsilon_{ij} \qquad \forall\, j \neq l. \tag{4.3}$$

Therefore, we can only estimate the probability P_{il} of individual *i* choosing alternative *l* rather than *j* (see Louviere and Street 2000, p. 53).

4.2 Implementation and Survey Design

As redistribution is no typical consumer good and respondents have to make hypothetical decisions about a rather abstract concept, the design of the DCE requires special attention. In this case, the underlying experimental design was carefully developed according to the procedure presented in Bateman et al. (2002, p. 258). As only those attributes affecting the utility of individuals and having an impact on decision making should be considered, we identified a set of ten attributes. Altogether, we define personal tax and social insurance contributions, the amount of redistribution as percentage of the GDP, the socio-demographic status of beneficiaries (sick persons and persons in need of care, families with children, retirees, unemployed, working poor) as well as the nationality of recipients (German, West-European, other) as relevant attributes. These are grouped together in four diagrams that make the substitutive character and the inherent trade-offs explicit (see appendix, figure A.1).

[7] In this case a linear utility function is assumed. If we consider a nonlinear utility function the calculation is straightforward.

[8] The price parameter can be interpreted as the marginal utility of income with the help of Roy's Identity. For a formal proof see Hanemann (1983, p. 544) or Telser (2002, p. 56).

Table 1: Attributes, Lables and Levels

Attribute	Lable	Level				
				Status quo		
Personal tax and social insurance contributions						
Tax and contribution	TC	15 %	25 %	**30 %**	35 %	45 %
Total amount of redistribution as percentage of GDP						
Redistribution	RE	20 %	25 %	**30 %**	35 %	45 %
Socio-demographic status of beneficiaries						
Retirees	RI		30 %	**40 %**	45 %	
Sick persons and persons in need of care	SP		30 %	**35 %**	40 %	
Unemployed	UL		5 %	**10 %**	15 %	
Families with children	FC		5 %	**10 %**	15 %	20 %
Working poor	WP			**5 %**	10 %	
Nationality of recipients						
German	DE	75 %	80 %	**85 %**	90 %	
West-European	WE			**5 %**	10 %	
other	OT		5 %	**10 %**	15 %	

Source: Own calculation and visualization (see Pfarr 2013).

In a second step, the levels of the attributes were defined. They should be sufficiently wide to make respondents indeed "jump" between the status quo and an alternative redistributive scheme. That is, respondents should be forced to overcome trade-offs (cf. Bateman et al. 2002, p. 260; Telser 2002, p. 39). Table 1 represents the attributes and their respective levels defined.

In the next steps, the design and the visual presentation of the DCE had to be considered. The complete factorial design – containing all possible combinations of attributes and their levels – results in a total of 129,600 combinations (alternatives). By using the program *gosset* to apply a D-optimal design (see Kanninen 2002, Kuhfeld et al. 1994, Kuhfeld 2006)[9], we were able to restrict the number of alternatives to 49 and split these into seven groups.[10] Each respondent was confronted with only one of these groups. To control for errors in decision making, one alternative was included twice in each of the seven groups, resulting in 8 binary choices per respondent.

Further, for unbiased estimates it is necessary to ensure that all individuals have similar knowledge about the current status quo and that they do not underlie a misperception about the true state. Therefore, respondents were provided with a detailed instruction and description of the choice process as well as the attributes and their possible realizations.[11] Finally, the choice experiment is complemented by a socio-demographic questionnaire covering the relevant individual characteristics to test the proposed relationship between income, risk of illness and preferences for redistribution.

[9] While the D-optimality was primarily developed for linear estimation models, Carson et al. (1994) suggest that the application for non-linear models such as probit or logit is also possible.
[10] Bech et al. (2011) show that the cognitive burden increases in the number of choice sets. Nevertheless, exposing respondents up to 17 choice-sets is manageable and respondents can handle it without problems.
[11] This information is available upon request.

The choice experiment as well as the survey was conducted by computer assisted personal interviews in February 2012 with a total of 1,538 representatively selected individuals in Germany.

