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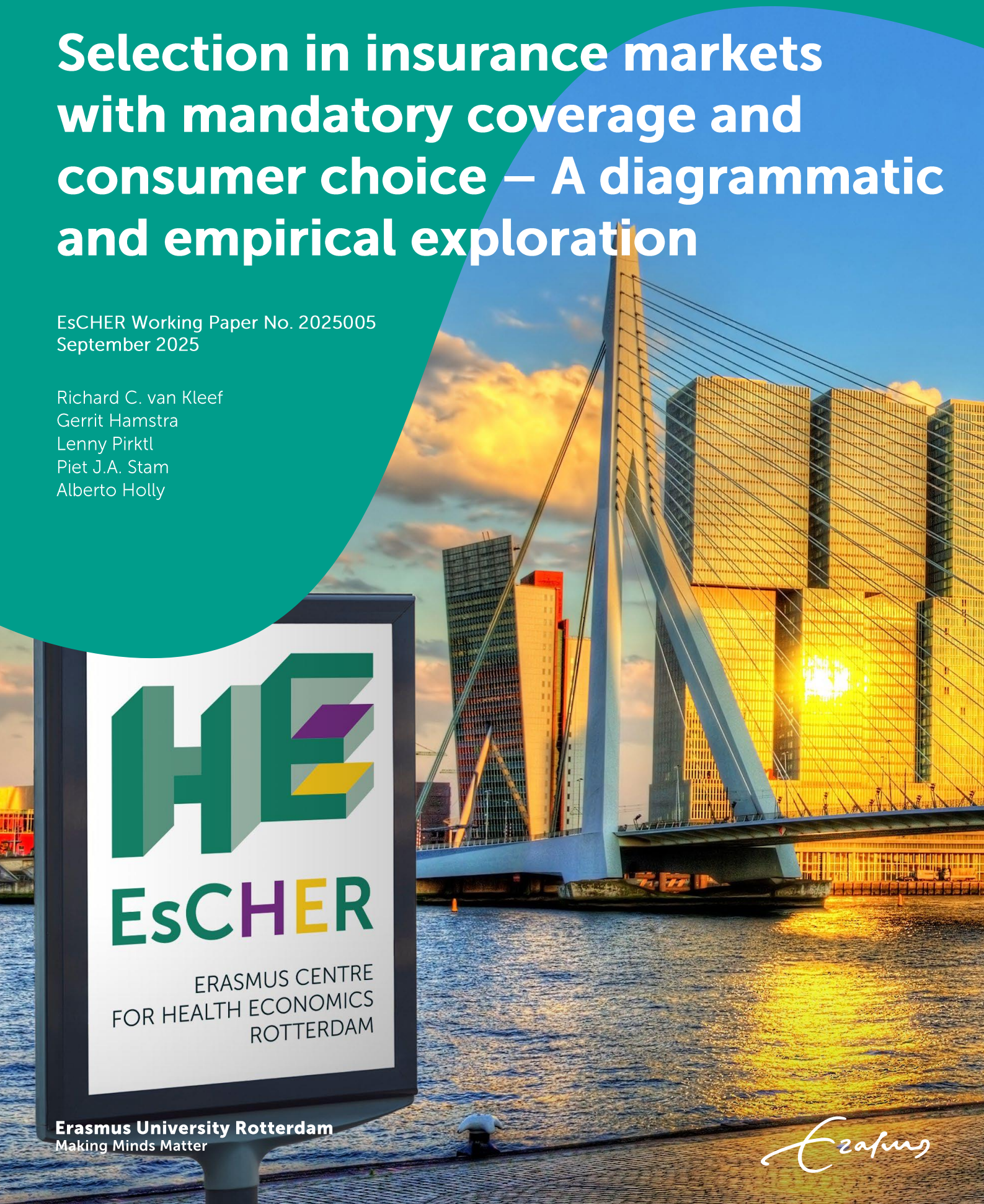

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Title
Selection in insurance markets with mandatory coverage and consumer choice – A diagrammatic and empirical exploration

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Selection in insurance markets with mandatory coverage and consumer choice – A diagrammatic and empirical exploration [1]

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Abstract: This paper studies selection in insurance markets with mandatory coverage and consumer choice. We first extend the diagram introduced by Einav, Finkelstein & Cullen (2010) and show that the competitive equilibrium price of choice attribute A (e.g., an additional loss event covered on top of mandatory coverage) does not just depend on the *demand and marginal cost of A*, but also on the *correlation between the demand for A and the cost of mandatory coverage*. Using data from the Swiss and Dutch mandatory health insurance schemes, we show that this correlation can be very substantial. Risk adjustment reduces this correlation.

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Many insurance markets are subject to regulatory interventions to enhance fairness and efficiency. For example, Van Kleef et al. (2024) show how *health* insurance markets are typically regulated in terms of premiums, enrollment, and coverage. An important challenge in these markets is to mitigate selection by consumers and insurers (Akerlof, 1970; Rothschild & Stiglitz, 1976; Glazer & McGuire, 2000; Einav & Finkelstein, 2011; Cutler & Reber, 1998). Selection by consumers can take the form of "adverse selection" and "advantageous selection". Selection by insurers – also known as "preferred-risk selection", "cream skimming", and "screening" – can take place via the design and marketing of insurance plans.

Over the past decades, economists have extensively studied selection problems in insurance markets, both theoretically and empirically. One of the mainstream contributions is the diagrammatic framework introduced by Einav, Finkelstein & Cullen (2010). This framework graphically exposes the core of adverse selection problems in markets with unpriced risk heterogeneity: *the interdependence of the demand for insurance and its marginal cost*. This framework helps understand adverse selection on both the extensive margin (i.e., whether to buy insurance) and the intensive margin (i.e., which plan to buy) and has proven to be very useful for estimating the welfare effects of adverse selection in terms of (in)efficient sorting of consumers into coverage and across coverage options. Moreover, the framework provides an excellent basis for analyzing the impact of regulatory interventions (see, for instance, Einav, Finkelstein & Cullen, 2010; Einav & Finkelstein, 2011; Geruso & Layton, 2017; Geruso et al., 2023).

Typical regulatory interventions for dealing with adverse selection on the extensive margin include insurance mandates, subsidies, and penalties. Although these measures might be

effective in avoiding adverse selection on the *extensive* margin, they might exacerbate adverse selection on the *intensive* margin (Azevedo & Gottlieb, 2017; Saltzman, 2021; Geruso et al., 2023). As far as we know, there is little empirical work on adverse selection on the intensive margin *in the presence of a strong mandate*.[7] This paper fills that gap and highlights the need for regulatory interventions to increase the viability of choice attributes, such as risk adjustment.

