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Premium levels and demand response in health insurance:

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Premium levels and demand response in health insurance: relative thinking and zero-price effects[1]

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Abstract

In health care systems with a competitive health insurance market, governments or other sponsors (e.g. employers) often subsidize premiums to encourage enrolment. These subsidies are typically independent of plan choice leaving the *absolute* premium differences in place so as not to distort consumer choice of plan. Such subsidies do, however, change the *relative* premium differences across plans, which, according to theories from behavioral economics, can affect choice. Consumers might be sensitive to differences *relative* to a reference premium ("relative thinking"). Furthermore, consumers might be particularly sensitive to a reference premium of zero ("zero-price effect"), a relevant range for some subsidized health insurance markets. This paper tests these ideas with two sources of evidence. We argue that observed equilibria in Germany and the U.S. Medicare Advantage markets are consistent with a powerful zero-price effects, resulting in an equilibrium focal pricing at zero. This contrasts with the Netherlands where equilibrium premiums are well above zero. In an empirical test using hypothetical questions in a web-based survey in these three countries, we also find evidence for both a relative thinking and a zero-price effect in the demand for health insurance. Our findings imply that well-designed subsidies can leverage relative thinking to increase demand elasticity for health plans. Creation of a powerful reference price (e.g., at zero), however, risks subverting price competition.

Key words: Health insurance; Health plan choice; Reference price; Reference dependence; Relative thinking; Zero-price effect

JEL classification: D91, H21, I13

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1. Introduction

Many countries organize health insurance markets according to the principles of regulated (or managed) competition in order to provide comprehensive and affordable health insurance to their population (Van de Ven et al. 2013).[2] Health plans compete on price, service and, depending on the country, some elements of plan quality, such as extra coverage or the breadth of the contracted provider network. Premiums are generally regulated (e.g., by requiring some form of community rating) to subsidize the sick as well as to protect consumers against reclassification risk. Public subsidies play an important role in managed competition policies, reducing the consumer-paid portion of premiums to ensure access to coverage.

Public subsidies in some regulated competition markets shrink the consumer premiums for health insurance by 50% or more. Indeed, in the world's two largest markets (in terms of spending) organized according to regulated competition, the Social Health Insurance system in Germany (from 2009-2014) and the Medicare Advantage program in the U.S., subsidies set independent of health plan choice reduce equilibrium premiums charged to consumers to around zero. Since Enthoven (1988), economists have argued that the subsidy should be fixed, i.e. independent of plan choice.[3] A fixed subsidy would not, the argument goes, interfere with consumers' relative valuation of plans or plans' incentives to compete on price. Recent research in behavioural economics questions this argument.

According to conventional price theory, consumer choice of plan depends on the absolute price differences between the available health plans, irrespective of the price level. If a plan is 100 euro less expensive than an alternative plan, the consumer should make the same choice (putting aside income effects) if that difference is between a 10 euro plan and a 110 euro plan, or between a 510 euro plan and a 610 euro plan. In practice, however, a fixed subsidy may not be neutral in its effect on plan subjective rankings and choices. The behavioral economics literature finds that consumers may also respond to relative prices (Tversky and Kahneman, 1981). If 10 euro is a consumer's reference price point for a health

[2] Some examples are Germany, Israel, the Netherlands and Switzerland. Examples in the US are the Marketplaces created by the Affordable Care Act and Medicare Advantage.

[3] Notice that fixed subsidies may vary per individual but not by plan choice. Most countries and health insurance markets set up as managed competition involve some form of risk adjustment of the premiums as part of plan payment. See Van de Ven and Ellis (2000) for general discussion of such systems.

plan 110 euro seems very expensive, whereas if 510 euro is a consumer's reference point, 610 euro may seem not so much more.[4] In this case, fixed subsidies will not be neutral. Furthermore, experiments find that a zero price is a particularly powerful reference point (Shampanier et al., 2007).

Research in health economics tests behavioural hypotheses about health plan choice.[5] Taylor et al. (2015) reviews research related to the complexity of products offered, limited health literacy and numeracy of the population, inadequate decision-support tools, and an excessive number of choices. As far as we know, the first paper to feature a "zero-price" effect in demand for a health plan was by Buchmueller and Feldstein (1997) who studied health plan choice among employees of a large employer in the U.S. moving to a fixed subsidy equal to the cost of the least expensive plan. They found that a zero price had special salience and acted as a reference price. A less than a 10 dollar increase in monthly premiums from a previous premium of zero caused roughly a five-fold increase in plan switching. A small-scale experiment among about 2,000 members of a Dutch internet panel checked for relative thinking. In return for a uniform premium discount, significantly more respondents were willing to switch to a less attractive health plan (in terms of provider network, coverage or claims payment process) at a relatively low than a relatively high premium level (Schut and Laske-Aldershof, 2001).

This paper adds two forms of evidence supporting reference-price behavior in the context of subsidized health insurance markets. We use the relative thinking-reference price framework to interpret equilibria in three important subsidized health insurance markets. We acknowledge that observing bunching in national patterns of pricing in the market data led us to seek an explanation, so showing that the national patterns are consistent with our hypotheses does not constitute an empirical test in a conventional sense. Nonetheless, we find it instructive to provide a theoretical framework with which to interpret the effect of fixed subsidies in these large health insurance markets. We propose that relative thinking and reference prices may affect health plan demand in two ways. First, they may affect the slope of the demand curve as lower reference prices may increase sensitivity to absolute price

[4] Income effects cannot be responsible for lower response to the same absolute differences at higher price levels; in fact they would work in the opposite direction. At a higher price level, consumers are poorer and should value a given price difference more, not less.

[5] A large literature in health economics studies the price elasticity of demand for health insurance, for recent reviews, see McGuire (2012) and Pendzialek et al. (2016).

differences. Second, reference-dependent demand may result in a kinked demand curve and lead to reference-point pricing in market equilibrium. Observed patterns of pricing are consistent with both effects in subsidized health insurance markets in Germany, U.S. Medicare Advantage, and the Netherlands, which differ both in the level and salience reference premiums. It appears that salient reference prices are powerfully influencing health plan premium setting and consumer choices, particularly in Germany and Medicare Advantage where zero reference-point prices play an important role.

Our second form of evidence is a conventional test, using responses to a web-based survey of approximately 3,600 respondents in the three countries in an experimental environment. We ask hypothetical questions about prices and health plan choice, and the responses confirm our hypotheses: absolute price differences matter more when price levels are lower, confirming the presence of relative thinking, and this effect is magnified around zero, confirming a zero-price effect.

Our paper is organized as follows. Section 2 briefly reviews some of the evidence for reference price effects in the general literature and introduces the key concepts of reference dependence, relative thinking and the zero-price effect. Section 2 also discusses the potential impact on price variation, competition, and consumer utility. Section 3 interprets patterns of plan pricing and studies of demand response in three of the largest markets organized along principles of regulated competition: the social health insurance system in Germany, the national health insurance scheme in the Netherlands, and in the Medicare Advantage sector in the U.S. Section 4 reports the results of a web-based survey of 1,200 consumers in each of the three countries. Section 5 returns to the three health plan markets introduced earlier and considers how reframing of premiums might improve market functioning. Our findings imply that policymakers have an additional instrument to influence choice behavior by consumers, and as a result, premium setting by health plans. A sponsor can influence price elasticity of demand for health plans by how premiums are framed for consumers. This no-budget-cost regulatory tool may be useful in markets for health plans where greater consumer demand response to price is needed to effectively discipline insurer pricing.

2. Relative Thinking and a Zero-Price Effect

2.1. Relative thinking and zero-price effect: empirical evidence

Consumers may behave differently according to how prices are framed (Thaler 1980). Tversky and Kahneman (1981) were among the first to show that consumers are affected by relative price differences when only absolute prices should matter, an effect labelled by Azar (2007, 2014) as "relative thinking." In a well-known example, Tversky and Kahneman (1981) find that 68% of the respondents in an experiment were willing to make a trip to another store (located 20 minutes away) to save $5 on a $15 calculator, but only 29% were willing to make the trip for the same $5 savings when the calculator's price was $125. The theoretical foundations of relative thinking can be traced to the Weber–Fechner law, which states that people respond to changes in physical stimuli by comparing it to an original value (Thaler 1980, Saini and Thota 2010). Furthermore, empirical results on consumer choice support the generalizations that consumers use reference prices in making brand choices and rely on past prices as part of the reference price formation process (Kalyanaram and Winer, 1995).

Grewal and Marmorstein (1994) propose that the psychological utility consumers derive from saving a certain amount is inversely related to the good's original price. Bartels (2006) shows that people may even maximize relative savings at the expense of absolute savings. Saini and Thota (2010) find that relative thinking plays a more important role in decision making if the cognitive load for consumers is higher, if the purchase involves affect-rich (emotions-based) products, and if consumers have a stronger individual level preference for intuitive decision-making. Azar (2011a; 2011b) also finds that both relative and absolute differences matter and the proportion of relative versus absolute thinking depends upon the specific circumstance. Several other studies have replicated these findings in various experimental settings (for a brief review, see Azar (2014)).

Relative thinking appears to be particularly powerful when the reference point is a "zero price" (see Shampanier et al. (2007) for review). In a series of experiments Shampanier et al. (2007) show that a price reduction from a small positive price to a zero price boosts demand for the free product. They argue that a zero price conveys some benefit in itself; a move away from zero to a positive price may not only result in a loss of utility because of the absolute price increase but also in a loss of utility because of having to give up a free product. The

"zero-price" effect is observed in other contexts. Nicolau and Sellers (2011) study choice of breakfasts when a preferred option is priced higher than a less-preferred alternative. When absolute differences are the same but the cheaper option is free, demand for it increases. Hossain and Saini (2015) replicate methods of Shampanier et al. (2007) and find the "zero-price bounce" is enhanced for hedonic products (for fun and feelings) and subdued for utilitarian products (for functional benefits).[6]

The zero-price effect could be thought of simply as an extension of relative thinking – the ratio of any positive price to zero is infinity. Given the special interest in a zero price for health insurance, we will continue to refer to and later test for a zero-price effect within the broader framework of relative thinking.

2.2. Reference dependence, kinked demand and focal pricing

Another robust finding in behavioral economics, first proposed and documented by Kahneman and Tversky (1979), is reference dependence, i.e. the asymmetry in reaction to payoffs above versus below a benchmark or focal payoff level due to loss aversion (Kőszegi and Rabin 2006, Terzi et al. 2016). Heidhues and Kőszegi (2008) show that reference dependence can explain focal and uniform pricing as the unique outcome even when firms face different cost structures. Because consumers may be especially averse to paying a price exceeding their reference price, the price responsiveness of demand is greater for prices above the reference price than for prices below. Raising prices above the reference price is unattractive to firms because many consumers leave, whereas reducing prices below the reference price may not gain many customers. Hence, in an echo of the old theory explaining "sticky prices" in oligopoly, firms may face a demand curve kinked at the reference price.[7]

2.3. ***Health plan choice in case of relative thinking and fixed premium subsidies***

According to conventional theory, consumer choice between Plan A and B is governed by the net benefits of each option.The consumer chooses Plan A if and only if (1) holds :

$$U_A - U_B > P_A - P_B \quad , \tag{1}$$

[6] We expect health insurance to be in the latter category.
[7] The reference-dependence reason for a kinked demand is different than that in traditional models of kinked demand facing an olipopolist (Sweezy 1939), where the kink results from each firm believing that rivals will follow price decreases but not price increases.

where $U_{A,B}$ represents the benefits (utility) and $P_{A,B}$ the premiums of Plans A and B, respectively. A fixed subsidy (*S*) to premiums *P* reduces both P_A and P_B by *S* and therefore has no effect on their difference or on consumer choice.