4.3 Econometric Specification

In the first part of the empirical analysis, we abstain from using the DCE and apply simple probit models to estimate the likelihood that an individual opts for private health insurance. In the second part, the DCE is used to calculate MWTP for redistribution in favor of the sick. As only the probability P_{il} of individual *i* choosing alternative *l* rather than *j* can be estimated, the estimation equation is:

$$\begin{aligned} P_{il}(l \mid C_m) &= \Pr[\varepsilon_{ij} - \varepsilon_{il} < w_l(\bullet) - w_j(\bullet)] \;\; \forall \; \mathrm{l,j} \in \mathrm{C}_m; \forall \; j \neq l \\ &= \int_{\varphi_{il}} [\varepsilon_{ij} - \varepsilon_{il} \leq w_l(p_l, b_l, y_i, s_i) - w_j(p_j, b_j, y_i, s_i)] \phi(\varphi_{il}) d\varphi_{il}. \end{aligned} \tag{4.4}$$

with $\varphi_{il} = \varepsilon_{ij} - \varepsilon_{il}$.

Therefore the probability is equal to the probability that differences between the error terms ($\varepsilon_{ij} - \varepsilon_{il}$) are dominated by differences in the deterministic component ($w_l(\cdot) - w_j(\cdot)$) (see Louviere and Street 2000, p. 40; Train 2009, p. 15). In line with the central limit theorem it can be assumed, that the error terms of eq. (4.4) are normally distributed with a mean vector of zero and covariance matrix Ù (Cameron and Trivedi 2008, pp. 947–951; Train 2009, p. 97). Under these assumptions $\phi(\cdot)$ denotes the pdf of a standard normal distribution, i.e. a binary probit model. Since each respondent makes 8 decisions, panel techniques are applied. This results in a random effects probit model with its traditional assumptions regarding the mean, variance and correlation of the random effect and the conventional error term.

The deterministic component of the utility function is typically modeled as an additive-linear specification (see Ben-Akiva and Lermann 1985, p. 63; Johnson and Desvousges 1997, p. 83). Pekelman and Sen (1979) as well as Gegax and Stanley (1997) present evidence that a quadratic specification is better than a linear form of the utility function with regard to the predictive power. Several specification tests and procedures have pointed to the model presented below to be the best with respect to goodness of fit. The current analysis aims to investigate individuals' preferences for redistribution in favor of the sick. Thus, the interaction between the attribute *redistribution* and the attributes of the *socio-demographic status of beneficiaries* has to be taken into account. The attribute RE has been interacted with each of the attributes of the *socio-demographic status of beneficiaries* to express MWTP in favor of the sick. For example:

$$\widetilde{SP} = SP * RE \tag{4.5}$$

The estimation equation further includes a quadratic term for the attributes *tax and contribution*, *retiree, working poor* and *other* therefore leading to a nonlinearity of the indirect utility function.

According to eq. (4.4), only utility differences in the deterministic component exhibit a relevance for individual's decision making. Therefore, individuals' socio-demographic characteristics will drop out as they do not vary between the decisions. To incorporate these factors and to allow testing the hypothesis described in section 2, interactions of individuals invariant

characteristics with the varying attributes are needed (see Boxall and Adamowicz 2002, p. 421; Johnson and Desvousges 1997, p. 83). Thus, the estimation equation is as follows:

$$\Delta V_{ilj} = \Pr_i[decision_{il} = 1 \mid C_m] = \alpha_0 + \delta_p \Delta p + \delta_{pp} \Delta p^2 + \sum_{k=1}^{K} [\delta_k \Delta b_k + \delta_{\vartheta}(\Delta b_k * s_i)] + \sum_{k=1}^{K} [\delta_{kk} \Delta b_k^2 + \delta_{\vartheta\vartheta}(\Delta b_k^2 * s_i)] + \varphi_{il} \tag{4.6}$$

with $\varphi_{il} = \varepsilon_{ij} - \varepsilon_{il}; \alpha_0 = \alpha_{0l} - \alpha_{0j}$.