The goal of this paper is to explore selection in insurance markets with a strong mandate and consumer choice. By consumer choice we mean that consumers can opt for additional coverage on top of mandatory coverage, e.g., in the form of a lower deductible or an additional loss event covered. Throughout this paper, we use the term 'mandatory coverage' to refer to the minimum coverage level consumers must buy. As a first step, we extend the framework introduced by Einav, Finkelstein & Cullen (2010), which we hence refer to as EFC. The goal of our extension is to characterize the competitive equilibrium price for choice attribute A. The key insight from our EFC extension is that the competitive equilibrium price of A does not just depend on the *demand and marginal cost of A* (which is captured by EFC), but also on the *correlation between the demand for A and the cost of mandatory coverage* (which is not captured by EFC). Consequently, we need two cost curves for finding the competitive equilibrium price of A: 1) the direct marginal cost of A (i.e., the causal effect of A on cost) and 2) the marginal cost of mandatory coverage. Like the EFC extension introduced by Geruso et al. (2023), ours recognizes the interdependence between the price of an insurance plan with A ($P_{A=yes}$) and the price of a

[7] Throughout this paper we will speak of markets with a "strong mandate" to indicate the absence of selection on the extensive margin. In other words, we look at situations in which the entire target population buys a predefined minimum of insurance coverage. Such a situation can result from a strong mandate, as well as high subsidies for buying insurance and/or penalties for not buying insurance. In theory, such a situation might also occur naturally, e.g., in the presence of (very) high levels of risk aversion towards losses covered by insurance.

plan without A ($P_{A=no}$). A key difference with Geruso et al. (2023), is that we assume absence of adverse selection on the extensive margin due to the presence of a strong mandate. Consequently, our EFC extension can be simpler and better tailored to the setting of interest.[8] We will show that in the presence of a strong mandate, consumer sorting between yes/no A can reveal unpriced risk heterogeneity in mandatory coverage. When the revealed unpriced risk heterogeneity is too large, a competitive equilibrium for A cannot exist.

Our EFC extension is not only useful for analyzing adverse selection in the presence of a strong mandate but also helps understand insurer decisions in this setting regarding whether to offer attribute A. In line with Azevedo & Gottlieb (2017) and Geruso et al. (2023) we show that under specific circumstances A might not be offered due to complete unravelling of the market for A.

Our EFC extension also allows for incorporating risk adjustment, a common regulatory intervention to compensate insurers for variation in expected costs across consumers. By redistributing expected costs from high-risk to low-risk consumers, risk adjustment reduces the correlation between the demand for choice attribute A and the cost of mandatory coverage. This way, risk adjustment increases the viability of A in a competitive insurance market.

As a second step, we empirically explore selection patterns in two insurance markets with a strong mandate and consumer choice: the basic health insurance schemes in the Netherlands and

[8] To demonstrate the interdependency of extensive and intensive margin equilibria, Geruso et al. (2023) need two demand curves, one for the low-value plan and one for the high-value plan. Since we focus on the intensive margin only, we need only ***one demand curve***, i.e., the demand curve for attribute A conditional on having mandatory coverage. This brings us back to the single demand curve in EFC. The difference with EFC, however, is that we need ***two cost curves***, one for the marginal cost (i.e. the causal effect) of A and one for the marginal cost of mandatory coverage. See the next section for further explanation.

Switzerland. First, we group insurance contracts in these markets by two types of choice options: a lower deductible level and fewer access restrictions (e.g., in terms of gatekeeping and provider network). Second, we partition the total population of each country into the following three plan types: 1) *mandatory coverage only* (i.e., plans with the highest deductible option and access restrictions), 2) *mandatory coverage* ++ (i.e., plans with the lowest deductible option and no or few access restrictions), and 3) *mandatory coverage* + (i.e., plans with coverage somewhere in between *mandatory coverage only* and *mandatory coverage* ++). For each plan type we calculate mean per person insurer spending and then check for adverse selection. Our findings indicate that the *correlation* between the demand for additional coverage and insurer spending on mandatory coverage can be very substantial. Third, we incorporate the risk adjustment formulas that are currently in place in the two countries and show that these models largely – though not completely – compensate for differences in mean insurer spending between the three plan types. As a fourth step, we incorporate the actual premiums for the three plan types. We find that (incremental) premiums tend to align with (incremental) insurer spending *net of risk adjustment* rather than (incremental) insurer spending per se. As a final step, we share an interesting by-product of our empirical exploration: consumers who switch to a certain plan type (newcomers) tend to have lower insurer spending than those who were already having that plan type in the previous year (stayers). We show and discuss how prospective risk adjustment can reduce, exacerbate or even reverse the profits and losses of newcomers compared to stayers.

The structure of our paper is as follows. Section I introduces our extension of the diagram introduced by Einav, Finkelstein & Cullen (2010). Section II briefly describes the institutional settings of our empirical exploration, together with the data and methods used. Section III

presents and compares the findings of our empirical exploration for the two countries. Despite important differences between the two settings, the general selection patterns are remarkably similar, which underlines the relevance and generalizability of our observations. Section IV discusses the implications of our findings and conclusions for policy and research.

I. Diagrammatic Exploration

As described above, we focus on insurance markets with a strong mandate in which selection on the extensive margin is absent. The strong mandate implies that ***all*** consumers have at least a predefined level of minimum coverage. On top of that mandatory coverage, the regulator has left some choice, meaning that insurance coverage is not completely standardized but can (to some extent) vary on top of mandatory coverage. Any item of additional coverage can be seen as a choice attribute. The key question in our diagrammatic exploration below is how consumers sort across choice attributes. For simplicity, we make the following additional assumptions:

1. We focus on a simple case with *just one choice attribute* which we refer to as attribute A. (Although an analysis of multiple choice attributes is beyond the scope of this paper, we briefly elaborate on this possibility at the end of this section).

2. *Premiums are community-rated per insurance plan*, both for plans with mandatory coverage only and for plans with mandatory coverage plus attribute A. (Although the inclusion of rating factors would complicate our analysis, our key observations are relevant for any setting with some degree of "unpriced risk heterogeneity".)

3. *The market for insurance plans is perfectly competitive*. There are no frictions on the side of consumers and for any insurance plan the community-rated premium perfectly reflects the mean expected cost of consumers sorting into that plan (zero profit condition).