The effect of a fixed subsidy differs in the presence of relative thinking. Following Azar (2007)[8] we modify equation (1) by including the possibility of relative thinking:

$$U_A - U_B > (P_A - P_B)\left(\frac{1}{RP}\right)^{\alpha}, \tag{2}$$

where *RP* is the consumer's reference premium, and α denotes the degree of relative thinking ($0 \leq \alpha \leq 1$). If $\alpha = 0$, there is no relative thinking and we obtain equation (1), whereas if $\alpha = 1$, choice between A and B depends only on premiums relative to a reference premium. With relative thinking, the impact of premium differences is inversely related to the level of *RP*: for instance, a if the premium of plan A is 50 dollars higher than that of plan B this may matter a lot if the consumer has an *RP* of 100 dollars in mind, whereas it may not matter much in case of an *RP* of 1000 dollars.

A fixed premium subsidy *S* has no effect on the difference between P_A and P_B, but may affect the reference premium *RP* and thereby alter choices. For instance, suppose with $\alpha = 1$, the introduction of a premium subsidy results in a new reference price $RP_1 = RP - S$. If $P_A > P_B$, the relative premium difference between both plans becomes more pronounced because $(P_A - P_B)/RP_1 > (P_A - P_B)/RP$ (assuming $S < RP$). Thus, in contrast to conventional theory a fixed premium subsidy may affect consumer choice. Notice that if RP_1 approaches 0, the ratio of any positive price to RP_1 approaches infinity, which represents a zero-price effect.

2.4. Reference price formation

How references prices are determined is obviously consequential since the implications of relative thinking and reference dependence differ depending on the specification of the reference point (Kőszegi and Rabin 2007). Reference point formation appears to depend on the circumstances, such as the prices a buyer has faced in the past (Kalyanaram and Winer 1995, Kőszegi and Rabin 2006). Experimental research shows that consumers use different

[8] Alternatively, an additive model can be formulated, see Azar (2014).

reference prices, some consumers employ multiple reference prices, while others employ none (Terzi et al. 2016).

In health insurance markets reference price formation may also be influenced by the government (or another sponsor) by the way premiums are framed or by the level of the subsidy. For example, a government might announce an expected premium level. Clearly, reference dependence will have more power to affect market equilibrium if more consumers in a market share the same reference price.

2.5. Reference premiums and health plan mark-ups

Demand response checks a seller's ability to mark up price above costs. The potential impact of reference dependence on markups depends on the level of the reference premium in relation to the equilibrium premium and the strength of the relative thinking. This is illustrated by Figures 1 and 2 where we show the situation of a representative health plan with some market power.[9] In both figures, D_0 represents health plan demand in absence of relative thinking, in which case health plans charge the profit-maximizing premium P_0. In case of relative thinking and a clear-cut reference premium (RP) functioning as a focal price, reference dependence results in a kinked demand curve D_1. In this case a profit maximizing health plan would set its premium equal to the reference premium because at lower premiums its marginal revenue would drop below its marginal cost. At prices exceeding the reference premium this demand curve is more elastic than demand curve D_0, whereas D_1 is less elastic than D_0 at prices below the reference premium. The effect of relative thinking crucially depends on the level of the reference premium. If the reference premium is set below P_0, as illustrated in Figure 1, relative thinking results in a lower mark-

[9] We assume health plan competition between an equal number of symmetric profit maximizing health plans and a fixed total population for which insurance is mandatory and the benefits package is standardized. Hence, in equilibrium, health plan enrollment is equal for all health plans.

Figure 1. Reference dependence and relative thinking resulting in a lower mark-up

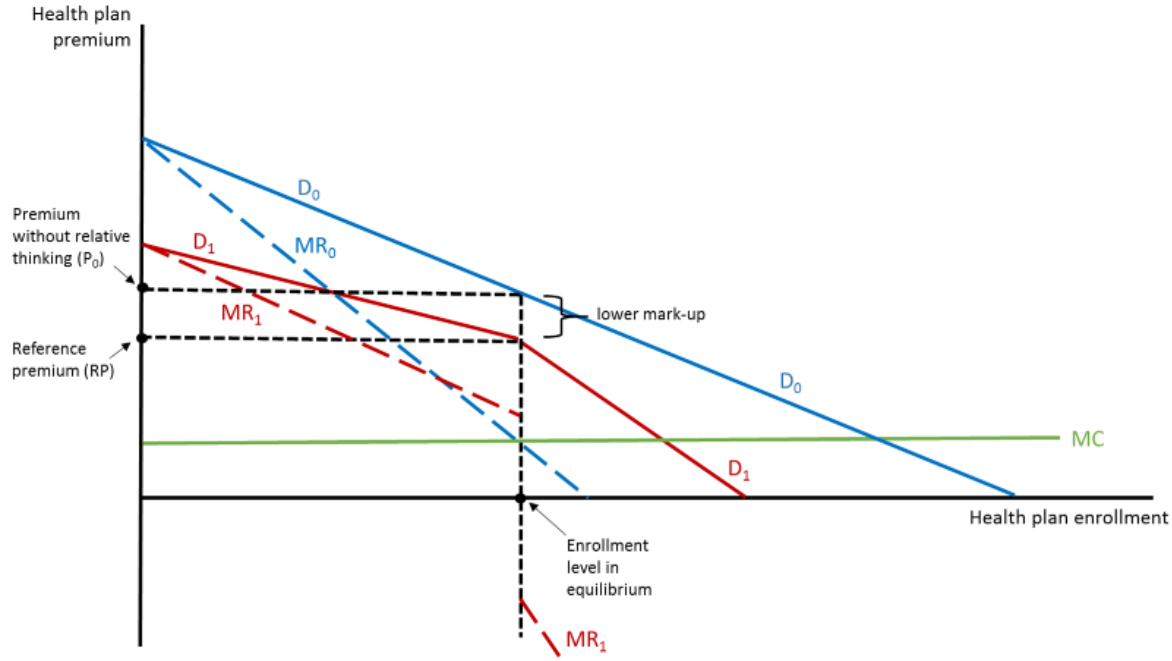
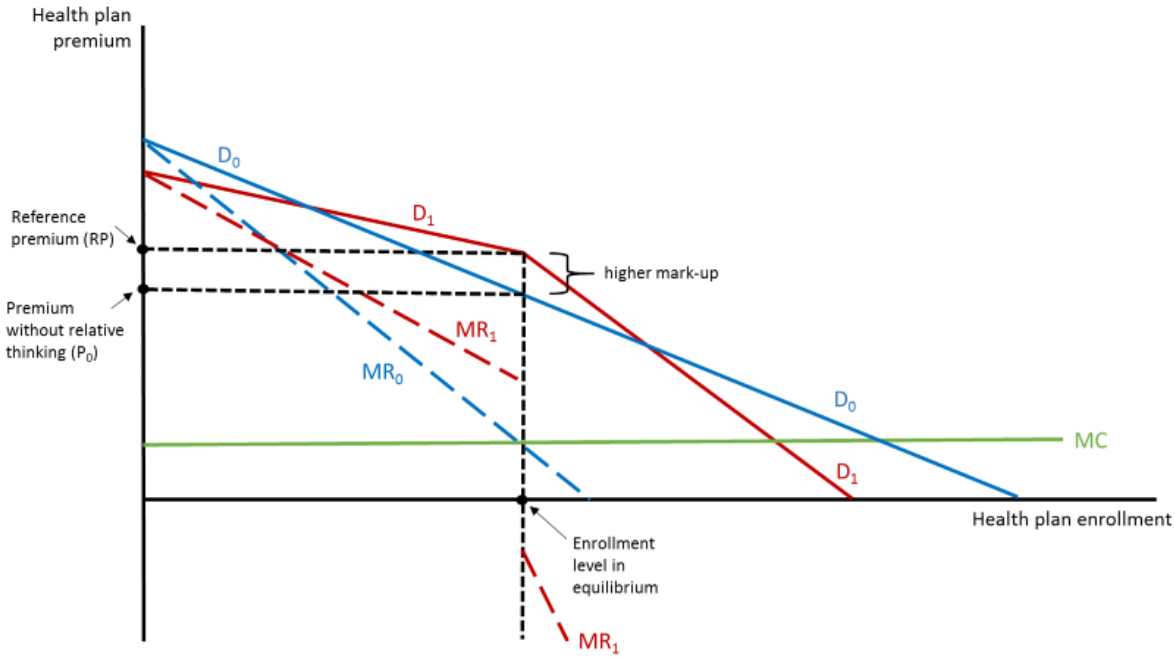


Figure 2. Reference dependence and relative thinking resulting in a higher mark-up



up, whereas the opposite situation is illustrated in Figure 2. Hence, relative thinking can be a double-edged sword. In the presence of imperfect competition, it might decrease markups if fixed premium subsidies result in focal premiums that are close to marginal costs, but might increase markups if it results in focal prices that substantially exceed marginal costs.

3. Evidence of reference dependence and focal pricing in three health insurance markets

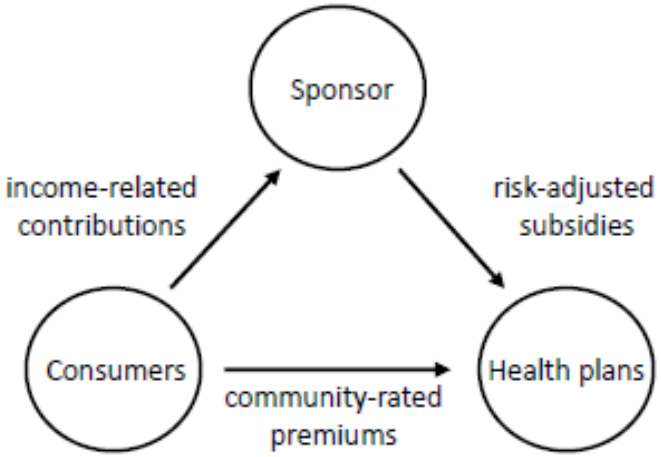
In this section we investigate the evidence for reference dependence and focal pricing in three health insurance markets. In each setting, fixed premium subsidies stipulated in government regulations have a large impact on equilibrium premiums and possibly consumer reference premiums. In two of these settings, the German Social Health Insurance system (from 2009-2014) and Medicare Advantage in the US, fixed premium subsidies are large enough to drive market prices to near or even below zero.[10] Hence, these settings offer an opportunity to check for a zero-price effect and its impact on health plan pricing. The German health insurance setting is particularly interesting because the premium structure (including the level of fixed premium subsidies) changed markedly twice over our period of review, shifting potential reference premium levels. The Dutch universal health insurance scheme serves as a useful contrast. In the Netherlands, risk-adjusted premium subsidies (per individual) equal the predicted expenses (per individual) minus 50 percent of the average predicted expenses. This implies that Dutch health insurers have to cover about 50 percent of the average predicted expenses by charging community-rated premiums to their enrollees, resulting in much higher equilibrium health plan premiums paid by consumers than in the US and German settings. Table A.1 in Appendix A summarizes some of the main features of the three health insurance markets.