Where δ's reflect the parameters to be estimated, p stands for the price attribute, i.e. *tax and contribution* and b_k is a vector of the remaining attributes. Individual's characteristics are covered by the vector s_i. This vector consists of the proxy for individuals' income-health ratio.

5 Empirical Analysis

5.1 Data

For the following analysis, we use data from a representative cross-section survey of 1,538 German individuals conducted in February 2012.[12] The implications of the theoretical model in section 3 are investigated by three approaches. In all three models, an indicator for individuals' income-health ratio is regressed on a dependent binary variable. Within the first, we use a binary variable reflecting the *insurance objective*. That is, whether the individual agrees to the statement that health insurance should provide optimal coverage for the personal risk of illness (=1) or if health insurance should guarantee an equal basic coverage for everybody (=0). The second approach maps individuals' income-health ratio to the extent of *public spending* for the sick. This binary variable equals one, if the individual exhibits the attitude that the government should spend much or a little bit more money for the sick. Finally, the third approach analyses the effect of individuals' income-health ratio within the framework of a DCE. In this case, the dependent variable covers individuals' decision for a specific alternative, as described above. Whereas the explanatory variables are the same for the first two approaches, the DCE consists of the attributes mentioned in section 4.2. A full description of the explanatory variables is presented in Table 2.

As outlined in section 3, individuals' income-health ratio consists of two components. The numerator represents the ratio between individuals' market income and the average market income of the population. The denominator covers the ratio between individuals' risk of illness and the average risk of illness within the society. We apply two versions of this indicator labeled *Income-health indicator F* an *Income-health indicator I*. While the character *F* indicates a family perspective, character *I* concentrates on individuals. Accordingly, both indicators differ with respect to the underlying variables. For the family version of the indicator, equivalent household net income enters the numerator. The risk of illness in the denominator results from the answer to the question, whether the respondent expects that somebody from his family falls severely ill within the next two years. In contrast, the individual specific indicator is based on an individual's gross income and self-assessed health status (*SAH)*.[13] These

[12] For more detail about the survey design pleases refer to Pfarr (2013).

[13] The variables used to calculate the two versions of the indicator are listed in Table 2 under the heading "basis variables".

income-health ratios are transformed into two binary variables. For both specifications, the income-health indicator equals one if the ratio is larger than one and zero otherwise.

A set of twelve socioeconomic variables are included in the first two models. In addition to the age and the gender of a respondent, the variables cover educational level, the number of children as well as the nationality.

Table 2: Variable description

variable name	label
Dependent Variables	
Insurance objective	1 = Health insurance should provide optimal coverage for my personal risk of illness 0 = Health insurance should guarantee an equal basic coverage for everybody
Public spending	Should the government spend less or more money for the sick? 1 = much or a little bit more 0 = leave it as it is, a little bit or much less
Income-health indicator F	1 = the ratio on the basis of the relative HH income and the relative ROI is larger than one
Income-health indicator I	1 = the ratio on the basis of the relative individual income and the relative SAH is larger than one
Basis variables	
HH income	Equivalent household net income in Euros
Individual income	Gross personal income in Euros (wages or pensions)
ROI	Risk of illness: How likely is it that somebody from your family falls severely ill within the next two years? 1 = very unlikely to 5 = very likely
SAH	Would you say that your health status is 1 = very good 2 = good 3 = ok 4 = bad 5 = very bad
Socioeconomic variables	
Age	Age in years
Age squared	Age in years squared
Female	1 = Female
Elementary school	1 = Highest level of education / degree is elementary school
Secondary school	1 = Highest level of education / degree is secondary school
Vocational training	1 = Highest level of education / degree is vocational training
A-Levels	1 = Highest level of education / degree is A-Levels
University degree	1 = Highest level of education / degree is a university degree
One child	1 = One child
Two or three children	1 = Two or three children
Four or more children	1 = Four or more children
German nationality	1 = German nationality

Source: Own visualization.