In their paper "Selection in insurance markets: theory and empirics in pictures", Einav & Finkelstein (2011) argue that "although for expositional simplicity we focused on the binary choice *whether or not to buy insurance*, the same graphical analysis can easily be applied to a choice between *more or less coverage*" (italics added). In the presence of a strong mandate, however, the EFC diagram needs an additional cost curve to find the equilibrium incremental premium of "more coverage" relative to "less coverage". To illustrate this point, we first introduce the standard EFC diagram and customize this diagram to our setting of interest.[9]

The top panel in Figure 1 applies the standard EFC diagram to a setting in which the entire population has a predefined level of mandatory coverage and – on top of that – has a binary choice between a plan *with* choice attribute A and a plan *without* A. So, the plan *without* A represents the mandatory coverage that is required by the regulator; in the terminology of Einav & Finkelstein (2011) this can be seen as "less coverage". The plan *with* A represents the more comprehensive coverage; in the terminology of Einav & Finkelstein (2011) this can be seen as "more coverage". Attribute A can be any form of additional coverage on top of mandatory coverage, such as an additional loss event covered or a lower deductible. The grey line in the

[9] By 'standard EFC diagram' we mean Figure 1 in Einav, Finkelstein & Cullen (2010). This figure also forms the basis of discussions and analyses in subsequent publications, such as Einav & Finkelstein (2011), Geruso & Layton (2017), and Geruso et al. (2023).

diagram represents the demand for A (D_A), which represents the *incremental* price consumers are willing to pay for attribute A on top of the premium for mandatory coverage. The population of interest (horizontal axis) is ordered from high to low demand. Due to the strong mandate, the sorting problem is reduced to the intensive-margin choice whether to buy A on top of mandatory coverage. The key question is "Where to find the competitive equilibrium price and quantity in this setting?". To answer this question EFC added two cost curves to the diagram, one for the marginal cost and one for the average cost. In our case, the marginal cost curve represents the expected cost of covering attribute A for the marginal buyer (MC_A). MC_A is downward sloping, which represents the well-known adverse selection property of insurance markets. As Einav & Finkelstein (2011) wrote: "the individuals who have the highest willingness to pay for insurance are those who are expected to be the most costly for the insurer to cover". In a market with perfect competition, the consumers on the very left of the horizontal axis will be the first to choose A when the price of A happens to fall below the demand curve. With a lower price more consumers will opt for A until the point where the entire population has chosen A. The average cost curve for A (AC_A) represents the average cost of providing A to the consumers left of any point on the horizontal axis. The competitive equilibrium price ($P_{A,eqm}$) and quantity ($Q_{A,eqm}$) are found at the intersection of the demand curve (D_A) and the average cost curve (AC_A):

$$P_{A,eqm} = AC_A \mid AC_A = D_A \qquad (1)$$

We are now ready for our extension of the EFC diagram: in the presence of a strong mandate, a second cost curve is potentially important, i.e., the marginal cost of mandatory coverage (MC_0). In many cases, MC_0 is likely to correlate with the demand for A. For example, when A takes the

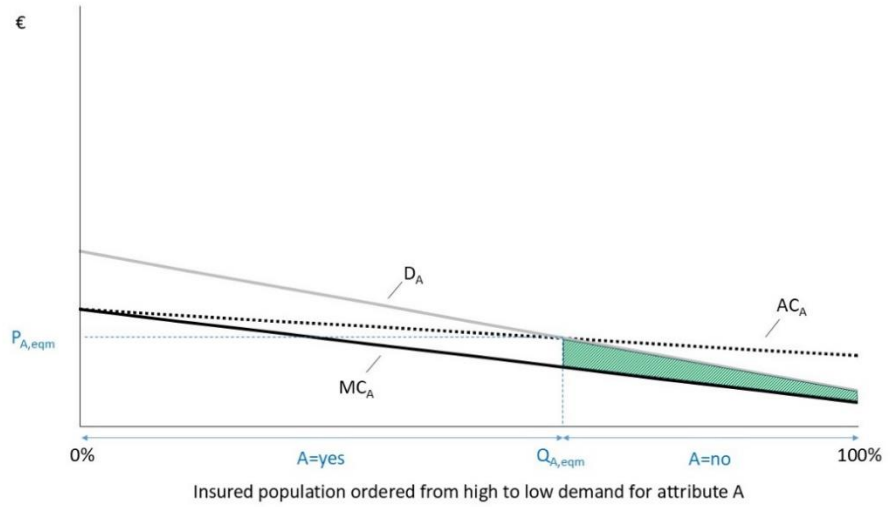
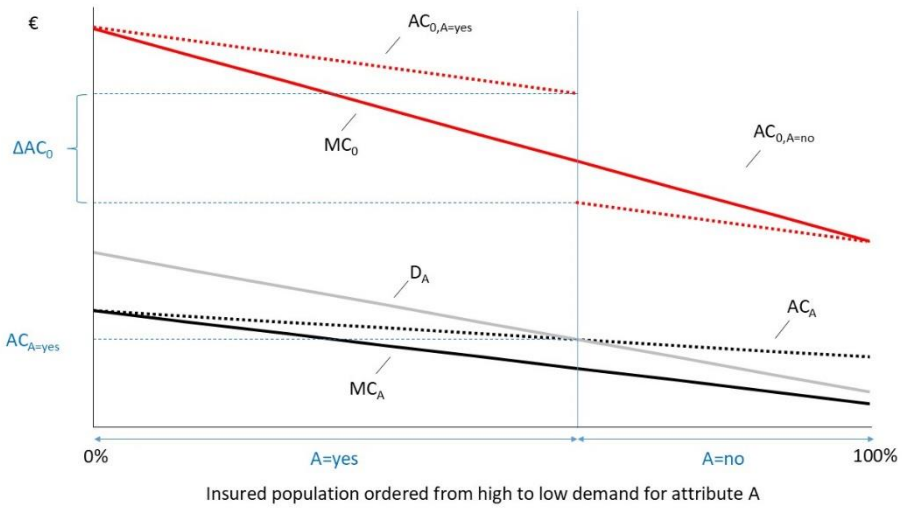
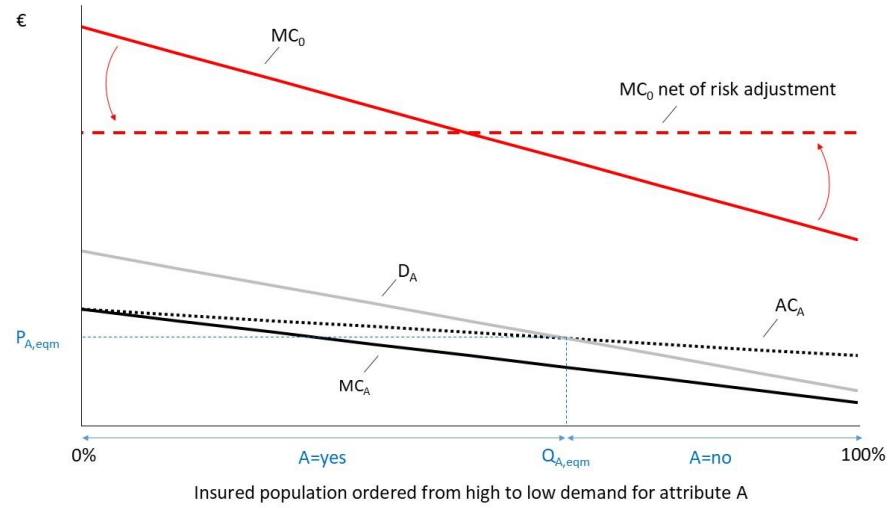
form of an additional loss event covered, consumers with the highest willingness to pay for A are likely to have both *relatively high expected cost for A* and *relatively high expected cost for mandatory coverage*. If this is true, both MC_A and MC_0 are downward sloping, a scenario shown in the middle diagram of Figure 1. In this scenario, the zero-profit premium for A does not just depend on the average cost of A in the group 'A=yes', but also on the difference in the average cost of mandatory coverage between the groups 'A=yes' and 'A=no'. This difference, which we refer to as ΔAC_0, can be found via the average cost curve for mandatory coverage (AC_0). As shown in Figure 1, AC_0 is not a straight curve but 'kinks' at the marginal buyer of A. It is easy to see how the sorting of consumers between yes/no A reveals some "unpriced risk heterogeneity" in mandatory coverage, captured by ΔAC_0. In a perfectly competitive insurance market (i.e., zero-profit condition), this has consequences for the equilibrium price of A:

$$P_{A,eqm} = AC_A + \Delta AC_0 \mid AC_A + \Delta AC_0 = D_A \qquad (2)$$

A closer look at the middle diagram in Figure 1 reveals that the market for A is expected to unravel completely: for each point on the horizontal axis the sum of MC_A and ΔAC_0 (which constitutes the price for A) exceeds D_A (i.e., the price consumers are willing to pay for A). In general, the viability of A in a setting with perfect competition depends on 1) the slopes of D_A and MC_A (which is captured by the standard EFC diagram) ***and*** 2) the slope of MC_0 (which is not captured by the standard EFC diagram). Although it is easier to think of examples in which the MC_0 curve is downward sloping, there might be situations in which this curve is flat (which brings us back to the standard EFC diagram), or upward sloping (i.e., advantageous selection). When the MC_0 curve is downward sloping, the correlation between the demand for A and the

cost of mandatory coverage *exacerbates* unraveling of the market for A (as in Figure 1); when MC_0 curve is upward sloping, the correlation between the demand for A and the cost of mandatory coverage *mitigates* unraveling of the market for A, ceteris paribus. When the MC_0 curve is perfectly flat, mandatory coverage has no effect on the equilibrium price of A.

Figure 1. Adverse selection regarding choice attribute A: Three scenarios

Scenario A (standard EFC): correlation between demand for A and marginal cost of A	
Scenario B (extended EFC): correlation between demand for A and cost of A *and* correlation between demand for A and cost of mandatory coverage	
Scenario C (extended EFC with risk adjustment): correlation between demand for A and cost of A *and* correlation between demand for A and cost of mandatory coverage *and* risk adjustment	

Note: see text for explanation of the three diagrams and meaning of notation.

Many regulated insurance markets include some form of risk adjustment to compensate insurers for unpriced risk heterogeneity. For example, Van Kleef et al. (2024) show how nine health insurance markets in Australia, Europe, Israel, and the U.S. all include risk adjustment and/or risk sharing to compensate insurers for the unpriced risk heterogeneity that inherently results from the premium-rate restrictions applied in these markets. The bottom diagram in Figure 1 shows the impact of a risk adjustment scheme that generates a *complete* redistribution of the expected cost of mandatory coverage. From the perspective of insurers, this redistribution increases the expected cost of enrolling low-risk people and decreases the expected cost of enrolling high-risk people, which results in a rotation of MC_0. Such a complete redistribution leads to a perfectly flat MC_0 curve, which brings us back to the standard EFC curve. This implies that our EFC extension is "only" relevant in case of an *incomplete* redistribution. Empirical literature indicates that even state-of-the-art risk adjustment formulas do not result in a complete redistribution of expected cost (e.g., Newhouse et al, 2015; Geruso, Layton & Prinz, 2019; Van Kleef, Eijkenaar & Van Vliet, 2019; McGuire, Zink & Rose, 2021; Zink & Rose, 2021).

Once the equilibrium premium for attribute A has been found, it is interesting to see what this means for social welfare. The potential welfare gain from A is defined by the extent to which the demand (willingness to pay) for A (D_A) exceeds the marginal cost of A (MC_A). In Figure 1, the demand for A exceeds the marginal cost of A for all consumers, implying that the optimal outcome of the market would be that all consumers choose attribute A, ceteris paribus. However, as we have seen above, adverse selection leads some (or all) consumers to not choose A, which results in a *forgone welfare gain*. In the standard EFC diagram, this forgone welfare gain is depicted by the green-shaded area (Einav, Finkelstein & Cullen, 2010). In scenario B of Figure

1, the forgone welfare gain would equal the total area between D_A and MC_A (not depicted), given our earlier observation that in this scenario the market for A will completely unravel.

To simplify our analysis, we assumed that the choice menu comprises just one attribute (assumption 1). In practice, it is likely that the choice menu consists of multiple attributes. Although it is beyond the scope of this paper to customize our framework for a scenario with multiple attributes, it is interesting to think about the implications for our EFC extension. Two cases of multiple attributes can be distinguished. A first, rather simple case would be one with two plans, one for mandatory coverage only and one for mandatory coverage plus a ***set*** S of multiple attributes. This case would be close to what we have focused on so far, with the difference that D_S and MC_S will be defined by the *aggregated* demand and marginal cost of the attributes in set S. MC_0 will then represent the marginal cost of mandatory coverage for the population ordered from high-to-low demand for set S. A second, more complex case would be one with multiple plans that cover different (sets of) attributes. In this case, the competitive equilibrium premium for a set of attributes S will not just be determined by the slope and position of D_S, MC_S and MC_0 for S but also on the slope and position of these curves for the other sets of attributes offered on the market. Although this severely complicates the prediction of competitive equilibrium premiums, we think that in these cases the key takeaway from our framework is still relevant: In the presence of a correlation between the demand for a set of attributes S and the cost of mandatory coverage, sorting of consumers into yes/no S reveals unpriced risk heterogeneity regarding mandatory coverage, which will affect the competitive equilibrium premium for S and will therefore have consequences for social welfare.

In line with the standard EFC diagram, we assumed simple linear slopes for the demand and cost curves in Figure 1. What these curves look like in practice is an empirical question and will differ from setting to setting and across choice attributes (Buchner & Schut, 2025).

II. Empirical Exploration: Data & Methods

The relevance of our EFC extension stands or falls with the existence of a correlation between the demand for choice attributes and the cost of mandatory coverage. In our empirical exploration below, we examine whether such a correlation exists in two insurance markets with a strong mandate and consumer choice: the basic health insurance schemes for curative care in the Netherlands and Switzerland. Both schemes are based on 'regulated competition'. Competition is rooted in a free consumer choice of insurance plan combined with financial responsibility for insurers. Regulation includes an insurance mandate, premium-rate restrictions, an open-enrollment requirement, and risk adjustment. Although coverage is highly standardized, insurers are allowed to differentiate their insurance plans along two dimensions: the level of cost sharing and access to care. Regarding the level of cost sharing, insurers in the Netherlands can offer the following voluntary-deductible options on top of the standard deductible of 385 euros per adult per year: 100, 200, 300, 400 and 500 euros. Insurers in Switzerland can offer the following voluntary-deductible options on top of a standard deductible of CHF 300 per adult per year: CHF 200, 700, 1,200, 1,700 and 2,200.[10] Regarding access to care, insurers in the Netherlands can selectively contract with healthcare providers and limit coverage of out-of-network spending.[11]

[10] On June 1st, 2025, CHF 1.00 is equivalent to 1.07 euros and 1.22 U.S. dollar.