In each of the three markets the government acting as a sponsor contributes or stipulates a risk-adjusted subsidy to competing health plans. These premium subsidies are risk-adjusted and in the case of Germany and the Netherlands fixed per enrolee so as to be independent of an enrolee's health plan choice. Medicare Advantage involves a bidding system that partially links the subsidy to plan's premium as we describe below. Health plans compete in a market

[10] We later describe the rebate mechanisms in Germany and Medicare Advantage. Consumers can only buy a quantity of one health plan and cannot resell the product, so retradability that would eliminate negative prices in many markets does not operate in the case of health insurance.

and choose the level of premiums they charge to enrolees. The general structure of health plan financing in the three markets is depicted in Figure 3.[11]

Figure 3. Two Sources of Financing for Health Plans



In all three markets, premiums are community-rated, meaning plans must charge the same premium to all enrolees. After a brief description of the premium structure in each country we consider two kinds of evidence bearing on relative thinking and a zero-price effect. Relative thinking implies that demand response to absolute premium differences depends inversely on the level of equilibrium premiums. Zero-price effects imply equilibria in this range will exhibit particularly strong focal point pricing.

3.1. The German Social Health Insurance system

The German Social Health Insurance (SHI) system, in place in roughly its current form since 1996 when switching health plans became a legal right, covers about 85 percent of the German population (Busse and Blümel, 2014, Schmitz and Ziebarth, 2017).[12] During this period, however, the premium structure was profoundly changed twice, impacting premium variation and health plan choice.

[11] For a review of health plan financing in these three sectors as well as 11 other sectors and countries see McGuire and Van Kleef (eds) (2018). Notice that this general structure of health plan financing also applies to other health insurance settings, such as the Swiss health insurance scheme, US employer-based health insurance (where employers are the sponsor), and the health insurance marketsplaces of the US Affordable Care Act (ACA).

[12] In the German social health insurance scheme family dependents, such as non-working spouses and children,do not have to pay a contribution.. Family dependants cannot switch independently but have to follow their paying family member .

We discuss the changes in premium structure for three consecutive time periods before and after the two reforms, and illustrate the impact of the reforms by three figures showing the premium distribution among German health plans in each period. The vertical axis will show the same 0-100 range in order to highlight the contrast in the distributions over time.

Income-related individual health plan premiums (1996-2008)

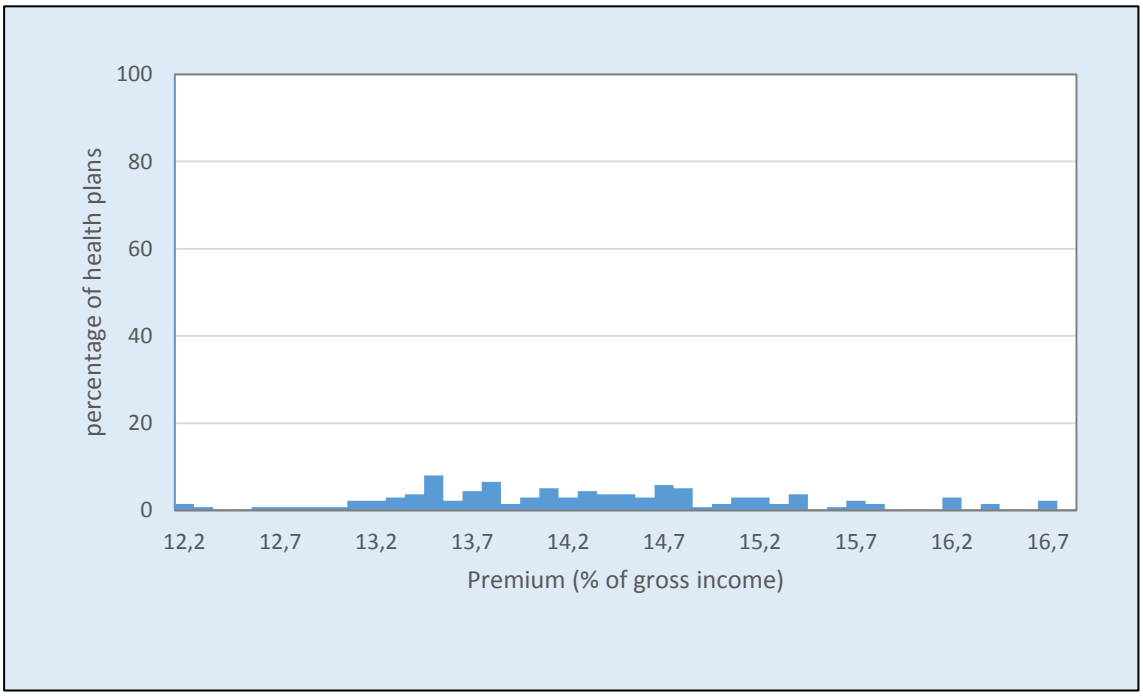
Until 2009 German health plans (known as sickness funds) were free to set an income-related contribution rate for covering all health and administrative expenses.[13] Health plans with a relatively high-risk population were compensated by health plans with a relatively low-risk population through a system of mandatory risk-adjusted subsidies across health plans.[14] Despite the largely standardized benefits package, contribution rates varied widely, from 12.2 to 16.7 percent of gross income (see Figure 4).[15] Despite the substantial variation in contribution rates, switching rates were modest (Tamm et al. 2007; Schmitz and Ziebarth 2017). As shown in Figure 4, in 2008 there was no specific contribution rate that may have functioned as an obvious shared reference point.

[13] Contribution rates were set by health plans as a percentage of gross income, up to a certain income threshold (43,200 euro in 2008). The first 0.9 percent of income had to be paid by the employee. The remaining contribution rate was split 50/50between the employee and their employer. .

[14] Notice that the general structure of health plan financing, as depicted in Figure 3, does not fit the German system prior to 2009. Income-related contributions were directly paid to health plans, and redistributed among health plans in the form of risk-adjusted (and partly income-adjusted) subsidies. Furthermore, people did not pay a community-rated premium in addition to the income-related contribution.

[15] Premium variation across health plans is quite similar to premium variation in terms of enrollment. The (unweighted) average contribution rate was 14.3 percent and the (unweighted) standard deviation 1.0 percent. For people with a minimum income (12,000 euro per year) the variation in contribution rates implied that premiums could vary by 270 euro per year, whereas for people with an income of 43,200 euro or higher premium could vary by almost 1,000 euro a year.

Figure 4. Premium distribution among German health plans, 2008



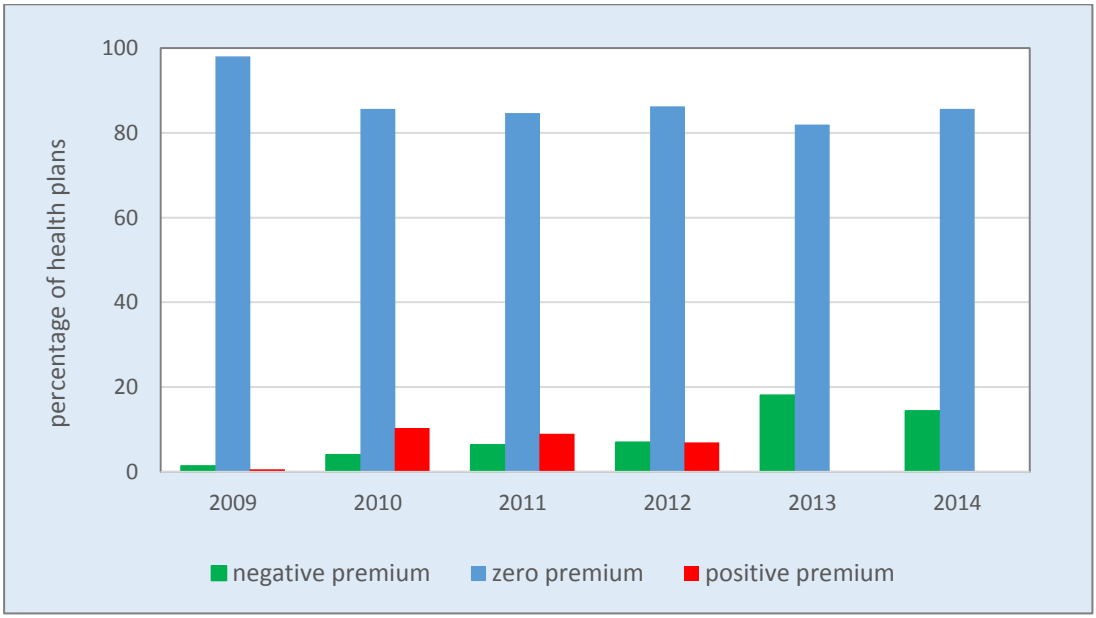
Source: Premium data of all German health plans with open enrollment derived from http://www.spiegel.de/wirtschaft/tabelle-so-koennten-sich-die-beitraege-der-krankenkassen-veraendern-a-527166.html

Focal pricing at zero premiums (2009-2014)

In 2009 the German premium structure was radically reformed to make premium differences between health plans more transparent and to enhance competition. The income-related contributions were no longer set by the individual health plans, but set at a uniform rate by the government, centrally collected in a Health Fund and then redistributed among health plans in the form of risk-adjusted capitation payments. The level of the risk-adjusted premium subsidies was set so as to cover 100 percent of insurers' expected costs on average (Deutsche Bundesbank 2014). Health plans were allowed to charge so-called "add-on" community-rated premiums. Furthermore, health plans were also allowed to offer a rebate or negative add-on premium (also community-rated). Given that on average all of health plans' expected costs were covered by the premium subsidies, the expected average add-on premium was around zero, but of course needn't be exactly zero for all plans. In 2009 and subsequent years, however, the vast majority (> 80%) of the health plans charged exactly zero premiums (see Figure 5). Hence, after the introduction of the new premium structure in 2009 the previously substantial premium variation across health plans almost completely vanished.[16]

[16] In addition to the introduction of the new premium structure, the risk adjustment scheme was extended to include direct measures of morbidity and a complete compensation of income differences. These changes may have contributed to the strong reduction of the premium variation in 2009.

Figure 5. Premium distribution among German health plans, 2009 - 2014



Sources: Own calculations based on premium data of all health plans (i.e. sickness funds with open enrollment, which reduced from 155 in 2009 to 98 in 2014), obtained from www.1a.net, www.krankenkassen.de, and www.der-zusatzbeitrag.de

For some health plans, however, a zero premium did not cover costs, and about 10 percent of all health plans started charging small positive premiums (mostly 8 euro per month) in 2010.[17] In spite of the fact that the resulting premium differences were much smaller than prior to 2009, the plans charging the small positive premiums experienced a huge outflow of enrollees (up to 40%), and in 2011 two of these health plans went bankrupt (Pendzialek et al. 2015). Comparing the demand response to premium differences before and after the 2009 reform showed a threefold increase in switching probabilities, while the demand elasticity quadrupled to about −4 (Pendzialek et al. 2015, Schmitz and Ziebarth 2017). Apparently, consumers became much more price sensitive in the range of premiums near zero, consistent with a powerful zero-price effect. Furthermore, before 2009 many health plans charged substantially lower contribution rates than the uniform rate set by the government in 2009.[18] Although

[17] According to the Deutsche Bundesbank (2014) the pressure on health plans to avoid positive premiums encouraged them to identify and realise cost-efficiency gains (including achieving scale effects through mergers).

[18] In 2008, about 75 percent of the health plans charged lower contribution rates than 14.9 percent (i.e. the uniform rate set by the government in 2009), and about 40 percent charges contribution rates lower than 14.0 percent (see: http://www.spiegel.de/wirtschaft/tabelle-so-koennten-sich-die-beitraege-der-krankenkassen-veraendern-a-527166.html).

these plans could have charged negative add-on premiums (i.e. offer rebates), very few did.[19] Hence, German health plans can be regarded as facing a kinked demand curve at a zero premium: very elastic above zero, and very inelastic below zero.