The summary statistics are presented in Table 3. Overall, the dataset consists of 1,538 individuals apart from the estimations that include the two income variables *HH income* and *Individual income*. These variables are typically prone to missing values; however the share of missing values is – compared to other surveys – relatively small within this dataset (see Essig and Winter 2009). Apart from the variables *age* and *age squared*, all other independent variables are binary. Regarding the dependent variable of the first model, *insurance objective*, 55 % of the respondents agree with the statement, that health insurance should provide optimal coverage for the personal risk of illness. That is, a majority of German citizens is inclined to vote for a private health insurance. Regarding our second dependent variable *public spending*, more than 70 % of the respondents think, that the government should spend much or a little bit more money for the sick. This figure provides an initial hint, that German citizens exhibit a strong preference for redistribution in favor of the sick. It's interesting to see that the mean as well as the standard deviation of both versions of the income-health indicator are equal. Thus, for 44 % of the respondents the respective indicator takes on the value one. From a public choice perspective this figure indicates that public health insurance would be the choice of a majority of German citizens as long as the median voter is decisive.

With a closer look at the variables used to calculate the two indicators we also see a right-skewed distribution of household income and individual income.

Table 3: Descriptive Statistics

	N	*Mean*	*Median*	*SD*
Dependent Variables				
Insurance objective	1538	0.55	1.00	0.50
Public spending	1513	0.72	1.00	0.42
Income-health indicator F	1306	0.44	0.00	0.50
Income-health indicator I	1373	0.44	0.00	0.50
Basis variables				
HH income	1306	1731.40	1590.99	967.82
Individual income	1373	1775.21	1500.00	1869.68
ROI	1538	2.74	3.00	0.96
SAH	1538	2.24	2.00	0.84
Socioeconomic variables				
Age	1538	49.55	50.00	16.52
Age squared	1538	2727.72	2500.00	1657.33
Female	1538	0.51	1.00	0.50
Elementary school	1538	0.22	0.00	0.42
Secondary school	1538	0.30	0.00	0.46
Vocational training	1538	0.21	0.00	0.40
A-Levels	1538	0.12	0.00	0.33
University degree	1538	0.14	0.00	0.35
One child	1538	0.24	0.00	0.43
Two or three children	1538	0.39	0.00	0.49
Four or more children	1538	0.03	0.00	0.17
German nationality	1538	0.97	1.00	0.16

Source: Own calculation.

5.2 Results

In the following we present the results for all three approaches. Table 4 provides the estimates for the dependent variable *insurance objective* which tries to bear a rather close resemblance to the microeconomic model. We use two specifications of the income-health indicator: the family perspective F and the individual perspective I. In both cases, the coefficient is positive and significant at the 5 % level. This means that – in line with the microeconomic model – individuals with an income-health ratio larger than one are more likely to favor an insurance system that offers optimal protection of the individuals' health risk. Following the logic of the model this is intuitive as these individuals are able to obtain private health insurance coverage more cheaply than the public one. They would be net payers within the redistribution system. We control for a number of socio-demographic variables, none of which does have a significant impact on the choice between public or private health insurance coverage.

Table 4: Results of the probit models for insurance objective

	Insurance objective		**Insurance objective**	
	Coeff.	$\|z\|$-value	Coeff.	$\|z\|$-value
Income-health indicator F	0.1595	2.19**		
Income-health indicator I			0.1896	2.51**
Age	-0.0095	-0.71	-0.0135	-1.04
Age squared	0.0001	0.94	0.0001	1.35
Female	-0.0643	-0.90	-0.0596	-0.83
Elementary school	0.3571	1.08	0.4625	1.44
Secondary school	0.3224	0.99	0.3659	1.15
Vocational training	0.2155	0.65	0.2354	0.73
A-Levels	0.3509	1.05	0.4069	1.26
University degree	0.0466	0.14	0.0962	0.29
One child	-0.0867	-0.87	-0.0919	-0.93
Two or three children	-0.1200	-1.26	-0.1043	-1.11
Four or more children	-0.2526	-1.22	-0.2218	-1.08
German nationality	-0.1875	-0.87	-0.1803	-0.84
Constant	0.2083	0.45	0.1937	0.43
LL Model		-889.07		-932.20
LR-Test		21.33**		26.07**
Mc Fadden's R^2		0.012		0.014
N	1,306		1,373	

*p<0.1, **p<0.05, ***p<0.01

Source: Own calculation.