[11] The Dutch law says that the reduction of coverage for out-of-network treatments should not form a 'financial hurdle' for consumers to access these treatments. The law is unclear, however, about the minimum level of coverage

Insurers in Switzerland can offer so-called 'managed-care plans' with selective contracting, gate keeping, and no coverage for out-of-network spending. However, each insurer in Switzerland is obliged to offer at least one standard plan that provides enrollees with a free choice of healthcare providers (within their canton of residence) and with the standard deductible of CHF 300 per adult per year.[12] For more information about the Dutch and Swiss health insurance schemes, we refer to Van Kleef et al. (2018) and Schmid et al. (2018), respectively.

Our empirical analysis consists of five steps. First, we quantify the difference in mean insurer spending between plans with 'mandatory coverage only' and 'plans with additional attributes.' By 'insurer spending' we mean the healthcare cost paid by insurers (i.e., excluding out-of-pocket payments by consumers, and excluding other types of costs for insurers such as administrative costs). Second, we examine whether a correlation exists between the demand for additional attributes and the cost of mandatory coverage. Third, we examine to what extent variation in mean insurer spending across plan types is compensated for by the risk adjustment systems that are currently in place in the two countries. Fourth, we compare mean insurer spending per plan type before and after risk adjustment with the premiums of plan types. Fifth, as a by-product of our analysis we compare mean insurer spending between 'newcomers' and 'stayers' in different plan types, both before and after risk adjustment and before and after premiums.

for these treatments. In practice, most insurance plans with a restricted provider network reimburse out-of-network treatments at a rate of >75% of the mean within-network price of these treatments.

[12] Note that there is a difference between the mandate for insurers to offer specific plan types and the mandate for consumers to buy a minimum level of coverage. When we speak of "mandatory coverage" in this paper, we refer to the minimum coverage consumers are obliged to buy (not the plans insurers are obliged to offer).

For the purpose of this paper, we obtained access to individual-level data on healthcare spending, risk-adjustment payments, choice of insurance plan, and plan characteristics (in terms of premiums, level of deductible, and coverage of out-of-network spending). For the Netherlands, these data cover the adult population enrolled in the basic health insurance in the period 2018-2019 (N = 13.7m insured years in 2019). For Switzerland, these data cover the adult enrolled in the basic health insurance in the period 2020-2021 (N = 7.0m insured years in 2021).[13] For simplification, we categorized plans for each country into three groups: plans with mandatory coverage only, plans with mandatory coverage plus two types of additional attributes (i.e., a lower deductible level and no/fewer access restrictions), and plans somewhere in between these two extremes. Table 1 shows the definition of these plan types for each country.

Table 1. Clustering of insurance plans into three plan types

Plan type	**Netherlands** [a]	**Switzerland**
Mandatory coverage only (hence: *mandatory coverage only*)	• Voluntary deductible = 500 euros • Access restrictions: selective contracting with a coverage rate for out-of-network treatments of <75% of the mean price for similar within-network treatments	• Voluntary deductible = CHF 2,200 • Access restrictions: managed-care plan (i.e., a plan with gatekeeping and/or selective contracting with no coverage for out-of-network care)
Mandatory coverage plus two types of additional coverage (hence: *mandatory coverage* ++)	• Voluntary deductible = 0 euros • No or little access restrictions: no selective contracting or a coverage rate for out-of-network treatments of >75% of the mean price for similar within-network treatments	• Voluntary deductible = CHF 0 • No access restrictions: traditional plan (i.e., plan with a free choice of providers within the canton)
Other (hence: *mandatory coverage* +)	Other than the two plan types above (e.g., plans with a voluntary deductible of 100, 200, 300 or 400 euros; and plans with access restrictions though without a voluntary deductible)	Other than the two plan types above (e.g., plans with a voluntary deductible of CHF 200, 700, 1,200, 1,700; and plans with access restrictions though without a voluntary deductible)

[a] For the Netherlands, our definition of 'access restriction' comes from the Dutch Healthcare Authority.

[13] Throughout our analyses we annualized spending and weighted individuals with the fraction of the year they were enrolled. This way, mean insurer spending, mean risk adjustment payment, mean premium etc. can be interpreted as the mean of these variables per individual *per insured year*.

As we will show in the next section, our findings reveal a huge difference in mean insurer spending among the three plan types. More specifically, mean insurer spending in *mandatory coverage* ++ and *mandatory coverage* + is much higher than in *mandatory coverage only*. In theory, the incremental insurer spending on *mandatory coverage* ++ and *mandatory coverage* + can have two sources. First, there can be causal effects of a lower deductible (e.g., additional spending covered and moral hazard) and fewer access restrictions (e.g., better access and more supplier-induced demand). Second, there can be a selection effect in the form of a correlation between the demand for additional coverage and the cost of mandatory coverage (see our conceptual framework). As well-documented in the literature, isolating selection from causal effects is a major challenge (e.g., Powell & Goldman, 2021; Bajari et al., 2014; Keane & Stavrunova, 2016; Gardiol, Geoffard & Grandchamp, 2005).[14] It is beyond the scope of our paper to perfectly disentangle these effects for our settings of interest. Instead, we 'just' aim to test the *existence* of a correlation between the demand for additional coverage and the cost of mandatory coverage. For this purpose, we apply a pragmatic approach that exploits consumer switching between plan types from one year to the next. More specifically, we focus on the following three groups: 1) consumers with *mandatory coverage only* in year t-1, 2) consumers with *mandatory coverage* + in year t-1 and 3) consumers with *mandatory coverage* ++ in year t-1. We split each of these groups into three subgroups based on their choice of insurance plan in year t. For example, we split the subgroup with *mandatory coverage only* in year t-1 into the

[14] The preferred strategy for isolating moral hazard and efficiency effects of plan types is to carry out a randomized controlled trial in which consumers are assigned randomly to plan types by design (such as in the RAND Health Insurance Experiment; Newhouse, 1993) or to exploit a natural experiment in which the assignment of consumers to different plan types is not randomized by design but occurs by an exogenous randomizer in the real world (such as in the Oregon Health Experiment, Baicker et al., 2013). In settings without random assignment, such as the two settings in this paper, isolation of the direct plan effect requires a correction of spending variation for selection.

following three subgroups: a) consumers that stay in *mandatory coverage only* in year t, b) consumers that switch to *mandatory coverage* + in year t and c) consumers that switch to *mandatory coverage* ++ in year t. We then calculate mean insurer spending for groups a, b and c in year t-1. Since subgroups a, b and c have more or less identical coverage in year t-1, a difference in mean insurer spending in year t-1 between these subgroups will point at adverse (or advantageous) selection regarding the choice of insurance plan for year t.[15] Note that this analysis might provide an underestimation of true adverse selection regarding coverage for year t since it does not capture any changes in health status anticipated by consumers for year t.