To prevent more health insurer bankruptcies, in 2011, the German government substantially raised the premium subsidies to health insurers by raising the income-related contribution rate from 14.9 to 15.5 percent. These higher premium subsidies turned out to be more than enough to cover costs, and rather than reducing premiums below zero health insurers accumulated substantial financial reserves (Deutsche Bundesbank 2014). As a result, in 2013, no German health plan charged a positive premium, and the proportion of health plans offering rebates (negative premiums) increased to 18 percent (see Figure 5). In view of the accumulation of financial reserves, however, the proportion of insurers offering rebates was small and the rebates were modest (varying between 30 and 125 euros per year).

Income-related add-on premiums (2015-present)

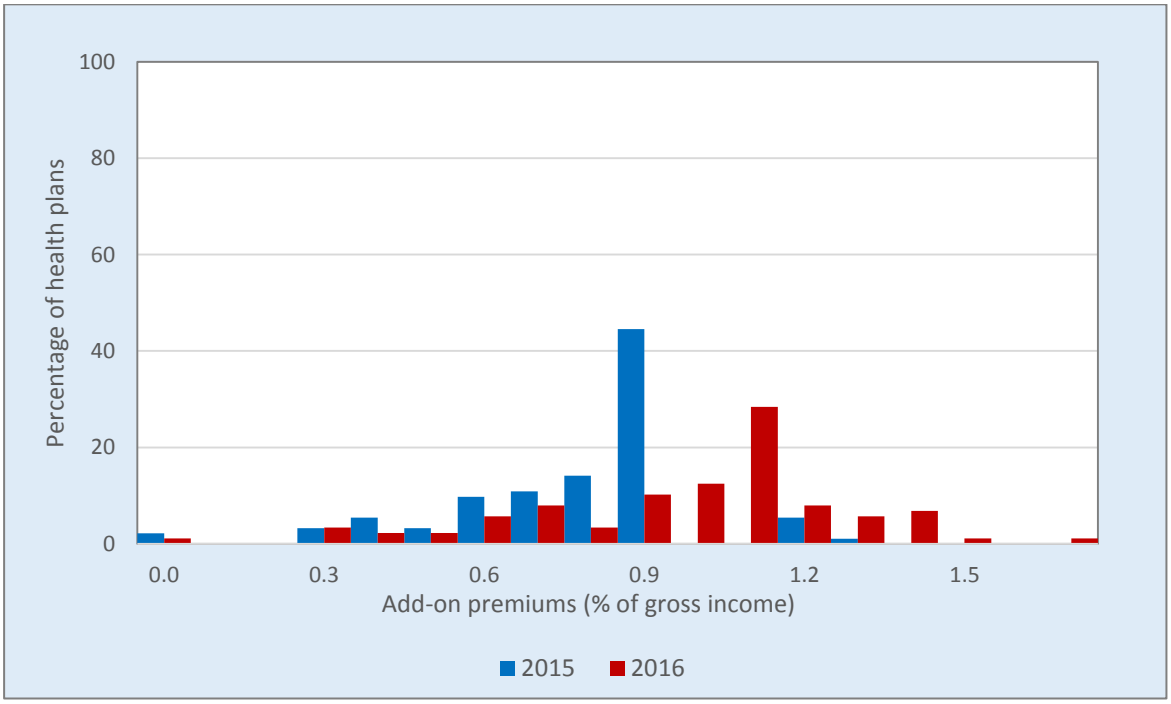
In 2015, the German government again reformed the premium structure. First, the German government lowered the income-related contributions (from 15.5 to 14.6%) resulting in proportionally lower fixed premium subsidies. Second, flat-rate add-on premiums were replaced by income-related add-on premiums. Hence, a zero premium in 2014 would be equivalent to an 0.9 income-related premium in 2015.[20] Each year the German Ministry of Health calculates and announces the average level of the add-on premium that should be sufficient to cover the expenses of an average health plan. Health plans are allowed to charge higher or lower add-on premiums. However, health plans charging a higher premium than the average level announced by the government, are legally required to notify their enrollees about this and to inform them about the opportunity to switch to a cheaper health plan.[21] Hence, the premium level announced by the government may now serve as the natural reference or focal price.

[19] Health plans charging a negative add-on premium were typically very small. For instance, in 2011 6.9 percent of all health plans charged a negative premium, but their joint market share in terms of enrollment was only 0.7 percent. (Calculations based on data obtained from: http://www.krankenkasseninfo.de/krankenkassen/geschaeftsberichte/).

[20] The reduction of the uniform income-related contribution rate by 0.9 percentage points was deducted from the employee share in the contribution rate.

[21] Section 175(4) Socialgesetzbuch V. In addition, since 2015 health plans that raise their contribution rates also have to inform their enrolees about their right to switch to another health plan. Moreover, they have to inform their enrolees about the average premium as announced by the government and have to provide an overview of the premiums of all other available health plans (see: https://www.gesundheitsstadt-berlin.de/durchschnittlicher-zusatzbeitrag-2015-bei-09-prozent-festgelegt-4847/).

Figure 6. Premium distribution among German health plans, 2015-2016



Source: own calculations based on premium data of all 92 (2015) and 88 (2016) health plans (i.e.sickness funds with open enrollment), obtained from www.1a.net, www.krankenkassen.de, and www.der-zusatzbeitrag.de

As shown in Figure 6, in 2015 most health plans indeed charged a contribution rate of 0.9 percent. Nevertheless, the bunching of health plans at this premium was substantially less than at the zero premium in 2014 (45 vs 85 percent of all health plans). Interestingly, the proportion of health plans charging less than the reference price is much higher in 2015 than in 2014 (i.e. 49 vs 14 percent), indicating that health insurers in 2014 indeed were reluctant to offer rebates. In 2016 price dispersion further increased and the bunching of health plans at the "average" premium level as designated by the government (1.1 percent contribution rate)[22] further reduced to 28 percent, suggesting that the announced premium level is becoming less widely perceived as a reference price.

In sum, by comparing the different ways premiums were structured over time we show that the way the German government structured premium subsidies may have had a profound impact on health plan price competition. Interpreting these impacts within our framework of relative thinking, two regulatory decisions were especially notable. First, setting premium subsidies leading to equilibrium prices around zero led to a powerful zero-price effect.

[22] See: https://www.bundesgesundheitsministerium.de/ministerium/meldungen/2015/gkv-zusatzbeitrag-2016.html

Second, requiring notifications to consumers if a health plan intends to deviate from the national norm created a reference premium.

3.2. Medicare Advantage (US)

Medicare Advantage (MA), an alternative to traditional Medicare (TM) for elderly and some disabled in the U.S., enrolls about 17 million beneficiaries, one-third of all beneficiaries. Medicare pays MA plans a risk-adjusted capitation payment for each enrollee normed on the average costs in Traditional Medicare (TM) from the enrollee's county. The formula determining the payment involves, in addition to risk adjustment, factors related to geography, adjustments for higher coding of severity in MA compared to TM, quality scores, and bids through which plans are supposed to declare the estimate of their costs for standard Medicare benefits for an average Medicare beneficiary (McGuire and Newhouse, 2018). The upshot of this set of regulations is that Medicare's payments to MA plans is roughly the average of costs in TM. MedPAC (2016, 329) estimates that for 2015 the average payment (including about 4% for quality bonuses) was 102% of TM average costs.

A subsidy equal to costs in TM is sufficient to finance a negative premium for most plans, since MA plans are, on average able to provide the same benefits as TM at lower cost (Newhouse and McGuire, 2014). When the Medicare subsidy exceeds the MA plan's bid, which is supposed to be a declaration of its costs, the plan must either increase benefits to beneficiaries (by, for example, reducing the demand-side cost sharing from that in TM) or reduce the premium charged to beneficiaries.

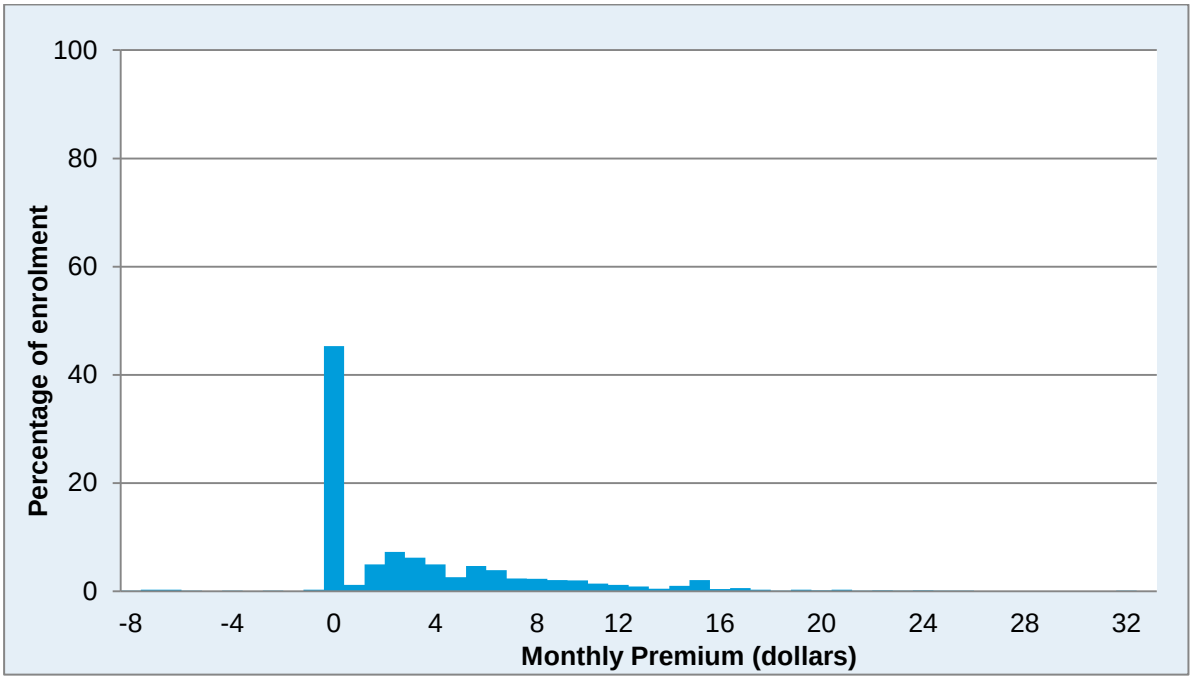
Medicare beneficiaries pay a premium to Medicare independent of their plan choice, referred to as the Part B premium.[23] For the large majority of beneficiaries who receive social security income payments, the Part B premium is deducted automatically from their monthly social security check. If they choose an MA plan, the beneficiary may also pay a premium to the plan, which could be positive, negative or zero. A positive monthly premium must be paid by check or charging a credit card,and is "seen" by the beneficiary in the same way as prices for other goods and services. A negative premium takes the form of the MA plan paying part of the Part B premium to Medicare on behalf of the beneficiary, typically, reducing the social

[23] The Part B premium is technically voluntary. Medicare beneficiaries are not required to enroll in Part B (covering physician and some other services) but the vast majority do enroll. The Part B premium only covers 25% or less of the Part B costs so it is a good value for most beneficiaires. Part A of Medicare (mostly hospital care) is automatic and free to the beneficiary.

security payment the beneficiary receives. In our terms, this framing reinforces a "zero-price" effect in MA. The salience of negative premiums referenced against this zero price may be lower than for positive premiums (Newhouse and McGuire, 2014).