The second approach makes the redistributive aspect explicit. Respondents were asked if the government should increase the spending for the ill. This is captured in the dependent binary variable *public spending*. The results of the probit models for both versions of the income-health indicator are presented in Table 5. Again, the results for the family perspective and the individual perspective are very similar. Seemingly in line with the prediction of the microeconomic model, both coefficients are negative and significant at the 1% and 5% level respectively. The negative sign indicates that people with a comparatively high relative income in relation to their relative risk of illness do not favor a higher degree of public spending in favor

for the sick. The intuition is that individuals for whom the indicator variable is one do not profit from the implicit redistribution inherent in public spending and therefore reject it.

Table 5: Results of the probit models for public spending

	Public spending		**Public spending**	
	Coeff.	$\|z\|$-value	Coeff.	$\|z\|$-value
Income-health indicator F	-0.2743	-3.50***		
Income-health indicator I			-0.2047	-2.533**
Age	-0.0002	-0.015	-0.0029	-0.206
Age squared	0.0001	0.418	0.0001	0.541
Female	0.1716	2.207**	0.1821	2.351**
Elementary school	-0.9282	-1.768*	-0.5612	-1.338
Secondary school	-0.8053	-1.539	-0.4698	-1.126
Vocational training	-0.7608	-1.449	-0.4233	-1.008
A-Levels	-0.7244	-1.371	-0.3605	-0.853
University degree	-0.7379	-1.393	-0.3985	-0.934
One child	-0.0413	-0.380	-0.0320	-0.303
Two or three children	-0.0592	-0.572	-0.0281	-0.278
Four or more children	0.2160	0.907	0.2661	1.124
German nationality	-0.7634	-2.437**	-0.5898	-2.075**
Constant	2.0758	3.123***	1.5864	2.823***
LL Model		-729.17		-775.47
LR-Test		37.85***		30.71***
Mc Fadden's R^2		0.025		0.019
N	1,290		1,353	

*p<0.1, **p<0.05, ***p<0.01

Source: Own calculation.

However, this interpretation – focusing only on the relative difference of the attitude towards redistribution between the two groups – disregards the *constant*, which is positive and highly significant. This means for the family perspective that if all predictors are evaluated at zero the predicted probability for a favorable attitude towards an increase in public spending in favor of the sick is extremely high at about 98 %. Setting the predictor German nationality equal one and all others equal to zero the predicted probability is still around 90 %. And if additionally the *income-health indicator F* is set one, the predicted probability is still around 85 %. The results for the individual perspective are very similar. Evaluating all predictors at zero the predicted probability is 94 %, setting German nationality equal to one 84 %. However, even with the *income-health indicator I* the predicted probability is still well over 78 %.

This means that strictly speaking the model has to be rejected, as it implies that individuals with an *income-health indicator* equal to one would oppose any redistributive aspect in the health insurance system.

Turning to the third approach one must be aware that the data is now not the result of a survey question which asks the respondents to voice their opinion. The data are the outcome of a DCE in which the respondents were forced to overcome trade-offs when allocating resources to different groups of potential beneficiaries. Furthermore, a price tag was added to the bene-

fits they granted. Similar to the second approach, the whole setup puts the redistributive aspect in the focus.

To allow for a meaningful interpretation of the results of the third approach, we have to convert the results into the MWTP. In this case, the MWTP – measured in percentage points of the individual's income – is calculated for an increase of one percentage point of the redistribution in favor of the sick. Surprisingly we find that no matter which of the two indicators is used both groups – individuals with an income-health indicator equal one and individuals with an income-health indicator equal zero – do have a positive MWTP for an increased level of public spending in the health insurance system (see table 6). Although at the first glance there seems to be a difference between the two estimates from the family perspective, tests indicate that these differences are not significant. Looking at the individual perspective, the estimates are basically identical for both groups.