After testing for the existence of a correlation between the demand for additional coverage and the cost of mandatory coverage we simulate the effects of the risk adjustment (RA) formulas applied in the two countries. The Swiss RA formula (version: 2021) includes risk adjustors based on age, gender, prior hospitalization, and disease indicators based on prescribed drugs in the previous year. The Dutch RA formula (version: 2022) is more sophisticated and includes risk adjustors based on age, gender, socioeconomic information, regional characteristics, and disease indicators derived from the following types of information: inpatient and outpatient hospital diagnoses in the previous year, prescribed drugs in the previous year, durable medical equipment in the previous year, physiotherapy diagnoses in previous year, and persistently low/high spending for specific types of care in multiple prior years, among others.[16] For more information about the Dutch and Swiss RA formulas, we refer to Van Kleef et al. (2018) and Schmid et al.

[15] Note that this correlation can be partly due to 'selection on moral hazard' in the sense that consumers who select into mandatory coverage ++ and mandatory coverage + might select into these plans based on their anticipated behavioral ("moral hazard") response (Einav et al., 2013).

[16] Unfortunately, our data did not allow for replicating the risk adjustment formula of 2019, which would have been preferred since we focused on spending and premiums in 2019. Instead, we applied the Dutch risk adjustment model of 2022 which contains a slightly richer set of risk adjusters than the model of 2019.

(2018), respectively. In the final step of our analysis, we calculate the mean premium per plan type and compare this with mean insurer spending per plan type before and after risk adjustment.

For two reasons we restrict our analysis to the population of 18 years and older.[17] First, children do not make an active choice of insurance plan. In both schemes, parents choose a plan for their children. In the Netherlands, children automatically enroll in the same plan as (one of) their parents and are exempted from the deductible. Second, the financing scheme for children differs from that for people of 18 years and older. In Switzerland, children are charged different premiums and are not included in the risk adjustment scheme. In the Netherlands, children are included in the risk adjustment scheme, but their premium is paid by the government.

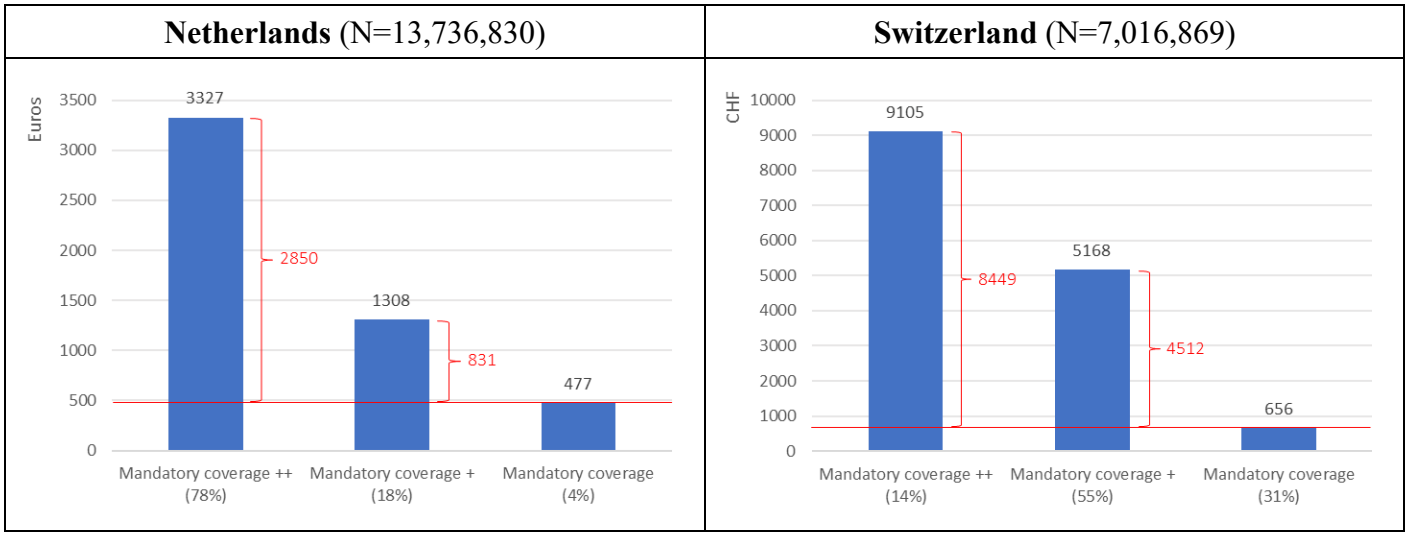
III. Empirical Exploration: Results

This section presents the outcomes of our analysis. Figure 2 shows mean insurer spending per plan type. In both countries, mean insurer spending is much higher for *mandatory coverage* ++ (left bar in the diagrams) than for *mandatory coverage only* (right bar in the diagrams). In the Netherlands mean insurer spending in *mandatory coverage* ++ is about 7 times higher than in *mandatory coverage only*; for Switzerland this ratio is even higher (>13). In both countries, mean insurer spending in *mandatory coverage* + lies in between that of the other two plan types. The percentages on the horizontal axis represent the proportion of the population enrolled in a plan type. In the Netherlands more people are enrolled in *mandatory coverage* ++ than in Switzerland. It should be noted, however, that the definition of access restrictions differs

[17] With the exception that – for the Netherlands – people below the age of 18 were included in the calibration of the risk adjustment model, following current practice.

between the two countries (see Table 1). More specifically, some insurance plans that are qualified as plans *without* access restrictions according to the Dutch definition might have been qualified as plans *with* access restrictions according to the Swiss definition.

Figure 2. Mean insurer spending per plan type in year t (population 18+) [a-c]



[a] See Table 1 for the definition of plan types.
[b] On June 1st, 2025, CHF 1.00 is equivalent to 1.07 euros and 1.22 U.S. dollar.
[c] For the Netherlands, year t corresponds to 2019. For Switzerland, year t corresponds to 2021.