When the Medicare subsidy exceeds their cost for providing standardized benefits, MA plans may also increase benefits in addition to reducing the premium below zero, and many plans do (Stockley et al., 2014). The lower salience of premium reductions below zero means that plans may stop passing on subsidies to consumers when they hit a zero premium, but continue to pass on some subsidies through benefit increases. The unequal salience may therefore distort the form of subsidy pass-through, tilting it towards enhanced benefits and away from a lower premium. Newhouse and McGuire (2014) find that in 2010 almost half of all beneficiaries were enrolled in plans that charge a zero premium, and very few were enrolled in plans that charge a negative premium. The pattern persisted for 2016 (Glazer and McGuire, 2016). Figure 7 shows bunching at zero for MA premium data for 2016.

Figure 7. Premium distribution among Medicare Advantage plans, 2016



Source: Authors' tablulations based on CMS 2016 Landscape, Enrollment and Benefit Files. Data includes MA-PD Local CCP plans (HMOs and PPOs) only and excludes SNPs and employer-sponsored group plans. Als excludes demonstrations, HCPPs. PACE plans, and plans for special populations.

A zero premium appears to act as a reference price in the MA plan market. Nothing in the underlying fundamentals of benefits and costs imply so many plans price exactly at zero if price should equal average cost.[24] A form of loss aversion may be playing a role. If relative to a zero premium people are more sensitive to losses (i.e. positive premiums) than to gains (i.e. negative premiums) demand will be less elastic for prices below zero than above zero.

3.3. The Dutch health insurance system

The Dutch health insurance scheme shares some features with MA in the US and SHI in Germany (Van de Ven and Schut 2008). However, an important difference is that premium subsidies to health insurers are much lower than in either of those systems. Risk-adjusted premium subsidies (per individual) equal the predicted expenses (per individual) minus 50 percent of the average predicted expenses. Health insurers must charge consumers a community-rated premium to cover the balance of costs (expenditure (about 100 euro per month). Although the Dutch government each year announces the expected average increase in health plan premiums for the mandatory basic benefits package, it does not – as in Germany – announce a specific premium level expected to be sufficient for the average health plan. No regulations require a health plan to notify its enrollees about the opportunities to switch to another health plan if its premium (increase) exceeds a certain level.[25]

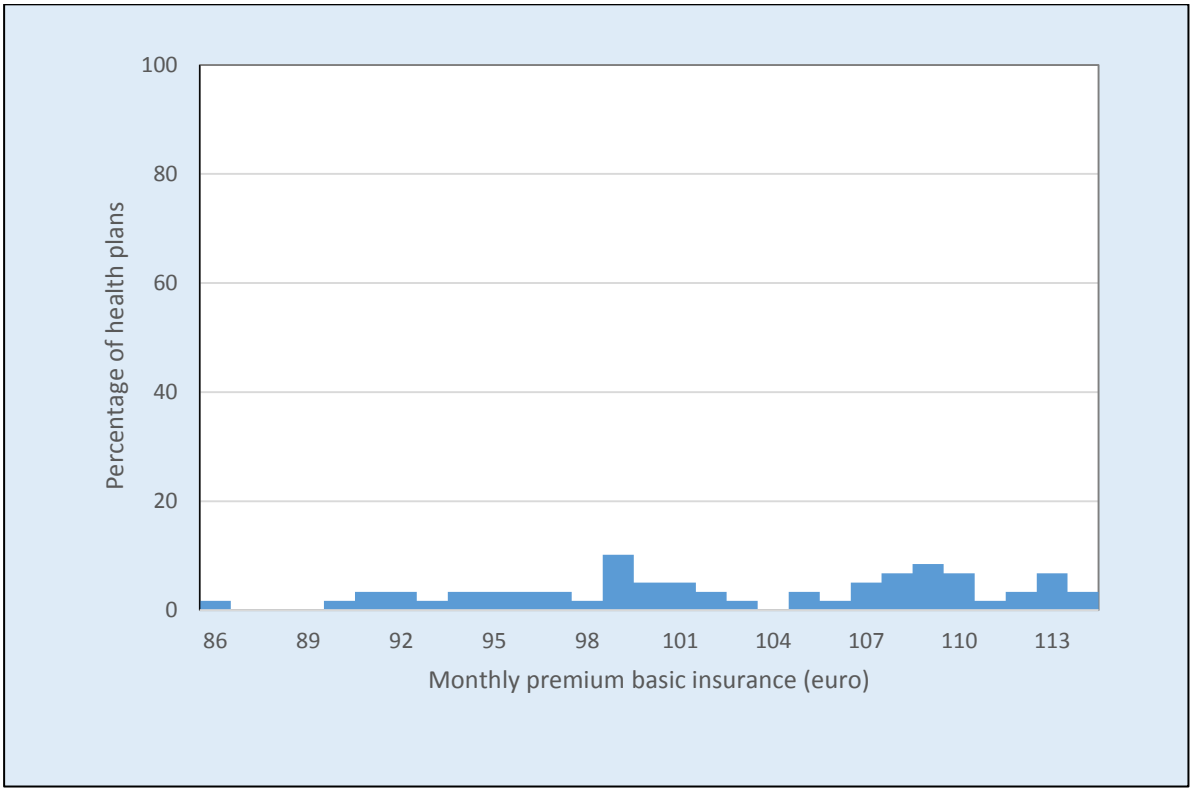
Figure 8 shows that in 2016 health plan premiums vary between 86 and 114 euro per month per person.[26] For purposes of comparison, we used the same scale on the vertical axis as in the US and German figures. In contrast to Germany and US Medicare Advantage there is no noticeable spike in the premium distribution among Dutch health plans. Only a slightly

[24] There is a second reason for a kink in the demand at a zero price in the case of MA. If a plan bids above the benchmark, the plan must pass on the full difference in the form of a positive premium. When the bid is below the benchmark, any savings must be shared with Medicare rather than fully passed on to consumers. See Glazer and McGuire (2016) for discussion.

[25] Over the period 2007-2016 the share of the Dutch population switching health plans varied from 4-8 percent per year and health plan price elasticities were ranging from −0.9 to −2.2. As in many health insurance markets the degree of choice persistence is high and many consumers make suboptimal choices (Douven et al. 2017).

[26] In 2016 the unweighted average premium and the standard deviation were 100 and 8.5 euro per month, respectively.

Figure 8. Premium distribution among Dutch health plans, 2016



Source: own calculations based on premium data of all 59 basic health plans (policies) from 9 independent health insurance companies, obtained from https://www.independer.nl/zorgverzekering/info/premieoverzicht.aspx

higher percentage of the health plans (10%) charge a monthly premium of 99 euro, which is about the average premium in the market. Given that a reference price is not evident in the Netherlands relative thinking is not likely playing an important role. This is corroborated by the higher price dispersion and the absence of focal pricing. Furthermore, since the premium subsidy in the Netherlands is lower than in Germany and MA, the resulting premium level is higher, so the expected impact of relative thinking on the slope of the demand curve is lower than in the other two settings.

4. Testing for a "relative thinking" and a "zero-price" effect

The literature on behavioural economics and our interpretation of pricing in the three health insurance markets implies that consumer demand response to a lower-priced alternative (e.g, health plan) may not only depend on absolute price differences (null hypothesis) but also on prices relative to a reference price (alternative hypothesis). We tested a "relative thinking" and a "zero-price" effect by surveying respondents from the US, Germany and the Netherlands, confronting randomly assigned groups of respondents with the same health plan choices and the same absolute price differences but at different reference premium levels.

4.1. Survey design

The surveys were openly posted on the website of Clickworker (www.clickworker.com), an internet-based crowdsourcing company, with a description stating that the survey takes approximately 5 to 10 minutes to fill out. The survey was posted in Germany, the Netherlands and the US. Respondents were paid a small amount of money to complete the survey in their own language.[27] The response limit was set at 1,200 respondents in each country. Respondents were randomly assigned to a questionnaire with one of the four monthly reference premiums of 0, 50, 100 or 200 dollars (US respondents) or euros (Dutch and German respondents).

We took several steps to increase the validity of our results. First, respondents could answer only one survey. Second, only respondents with completion rates of more than 90 percent at clickworker.com in the past were eligible. Third, to exclude "robots," surveys were created with the commercial program Survio (www.survio.com). Survio requires respondents to reach the surveys through a link.

The survey contained 12 questions of which the first 10 were about background characteristics of the respondents. [28] These background characteristics allow us to control for potential confounders and to test for differences among respondents across different premium categories. The background section contains questions about age, employment status,

[27] Each respondent received 25 cents for a survey that takes about 5 to 10 minutes to fill in.
[28] In our survey two other questions were placed in between the last two questions to prevent easy repetition of the answers. Appendix C contains the ten background questions and the two relative thinking questions of the American, German and Dutch surveys that we use for this paper.

household income and health status. Four questions were related to respondents' own experience with health plan choice. We asked respondents whether they were satisfied with their own health plan, had switched from health insurer in the past five years, perceived changing from health insurer as difficult and whether they had a reference premium in mind (and, if so, which premium) when choosing a health plan.

Two questions tested for relative thinking and zero price effect. Specifically we asked the four randomly assigned groups of respondents in each country whether they were willing to switch from health plan if: (1) their own health insurer would raise its monthly out-of-pocket premium by 10 dollars/euros, and (2) a competing health insurer would lower its monthly out-of-pocket premium relative to that of their own insurer by 10 dollars/euros.

4.2 Empirical Analysis

For both survey questions we estimated three probit models. The underlying latent variable of the probit model is $y_i^* = U(y_i = 1) - U(y_i = 0)$ where

$y_i^* > 0$: person i somewhat or very likely switches to lower priced plan ($y_i = 1$).

$y_i^* < 0$: person i somewhat or very likely remains at the higher priced plan ($y_i = 0$).

The four reference premiums are represented by $P_j, j = 1,..,4$ ($P_1 = 0, P_2 = 50, P_3 = 100, P_4 = 200$). We include four dummy variables: $D_{ij} = 1$, if respondent i faces a reference premium P_j, and zero otherwise. Moreover, we include a set of X variables with background information on the respondents. These include dummy variables for different countries, age, gender, health status, household income, employment status, education, perceived difficulty of switching health plans, whether persons have switched in the last five years and whether respondents have a reference premium in mind.

Testing for relative thinking

Relative thinking implies that respondents switch more often to a 10 euro/dollar lower-priced plan if the monthly reference premium is lower. Therefore, we estimate for each of the four dummy variables D_{ij} a separate response parameter α_j in:

Model 1 $$y_i^* = \sum_{j=1}^{4} D_{ij}\alpha_j + X\beta + \epsilon_i \,,$$

where the β is a vector of effects of the background variables and a constant term in X, and ϵ_i represents the error term. After computing the marginal effects $\hat{\alpha}_j$ of the probit model, we test H_0: $\hat{\alpha}_1 = \hat{\alpha}_2 = \hat{\alpha}_3 = \hat{\alpha}_4$, i.e., there is no relative thinking, against the alternative hypothesis

H_1: Relative thinking if $\hat{\alpha}_1 > \hat{\alpha}_2 > \hat{\alpha}_3 > \hat{\alpha}_4$.

Note that group 4 with the highest premium services as a reference category, so $\hat{\alpha}_4 = 0$.