Table 6: Marginal willingness-to-pay for redistribution

	Redistribution in favor of the sick	
	MWTP	MWTP
Income-health indicator F = 1	0.7682 ***	
Income-health indicator F = 0	0.3379 *	
Income-health indicator I = 1		0,4923 ***
Income-health indicator I = 0		0,4932 ***
N	10,448	10,984
LL	-5,982	-6,284

* $p<0.10$, ** $p<0.05$, *** $p<0.001$. Standard errors were calculated with the help of the delta-method.

Source: Own calculation.

The results of the third approach provide even less support of the microeconomic model than the results of the second approach. Now, not even a relative tendency can be identified.

6 Discussion and concluding remarks

Taken together, these results seem to be a little bit puzzling. While the first approach supports the microeconomic model, the second approach creates doubts and the third approach outright rejects the model. However, we do argue that the overall picture is consistent.

The first question did not focus on the redistributive component but rather on the type of health insurance coverage. One could rephrase the question and ask: Should the system allow customizing the coverage so that the individual risk is optimally covered? Individuals with an *income-health indicator* equal to one are significantly more inclined to favor optimal individual coverage. At the same time, this group of people is in favor of redistributive elements in the health insurance system and would even support an extension of this component. Thus, although this group would rather customize their insurance package and are not in favor of a one-size-fits-all basic coverage, to them redistributive elements are an integral part to any form of health insurance coverage.

The model is not able to capture the reasoning behind these attitudes and preferences and has to be extended. At this point we cannot say if ethical, altruistic or more complex self-interest driven factors are decisive and should be taken into account. This warrants further research.

But the results provide some more insights that might be interesting from a public choice perspective. Looking at the median voter one can see from the descriptive statistics that for the majority of people the *income-health indicator* equals zero. This means that for the majority of people a basic and equal health care coverage seems to be favorable. Furthermore, they would support a further extension of the redistributive elements. The latter seems to be a rather broad consensus across various subgroups. Looking at the results of the third approach – which is grounded in microeconomic theory, captures trade-offs and budget constraints – individuals with an *income-health indicator* equal to one do not have a lower MWTP – i.e. preference – for additional redistribution in favor of the sick.

There seem to be two core messages for policy makers. First, the health insurance coverage should be founded on strong principals of solidarity. There is a wide consensus in the society that redistributive elements are necessary. Second, there is also a large group who would prefer insurance coverage that is better tailored to their individual need. Thereby the principles of solidarity and redistribution are not questioned at all. Thus the goal of policy makers might be to build health care coverage that in its essence provides an equal basic coverage to everybody but allows for some flexible components to individualize the package according to the individual's needs. Another option could be what Pauly (2002, pp. 360–364) describes as means tested insurance: Individuals up to a certain income ceiling a required to become members of the social health insurance. The nonpoor people have to finance the redistributive component via taxes but are free to choose any form of insurance that they want. From a distributional perspective this leads to the same results as a social health insurance approach. At the same time the system can accommodate different preferences regarding the extent and type of insurance consumed by the nonpoor.

The investigation presented in this paper is subject to some limitations. First, only the effect of one specific factor was analyzed. Future research should also consider determinants such as risk aversion, altruism and culture. Second, survey data always refer to a point of time and cover the current economic and social situation in the country in which the survey was administered.

Based on a microeconomic model the aim of this paper is to test the relationship between income, risk of illness and preferences for insurance type and redistribution. Using three different approaches with slightly different perspectives on the same question we obtained various interesting results. First of all, the model in its current form has to be rejected. Even individuals for whom – according to the model – health insurance coverage with redistributive components is unfavorable do not reject this but are rather strongly in favor of redistributive components. This group even exhibits a positive MWTP to increase the current level of redistribution in favor of the sick. This result is however in line with the theoretical implications of Kifmann (2005), who predicts that a redistributive social health insurance might be supported by the majority of the population – i.e. also the very rich and healthy individuals – as long as insurance markets are incomplete and individuals are not able to buy insurance against premium risks. Nonetheless, this group does have a preference for health insurance coverage that fits better with the individual risk.