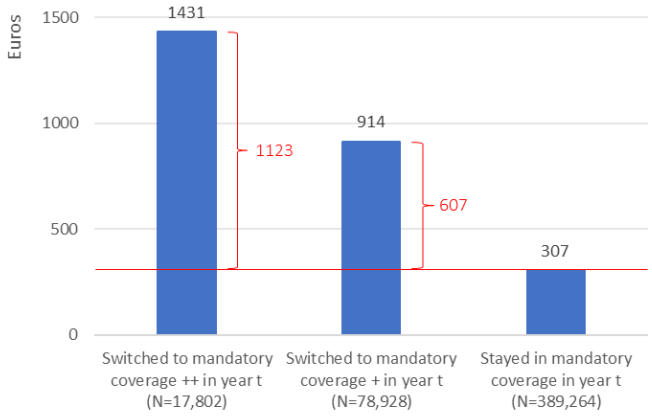
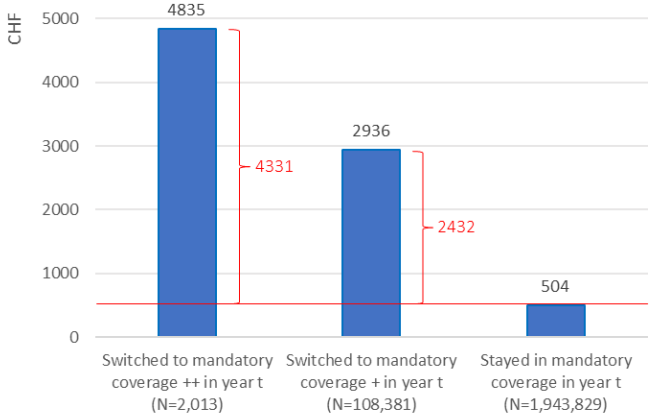
The red braces in Figure 2 mark the incremental insurer spending of *mandatory coverage ++* and *mandatory coverage +* compared to *mandatory coverage only*. As discussed in the Methods section, this incremental insurer spending can have two sources. First, there can be a causal effect of a lower deductible (e.g., additional spending covered and more moral hazard) and fewer access restrictions (e.g., better access and more supplier-induced demand). Second, there can be a selection effect in the form of a correlation between the demand for additional coverage and the cost of mandatory coverage. It is beyond the scope of this paper to disentangle these two sources. Instead, we 'just' aim at testing the *existence* of a correlation between the demand for additional

attributes and the cost of mandatory coverage in order to indicate the relevance of our EFC extension for the two settings. We do this by exploiting information on plan switching.

Figure 3a splits the group of consumers with *mandatory coverage only* in year t-1 into three subgroups: consumers that stay in *mandatory coverage only* in year t (right), consumers that switch to *mandatory coverage* + in year t (middle) and consumers that switch to *mandatory coverage* ++ in year t (left). The bleu bars show mean insurer spending for these subgroups in year t-1. In both countries mean insurer spending in year t-1 is higher for consumers who switch to *mandatory coverage* + and *mandatory coverage* ++ than for consumers who stay in *mandatory coverage only.* Since the three subgroups have (more or less) identical coverage in year t-1, we can attribute these differences to a selection effect in the form of a correlation between the demand for additional coverage and the cost of mandatory coverage. Note that these results may give an underestimation of the true selection effect since they (are based on spending in t-1 and therefore) do not incorporate any health changes in year t anticipated by consumers.

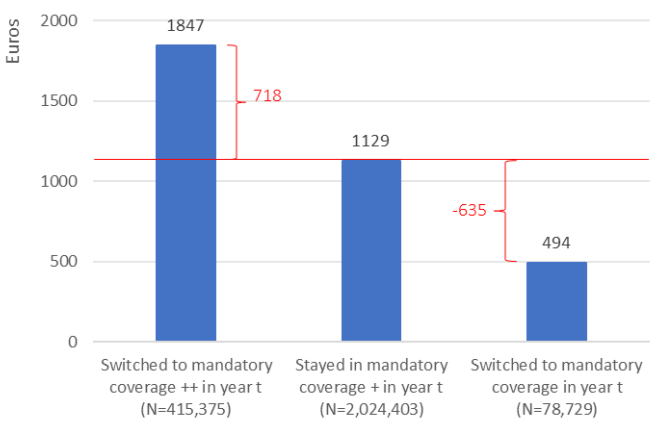
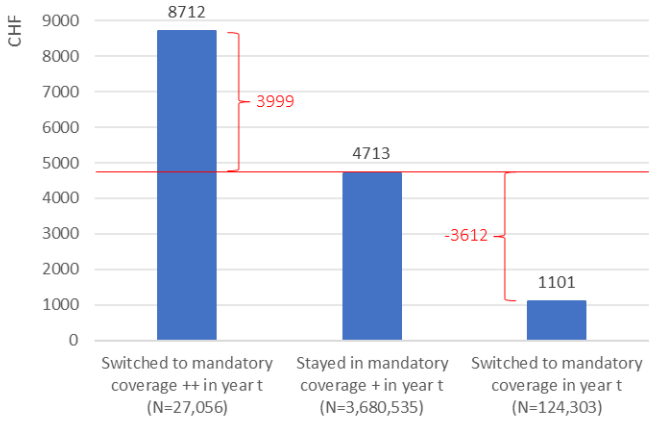
Figures 3b and 3c do the same as Figure 3a but focus on the group of consumers with *mandatory coverage* + in year t-1 and *mandatory coverage* ++ in year t-1, respectively. The patterns are consistent with those in Figure 3a and point at the presence of selection.

Figure 3a. Mean insurer spending in year t-1 for three mutually exclusive subgroups within the total group with *mandatory coverage only* in year t-1 (population 18+) [a-d]

Netherlands (N=490,796)	**Switzerland** (N=2,083,592)
	