Testing for zero price effect

We test for a zero-price effect in two ways. First, we hypothesize that consumer switching responses are linearly related to the reference premiums, therefore we introduce an explanatory variable $Pr_i = \sum_{j=1}^{4} D_{ij}P_j/50$.[29] Next, we hypothesize that respondents with a zero reference premium may deviate from this linear relationship, implying a zero price effect:

Model 2 $$y_i^* = Pr_i\theta_1 + D_{i1}\theta_2 + X\beta + \epsilon_i \ ,$$

H_2: A zero price effect is present if $\hat{\theta}_2 > 0$ (and $\hat{\theta}_1 \leq 0$)

Second, we hypothesize a non-linear relationship and test for a zero price effect by allowing for a quadratic relationship in reference premiums. A significant convex quadratic effect implies a more powerful effect of a reference price at zero:

Model 3 $$y_i^* = Pr_i\vartheta_1 + {Pr_i}^2\vartheta_2 + X\beta + \epsilon_i \ ,$$

H_3: A zero-price effect is present if $\hat{\vartheta}_2$>0 (and the strongest response is for $P_1 = 0$).[30]

4.3. Data

In total 3580 respondents completed the surveys: 1175 were Dutch, 1196 were German and 1209 were from the US. Among all respondents, 895 (25.0%) respondents were assigned to a zero reference premium, 866 (24.2%) to a reference premium of 50, 906 (25.3%) to a

[29] Pr_i is a categorical variable that contains for each respondent a number 0, 1, 2, or 4, corresponding to their monthly reference premiums in the survey of respectively, 0, 50, 100 and 200 euro/dollar.

[30] A zero price effect implies that the quadratic effect is convex ($\hat{\vartheta}_2$>0).

Table 2. Sample characteristics*

	United States				Germany				Netherlands			
Monthly Premium (€/$)	0	50	100	200	0	50	100	200	0	50	100	200
Age												
18 - 29	46.3	47.3	46.0	48.2	37.7	38.1	36.7	37.0	64.3	69.0	65.8	63.6
30 - 39	28.8	29.3	30.3	27.4	25.9	25.8	26.6	27.4	19.3	15.1	16.8	17.5
40 - 49	13.9	12.0	12.3	14.4	19.3	17.9	17.8	18.8	9.3	9.5	10.7	12.3
50 - 59	7.8	7.7	7.0	5.7	13.1	13.6	14.1	13.0	6.4	5.6	5.4	5.2
60 - 69	2.9	3.1	3.3	3.3	3.9	4.6	4.4	3.8	0.7	0.8	0.7	1.3
70 +	0.5	0.6	1.1	1.0	0.0	0.0	0.3	0.0	0.0	0.0	0.7	0.0
Gender												
Male	36.3	34.3	37.7	37.8	52.1	52.3	51.9	53.1	42.9	43.7	43.6	40.9
Female	63.7	65.7	62.3	62.2	47.9	47.7	48.1	46.9	57.1	56.3	56.4	59.1
Household income (€/$)												
0 – 10,000	13.6	14.0	12.7	14.4	20.3	18.9	20.5	20.5	26.4	29.4	27.5	27.9
10,001 – 25,000	21.0	21.3	22.3	21.7	24.9	27.5	25.9	26.0	17.9	16.7	18.1	20.1
25,001 – 50,000	27.2	28.0	27.0	26.1	29.5	26.8	27.9	28.8	27.1	28.6	27.5	24.0
50,001 – 100,000	22.3	20.3	23.3	23.4	8.5	10.3	8.8	8.9	7.1	5.6	4.7	6.5
100,000 +	8.4	7.7	7.3	6.7	1.6	1.3	1.0	1.0	1.4	1.6	2.0	2.3
No answer	7.4	8.7	7.3	7.7	15.1	15.2	15.8	14.7	20.0	18.3	20.1	20.1
Level of education												
Primary school	0.6	1.3	1.0	2.3	14.4	13.2	14.1	13.4	0.0	0.8	0.7	0.0
High school	36.0	34.0	33.7	34.8	28.9	30.1	29.0	30.5	38.6	40.5	36.9	36.4
College or universtity	63.4	64.7	65.3	62.9	56.8	56.6	56.9	56.2	61.4	58.8	62.4	63.6
Employment status												
Work for employer	34.3	36.3	36.3	35.1	39.0	39.4	37.4	38.7	21.4	19.8	19.5	19.5
Self employed	27.8	26.7	25.3	26.4	22.3	18.5	20.2	20.2	14.3	12.7	11.4	12.3
Student	16.8	17.3	17.0	20.1	22.0	23.5	23.6	23.3	44.3	46.8	47.7	46.8
Unemployed	19.7	17.7	18.7	16.4	10.2	10.9	10.8	11.0	19.3	19.8	20.8	20.1
Retired	1.3	2.0	2.7	2.0	6.6	7.6	8.1	6.8	0.7	0.8	0.7	1.3
Health status												
Excellent	13.6	15.3	16.0	15.1	10.8	9.9	10.8	13.4	19.3	20.6	18.1	20.8
Very good	42.7	41.0	40.3	41.5	38.0	38.1	38.7	37.0	35.0	34.1	33.6	32.5
Good	32.4	32.7	32.0	30.4	34.1	34.8	32.3	33.2	35.7	34.9	37.6	37.0
Fair	10.4	10.3	11.3	11.4	12.8	11.9	12.8	11.0	7.1	7.1	7.4	7.1
Poor	1.0	0.7	0.4	1.7	4.3	5.3	5.4	5.5	2.9	3.2	3.4	2.6
Easy/difficult to change from insurer												
Difficult	18.1	19.0	19.3	21.1	16.4	20.2	19.9	18.8	21.4	23.0	16.8	17.5
Somewhat difficult	32.7	33.3	30.3	31.4	25.2	24.2	25.3	24.0	30.7	31.7	36.2	36.4
Easy	17.8	15.7	17.3	13.4	26.9	26.5	27.3	28.4	25.0	23.8	20.8	21.4
Don't know	31.4	33.0	33.0	34.1	26.9	29.1	27.6	28.8	22.9	21.4	26.2	24.7
Change past 5 years from health insurer												
Yes	47.2	45.7	47.7	45.5	79.3	76.5	78.1	77.1	42.1	42.1	43.6	38.3
No	52.8	54.3	52.3	54.5	20.7	23.5	21.9	22.9	57.9	57.9	56.4	61.7
Do you have premium in mind												
Yes. current insurer	57.4	57.7	59.1	58.9	45.9	45.4	47.5	45.9	53.3	56.1	57.1	58.2
Yes. seen elswehere	11.5	14.0	13.0	13.4	11.2	13.3	11.1	13.0	12.3	12.5	8.8	12.3
No premium in mind	31.2	28.3	27.9	27.8	42.9	41.4	41.4	41.1	34.4	31.4	34.1	29.6
Satisfied with your health insurer												
Yes	73.1	72.7	73.7	72.6	84.9	86.4	86.2	84.9	90.7	90.5	90.6	91.6
No	26.9	27.3	26.3	27.4	15.1	23.6	13.8	15.1	9.3	9.5	9.4	8.4

*All numbers are in percentages and represent the share of observations in their category (for the four different reference premium levels).

reference premium of 100, and 909 (25.5%) to a reference premium of 200 euro/dollar.[31] Table 2 provides sample characteristics of our survey and confirms the success of randomization in terms of the balance of observable characteristics. Across the three countries, the respondents were relatively homogenous, with some exceptions. The majority of the respondents were less than 40 years old. There were somewhat more females than males and the majority of the respondents have a good or excellent health status and a college or university degree.[32] The majority of the respondents were satisfied with their current health insurer in all three countries, though the level of satisfaction was somewhat lower in the US. About half of the respondents reported it to be difficult or somewhat difficult to change insurers. German respondents show a thirty percent higher switching rate in the past five years than the Dutch and US respondents which might be related to the recent German reforms. Interestingly, about 65% of the respondents report having a premium "in mind," possibly a reference premium, when deciding to switch to another health plan. The majority of these respondents use the premium of their current insurer while a minority uses other information. About 35% of the respondents report not using reference premiums when choosing a health plan.

4.4. Results

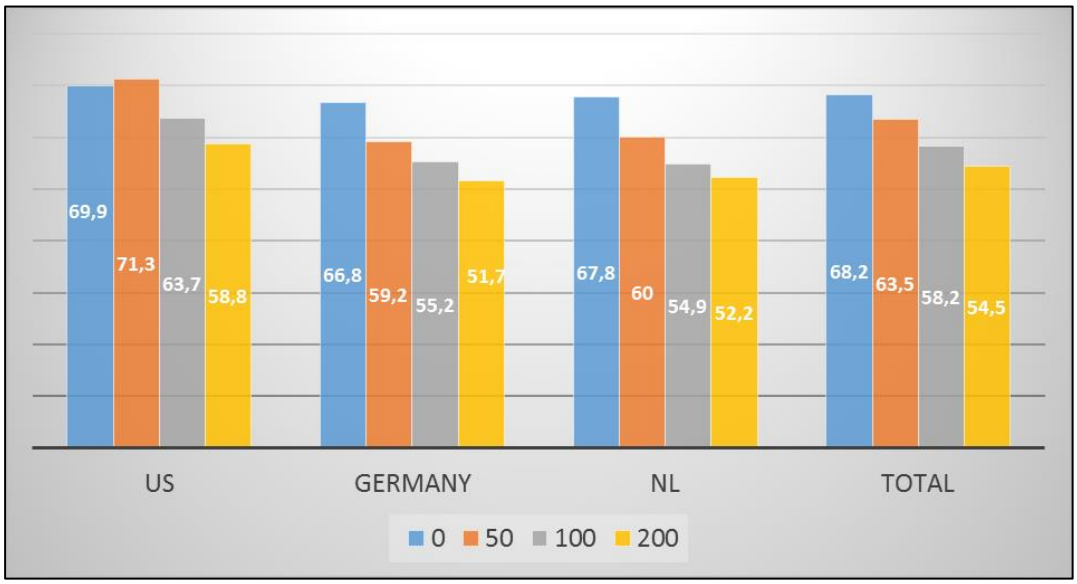
Presence of a "relative thinking" effect

The first question tested respondents' willingness to switch health plans if their present health plan raises its premium by 10 dollars/euros per month. In total 2194 of all 3580 respondents were willing to switch from health plan. Figure 9 summarizes the main results. We observe a clear pattern in all three countries: respondents were more likely to switch from a health plan at lower reference premium levels. Table 3 (first column) presents the marginal effects of question 1 (model 1). Note that the marginal effects are presented relative to a reference category. We find evidence for relative thinking: $\hat{\alpha}_1 = 13.6\% > \hat{\alpha}_2 = 8.6\% > \hat{\alpha}_3 = 4.2\% > \hat{\alpha}_4 = 0\%$, where $\hat{\alpha}_4$ represents the reference category for a reference premium of 200 dollars.

[31] There were no missings as all respondents completed the survey. We asked clickworker.com to survey exactly 300 respondents for each reference premium in each country, but the Dutch and German survey were closed somewhat too early, whereas the American survey was kept open somewhat too long. Therefore the number of respondents differs slightly across categories.

[32] The average age of the population in our experiment is similar to Kuziemko et al. (2015) who performed a web survey experiment with Amazon's Mechanical Turk (mTurk). Other characteristics are similar as well, for example we have also fewer males and a low number of unemployed persons. However, we have considerably more persons with a college or university degree. Kuziemko et al. compare the population of their survey with the population of more traditional American surveys.