7 Literature

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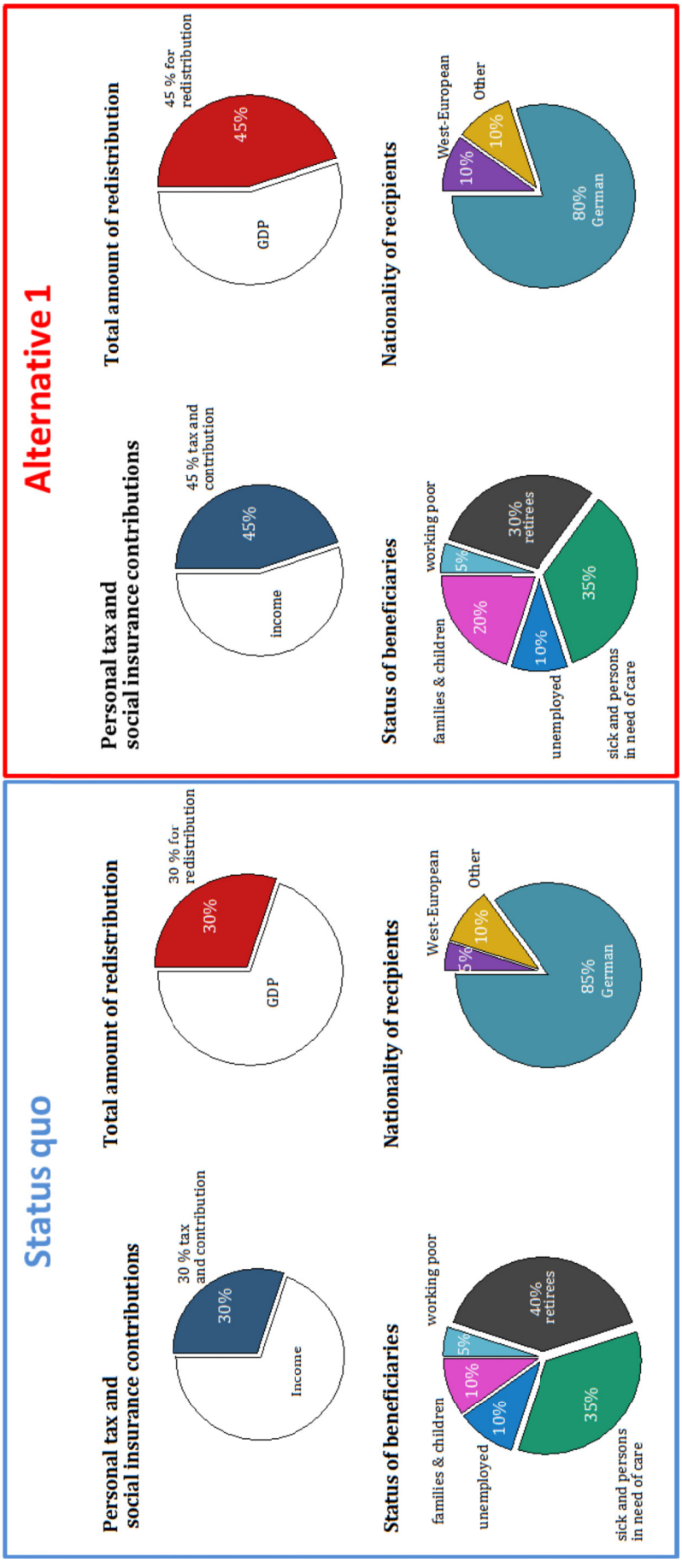
Appendix

Figure A.1: Example of a choice situation



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