Figure 9. Switching responses when own health plan raises its premium (question 1)*



* The numbers in the columns represent the percentage of respondents that answered (very) likely to switch to another health plan. One minus this number represents the percentage of respondents who answered (very) unlikely. Each color represents a reference premium, blue, 0; red 50; grey, 100, and yellow 200 dollar/euro. TOTAL represent the sum of all US, German and Dutch (NL) respondents.

Respondents are significantly more likely to switch if the reference premium is lower.[33] For example, an additional 13.6% respondents (or 20% of all respondents intending to switch) intend to switch if their current monthly reference premium is 0 instead of 200 euros. This figure is of considerable magnitude implying that the relative thinking effect is also economically relevant. The results in Table 3 furthermore suggest that income plays a relatively minor role. Interestingly, respondents stating that they had a reference premium in mind when choosing health plans were significantly more willing to switch than those who did not.[34] The results further indicate that respondents in the US are overall somewhat more likely to switch. Other significant findings are in line with the health plan choice literature: switching propensities are higher for those who are young, healthy and higher educated.[35] Other results were also in line with our expectations: respondents who state finding it easy to switch health plans, who switched health plans in the last five years and who are dissatisfied with their health insurer were significantly more likely to switch. The second question tested

[33] All three one-sided parameter tests H_1: $\alpha_1 > \alpha_2$; $\alpha_2 > \alpha_3$; $\alpha_3 > \alpha_4$ are not rejected at a 5% level.
[34] The marginal effect is 7.6%. This interpretation seems plausible because correlations among the various background variables are low (see Appendix B. Table B1 for the correlation matrix).
[35] For example, Royalty and Solomon (1999) find evidence that transition costs are higher for older and less healthy employees. They find lower price elasticities for the higher educated indicating higher time costs.

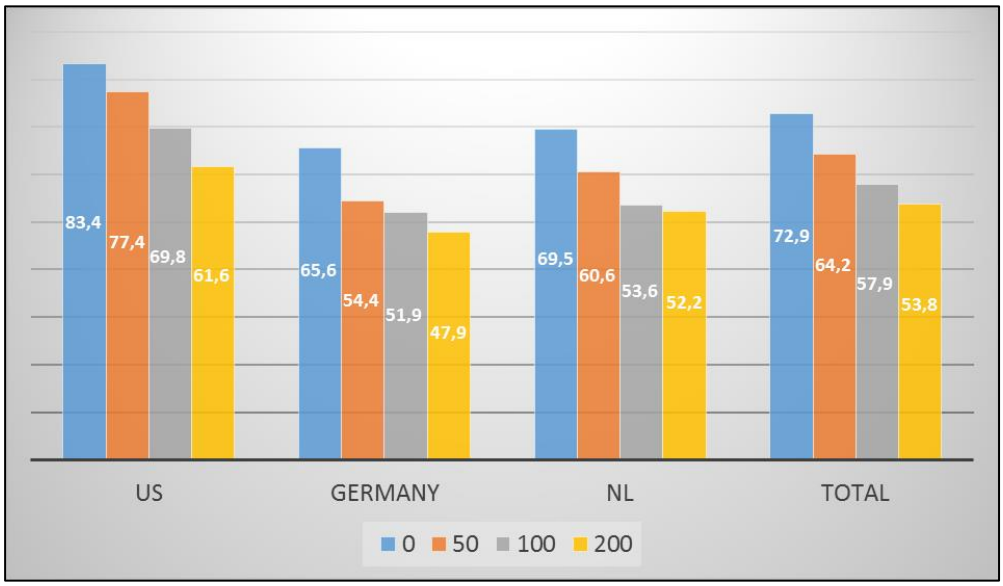
Table 3. Marginal effects probit estimation "relative thinking" and "zero-price" effect

Dependent variable: yes/no switch from health plan				
	Question 1: Own health plan raises premium		***Question 2: Competitive health plan lowerspremium***	
	Model 1			
Dummy variables	*Marg. effects*	*Std.err.*	*Marg. effects*	*Std.err.*
$\hat{\alpha}_1$ (reference premium 0)	13.6%*	(2.2)	19.3%*	(2.1)
$\hat{\alpha}_2$ (reference premium 50)	8.6%*	(2.2)	10.0%*	(2.1)
$\hat{\alpha}_3$ (reference premium 100)	4.2%	(2.2)	4.5%*	(2.1)
$\hat{\alpha}_4$ (reference premium 200)	0%		0%	
US	6.6%*	(2.1)	13.8%*	(2.1)
GE	4.0%	(2.2)	2.0%	(2.1)
NL	0%		0%	
Age (19-29 years old)	15.1%*	(2.9)	17.7%*	(2.8)
Age (30-49 years old)	9.1%*	(2.7)	8.9%*	(2.7)
Age (50 years and older)	0%		0%	
Gender (m=0.w=1)	2.1%	(1.6)	4.0%	(1.6)
Household income (0-25K)	4.6%	(2.5)	2.7%	(2.4)
Household income (25-50K)	4.2%	(2.7)	2.6%	(2.6)
Household income (50K and higher)	1.3%	(3.0)	2.5%	(2.9)
Household income (no response)	0%		0%	
Education (primary school)	− 8.0%*	(3.9)	− 9.5%*	(3.8)
Education (high School)	3.4%	(1.8)	2.1%	(1.7)
Education (university)	0%		0%	
Employment (self-employed)	− 4.4%	(2.2)	− 5.7%	(2.2)
Employment (work for employer)	− 1.2%	(2.2)	− 1.5%	(2.2)
Employment (unemployed)	0%		0%	
Health status (bad=0. good=1)[a]	− 1.5%	(2.4)	− 4.9%*	(2.4)
Insurer switching (easy)	2.1%	(2.4)	4.0%	(2.4)
Insurer switching (difficult)	− 7.0%*	(1.9)	− 4.8%*	(1.9)
Insurer switching (no idea)	0%		0%	
Switched last 5 years (no=0. yes=1)	10.7%*	(1.7)	8.7%*	(1.7)
Satisfied with insurer (no=0. yes=1)	− 8.4%*	(2.3)	− 9.5%*	(2.2)
Ref. premium in mind (no=0. yes=1)	7.6%*	(1.7)	8.4%*	(1.6)
Statistics Probit Model	*LL= −2284.20*		*LL= −2198.74*	
	Model 2			
$\hat{\theta}_1$ (linear premiums)	− 2.7%*	(0.7)	− 3.1%*	(0.7)
$\hat{\theta}_2$ (reference premium 0)	3.0%	(2.5)	7.2%*	(2.5)
Statistics Probit Model	*LL= −2284.48*		*LL= −2199.40*	
	Model 3			
$\hat{\vartheta}_1$ (linear premium term)	− 5.9%*	(1.9)	− 10.2%*	(1.9)
$\hat{\vartheta}_2$ (quadratic premium term)	0.6%	(0.4)	1.3%*	(0.4)
Statistics Probit Model	*LL= −2284.21*		*LL= −2198.78*	

[a] Health status was coded as good=1 if respondents filled in "excellent", "good" or "very good" and coded as bad=0 otherwise. *LL* refers to the Log likehood of the probit estimation. A* indicates that probit estimates are significant at a 5% level.

respondents' switching propensity when a competing health plan lowers its premium with 10 dollar/euro.[36] In total 2231 respondents were willing to switch health plans. Figure 10 summarizes the main results (question 2, model 1). Again we find strong evidence for relative thinking; the responses are even somewhat stronger (and again significant): $\hat{\alpha}_1 = 19.3\% > \hat{\alpha}_2 = 10.0\% > \hat{\alpha}_3 = 4.5\% > \hat{\alpha}_4 = 0\%$.[37] The marginal effects of the explanatory variables in Table 3 are similar as in the first question. To summarize, the responses in both questions clearly reject the null hypothesis and provide evidence of a "relative thinking" effect.

Figure 10.Switching responses when a competing plan lowers its premium (question 2)*



* The numbers in the columns represent the percentage of respondents that answered (very) likely to switch to another health plan. One minus this number represents the percentage of respondents who answered (very) unlikely. Each color represents a reference premium, blue, 0; red 50; grey, 100, and yellow 200 dollar/euro. TOTAL represent the sum of all US, German and Dutch (NL) respondents.

Presence of a "zero-price" effect

We identify a possible "zero-price" effect by testing whether there exists an additional effect for a reference premium of zero. In the last rows of Table 3 we present our results for Model 2 and Model 3.[38] We find evidence for a zero price effect in Model 2: $\hat{\theta}_2 > 0$ (and $\hat{\theta}_1 < 0$), albeit only a significant result for the second question. The same holds for Model 3, where we

[36] The exact question was: "You pay a monthly premium of [0, 50, 100, 200] dollar. You find out that another health insurer sets its monthly premium 10 dollar lower than your current insurer. How likely would you be to switch to this other health insurer?".
[37] Especially for the US we observe stronger responses for the zero reference premium category.
[38] We didn't report the marginal effects of the background variables; they were almost the same as in Model 1.

find evidence for a convex quadratic term in premiums ($\hat{\vartheta}_2 > 0$). The log likelihood is lower in model 3 than in model 2, and almost equal to the log likelihood in model 1, which suggests that the effects are non-linear. Thus, our results tend to indicate that switching responses are higher at a zero premium level, suggesting the presence of a "zero-price" effect.

4.5. Limitations

The main purpose of our survey was to test the null-hypothesis of no relative thinking. We found that the null can be rejected and that a "relative-thinking" and a "zero-price" effect are likely to be present. However, our quantitative results may not be fully generalizable to actual health plan choices. First, our survey is about hypothetical situations, and our findings, especially the "zero-price" effect may be more or less prominent when real money is at stake. Shampanier et al. (2007) find a strong zero-price effect in both hypothetical and real choice experiments. We do also not consider practical aspects of switching such as potential hassle costs, search time or opportunity costs. It is much easier to say one intends to switch than actually switching in real life. For example, annual switching rates of 10-20% of the total population are quite high in actual health insurance markets while more than 50% of our respondents state that they intend to switch for a small change in premiums. Second, the magnitude of our effects may differ across populations. By the nature of our sample recruitment process, our respondents are willing to act on the basis of a small price. Third, survey results might be sensitive to the framing of the questions and contextual differences.

5. Conclusion

Both the hypothetical survey experiment and the observed equilibria in three large markets with premium subsidies imply that relative thinking and reference pricing, and especially a reference price of zero, impact health plan choice and price competition. Policymakers (or other sponsors) already use the level of premium subsidies as a policy tool to achieve access to health insurance. Our research suggests subsidy level and design should involve another set of considerations having to do with the effect of the subsidy on demand response and price competition. For purposes of this discussion, we will assume that in addition to access to health insurance, the sponsor would like to increase demand response to price and thereby heighten price competition among plans. A first policy implication is that policymakers can increase demand response by increasing a fixed subsidy as a share of the total health insurance payments. In the presence of relative thinking, a given price difference has a greater

effect on demand if the level of consumer prices lowers consumers' reference prices. If a certain level of public subsidy is justified based on access and equity considerations, this additional benefit from a subsidy increase implies that subsidies should be greater than based on access/equity alone.

A subsidy can be set "too high" in terms of its effect on demand response and competition. We counsel special caution setting subsidies such that the reference prices become near zero, a kind of "black hole" with respect to price competition. Relative thinking is most powerful as prices approach zero. In other words, once consumers get something "free" is is hard to dislodge them from this state. It is true that health plans would be highly penalized by setting a positive price if consumers' reference price is zero, but this is a good thing only if the optimal price is not positive. The powerful reference effects creating the kink in demand at zero implies also the equilibrium market price is unlikely to fall below zero. However, if a sponsor knows the total price/cost for health plans that it wants, and it wants to get that through market forces, then it can set a subsidy so that the reference price at the target spending is zero. This manner of increasing demand response of course requires increased public funds.[39]

Our research also implies that for a given level of premium subsidies, and thus at no budget costs, demand reponses can be altered by changing the design or framing of premiums in the market. First, policymakers can influence health plan competition by increasing (or decreasing) the salience of reference premiums. As discussed above, the German government announced a specific premium level that should be sufficient for the average health plan, requiring health plans charging higher premiums to inform their enrollees about the opportunity to switch to a cheaper health plan. The choice of the "announced premium" is one that can be made not simply as an accounting issue (what is needed to cover cost) but on the basis of policy considerations about what would be a desirable reference premium. A government or other sponsor may believe past costs have been too high because of inefficiency or market power issues. A no-budget cost way of pressuring plans to compete more vigorously around the target premium level is to in effect create a reference premium at that level. Second, policymakers can exploit the evidence we found that the 'relative thinking'

[39] Notice, however, this does not necessarily require additional cross-subsidies, since each individual's contribution to the subsidy-fund and the subsidy each individual receives from the fund can be increased with the same amount.

effect might be non-linear, i.e. that demand responses become stronger when reference premiums are smaller. This finding implies that the presentation of premiums to consumers may be important. Premiums can be presented to consumers on a weekly, monthly or annual basis (or as a percentage of income as in Germany). We leave the question of an optimal presentation of premiums, that may differ for policymakers and insurers, for future research.

Finally some country specific policy implications can be drawn. Consider the Medicare Advantage program in the U.S., and suppose, based on the discussion and evidence presented above, we regard Medicare has fallen into the zero-price black hole. Health plans "should" decrease premiums to consumers but the sharp kink in demand at zero inhibits them from decreasing premiums. The inefficiencies associated with the powerful zero reference price include too few beneficiaries choosing Medicare Advantage and too much of the shared savings going back to plans put into benefit enhancements rather than premium reductions.

Medicare could use the Part B premium to reframe pricing to beneficiaries at no budget cost. The standard Part B premium for 2017 is 134 dollars per month. Suppose, instead of collecting this "automatically" and framing Medicare Advantage enrolment premiums as something above or below this, Medicare asked beneficiaries to choose between traditional Medicare priced at 134 dollars per month and Medicare Advantage plans priced also *around* 134 dollars per month.[40] The former "zero premium" plans would now be 134 dollar plans. It is true that 134 dollars would likely be the new reference price, but not so much a black hole. Relative thinking implies that with reframing, a health plan offering somewhat better benefits at a 150 dollars per month competing with 134 dollar traditional Medicare would do better on the market than at present when such a plan would price at 16 dollars to compete with "free" traditional Medicare (and other zero-premium plans). Without such a sharp kink plans would also have more incentives to compete by offering prices below a reference price of 134 dollars compared to a reference price of 0 dollars.

In the Netherlands health plan pricing could be reframed to reinforce price competition on the health insurance market at no budget cost by increasing each individual's income-related contribution and each consumer's risk-adjusted subsidy by the same amount (e.g. 700 euros per year). Then the risk adjusted-subsidy would equal an individual's predicted expenses

[40] The idea in this paragraph was proposed in Newhouse and McGuire (2014). The earlier paper did not frame the analysis firmly in the framework of relative thinking.

minus 500 euro instead of 1200 euro, as currently is the case. As a result, the community-rated premiums would reduce to about 500 rather than 1200 euros per year. Due to the relative thinking effect, the lower premium level may make consumers more price sensitive, inducing more price competition. This measure would also reduce the number of defaulters and the deficit per defaulter.[41] In addition, the government may reinforce this relative thinking effect further by more explicitly setting a reference premium. As in Germany, the government may require health insurers notifying their enrollees if their health plan premiums exceed a certain benchmark.

[41] In 2016 the number of defaulters – defined as those that did not pay their health insurance premium for more than 6 months – was about 290,000 (2.3 percent of the total number premium paying enrollees).

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Appendix A Institutionals detail of three health insurance settings

Table A1. Main features of health insurance setting in three countries

	Germany	**United States**	**The Netherlands**
Name	Social Health Insurance	Medicare Advantage	Health Insurance Act
Who is eligible?	85% of population. 15% are privately insured (high incomes and most civil servants)	Residents age 65+ and disabled	Total population
Is enrollment mandatory?	Yes. enforced by law	No. could stay in Traditional Medicare	Yes. enforced by law
Contract period with insurer?	18 months, but shorter if insurer increases premium	9-12 month	1 year
Number of people covered	71.1 million (2015)	17.6 million (2016)	16.9 million (2016)
Mean per person claims	2.800 euro (2015)	10.180 dollar (2015)	2.500 euro (2016)
Enrollee premium?	Yes. all enrollees – except non working spouses and some other exceptions – equal or above age 23 or 25 (provided that children below 23 years have no income and the partner is not privately insured)	Yes. two components: mandatory Part B paid to Medicare; plan-set premium which could be positive. negative or zero.	Yes. all enrollees >=18 years.
Number of switchers	3-6% annually (2002-2008) In period 2009-2014 the number of switchers were high for the few health plans with add-on premiums.	About 10% of enrollees switch Medicare Advantage plan in a year.	4-8% annually (2007-2016)
Share of claims covered by community-rated premiums	about 0% (2009-2014) approximately 5% (2015-2016).	Part A: about 0 % Part B: 10% of total claims.	about 50% (2006-2016)
Premium categories	Prior to 2009 and after 2015 income-related premiums per health plan From 2009-2014 uniform income-related premiums per health plan plus a community-rated add-on premium	Part B are fixed across all options and mildly income-related. Plans can set community-rated supplemental premium.	Premiums are community-rated per health plan
Premium flexibility	Yes. For special features health plans may charge lower or higher premiumsdifferentiation	Yes. for plan component.	Yes. premiums are allowed to vary across several dimensions (provider. networks. voluntary deductible level. group contracts)
Consumer cost sharing	Few co-payments (about 3% of total expenditures)	Limits to annual out-of-pocket spending (6.700 dollar per year since 2011)	Mandatory deductible and some copayments for specific services

Tax and income related contributions	Uniform income related contribution rate (approximately 95-100%)	Federal taxes from general revenues and Medicare tax. Part A costs are 100% subsidized, Part B costs approximately 75% subsidized.	All enrollees with income pay an income-related earmarked tax (approximately 50%)
Additional subsidies	No subsidies (but income-related limits to copayments for families and chronically ill).	Low-income individuals may qualify for Medicaid which pays Part B premiums on behalf of beneficiary.	Low- and middle income enrollees receive an income-based premium subsidy

Source: McGuire and Van Kleef (2018)

Appendix B

Table B1. Correlation matrix*

	Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	premium increase own plan	1.00											
2.	premium increase competitor	0.70	1.00										
3.	age	-0.12	-0.10	1.00									
4.	gender	0.05	0.01	0.02	1.00								
5.	household income	-0.01	-0.03	0.04	-0.02	1.00							
6.	education level	0.07	0.03	0.09	0.07	0.09	1.00						
7.	employment status	0.05	0.03	0.07	-0.03	0.10	0.16	1.00					
8.	health status	0.00	0.01	-0.20	-0.03	0.07	0.10	0.14	1.00				
9.	switching is difficult	-0.03	-0.03	-0.15	-0.02	0.02	-0.04	-0.01	-0.02	1.00			
10.	switched last 5 years	0.13	0.12	-0.05	0.10	0.08	0.11	0.02	0.04	-0.24	1.00		
11.	satisfied with insurer	-0.10	-0.07	-0.02	-0.02	0.05	0.00	-0.03	0.10	-0.04	-0.08	1.00	
12.	premium in mind	-0.07	-0.06	-0.02	-0.01	0.00	-0.13	-0.05	-0.05	0.01	-0.04	-0.12	1.00

* The variable 'premium increase' is a binary variable which is 1 if the respondent is likely or somewhat likely to switch from health plan if their present health plan raises its premium by 10 dollar/euro per month, and 0 otherwise. The variable 'premium decrease' is a binary variable which is 1 if the respondent is likely or somewhat likely to switch to the health plan that lowers its premium by 10 dollar/euro per month (see Appendix C). The other variables concern patient characteristics and are also shown in Table 2 in the text.

In the correlation matrix in Table B1 we computed the Pearson correlation coefficients. Only the first two variables are highly correlated. Respondents who tend to switch between health plans when an insurer raises its premium also tend to switch when a competitive health plan lowers its premium. Other interesting correlations are that older and less healthy respondents find it more difficult to switch from health plan. Respondents who find it difficult to switch from health plan also more often didn't switch from health plan in the last five years.

Appendix C: Survey Questions

We fielded our survey in Germany, The Netherlands and the U.S., in German, Dutch, and English, respectively. English versions of the questions are listed here. German and Dutch versions are available from the authors upon request.

This survey consists of background questions about you and a series of questions about how much you pay for health insurance. which we refer to as the premium. The premium is what you pay each month for health insurance.

Backgound questions

1. What is your age (in years)?
18-29
30-39
40-49
50-59
60-69
70+

2. What is your gender?
Female
Male

3. What is your approximate net annual household-income (in euros/dollars)?
0 - 10.000
10.001-25.000
25.001-50.000
50.001-100.000
100.000 +
Prefer not to answer

4. What is your highest achieved education level?
Primary school
High school
College or University

5. What is your employment status?
Work for employer
Self-employed
Student
Unemployed
Retired

6. In general. would you say your health is:
Excellent
Very good
Good
Fair
Poor

7. Suppose you want to change from health insurer. How easy/difficult would this be?
I don't know
Very difficult
Somewhat difficult
Easy

8. Did you change from health insurer in the past five years?
Yes
No

9. Are you satisfied with your current health insurer?
Yes
No
No health insurance

10. Suppose you consider switching to another health insurer. Do you keep in mind a certain premium when you compare different health plans?

Yes. the premium of my current health plan
Yes. a premium which I have seen elsewhere (newspapers. advertisements. news etc.)
No. I compare health plans without having in mind a specific amount.

Hypotheses-related questions

In the case of a survey with a reference premium of zero dollars, the introductionary text was:
Suppose your employer or the government subsidizes health insurance and that this subsidy is sufficient to cover the full premium of your current health insurance plan. This means that the monthly premium you have to pay is zero dollars and thus is free of charge.

In the case of a survey with a reference premium of [50.100.200] dollars, the introductionary text was:
Suppose your employer or the government subsidizes health insurance and that this subsidy covers part of your premium of your current health insurance plan. This means that the monthly premium you have to pay is [50.100.200] dollars

11. Suppose your health insurer raises its monthly premium with 10 dollars. This means that you now have to pay a monthly premium of [10. 60. 110. 210] dollars. How likely would you be to switch to another health insurer that keeps the monthly premium at [0. 50.100.200] dollars?

Very likely
Somewhat likely
Somewhat unlikely
Very unlikely

12. You pay a monthly premium of [0. 50. 100. 200] dollars. You find out that another health insurer sets its monthly premium 10 dollars lower than your current insurer. This means that

you will receive 10 dollars per month (or pay [40. 90. 190] dollars per month). How likely would you be to switch to this other health insurer?

Very likely
Somewhat likely
Somewhat unlikely
Very unlikely

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