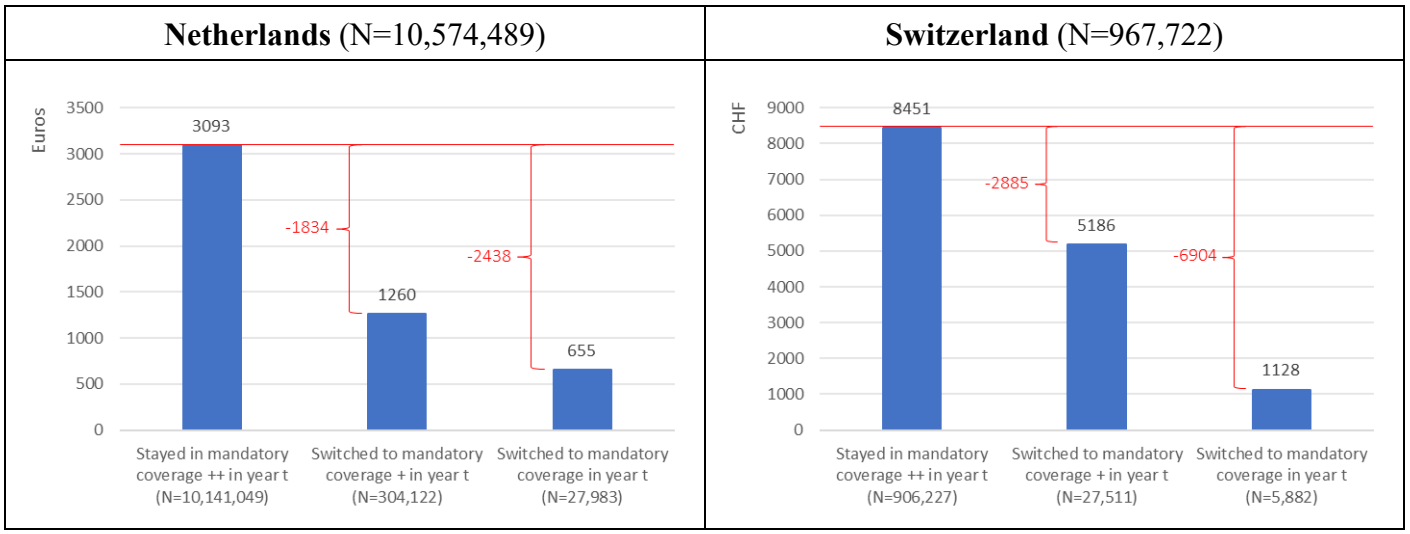
[a] See Table 1 for the definition of plan types.
[b] On June 1st, 2025, CHF 1.00 is equivalent to 1.07 euros and 1.22 U.S. dollar.
[c] For the Netherlands, year t corresponds to 2019. For Switzerland, year t corresponds to 2021.
[d] For the Netherlands 4,802 individuals in the total group with *mandatory coverage only* in t-1 are missing in year t; for this group mean spending in t-1 equals 1,116 Euros. For Switzerland 29,368 individuals in the total group with *mandatory coverage only* in t-1 are missing in year t; for this group mean spending in t-1 equals CHF 1,725.

Figure 3b. Mean insurer spending in year t-1 for three mutually exclusive subgroups within the total group with *mandatory coverage* + in year t-1 (population 18+) [a-d]

Netherlands (N=2,540,273)	**Switzerland** (N=3,891,540)
	

[a-c] See notes a-c Figure 3a.
[d] For the Netherlands 21,766 individuals in the total group with *mandatory coverage* + in t-1 are missing in year t; for this group mean spending in t-1 equals 4,912 Euros. For Switzerland 59,645 individuals in the total group with *mandatory coverage* + in t-1 are missing in year t; for this group mean spending in t-1 equals CHF 19,507.

Figure 3c. Mean insurer spending in year t-1 for three mutually exclusive subgroups within the total group with *mandatory coverage* ++ in year t-1 (population 18+) [a-c]



[a-c] See notes a-c Figure 3a.
[d] For the Netherlands 101,335 individuals in the total group with *mandatory coverage* ++ in t-1 are missing in year t; for this group mean spending in t-1 equals 22,992 Euros. For Switzerland 28,103 individuals in the total group with *mandatory coverage* ++ in t-1 are missing in year t; for this group mean spending in t-1 equals CHF 23,236. These high spending levels are due to fact that these groups largely consist of people who died in year t-1.

In the absence of risk adjustment, community-rating per insurance plan would lead to high incremental premiums for *mandatory coverage* ++ and *mandatory coverage* +. Following the difference in insurer spending across plan types in Figure 2, the actuarially fair premium for *mandatory coverage* ++ would be about 7 (Netherlands) or >13 times (Switzerland) higher than the actuarially faire premium for *mandatory coverage only*. It is questionable whether in this (hypothetical) scenario any consumer would opt for *mandatory coverage* ++.

In practice, both schemes include a risk adjustment system that compensates insurers for predictable spending variation across individuals. Figure 4 shows the effects of risk adjustment on insurer spending. The bars with solid fill represent insurer spending ***before*** risk adjustment and mimic the bars in Figure 2. The bars with pattern fill represent insurer spending ***after*** risk adjustment. In Switzerland, risk adjustment redistributes insurer spending from high-risk to low-

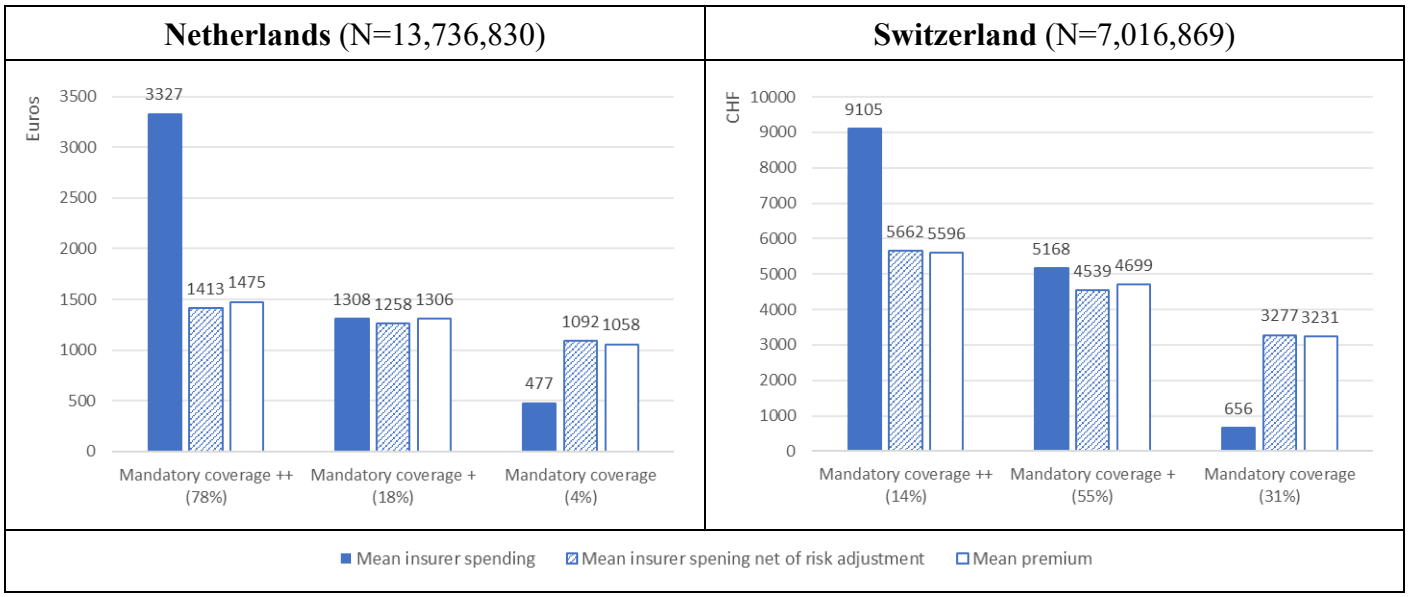
risk individuals but does not affect mean insurer spending across the market. The reason is that Switzerland has a so-called 'internal' risk adjustment system in which payments to insurers for high-risk people are financed by contributions from insurers for low-risk people. In other words, risk adjustment payments in Switzerland sum to zero. In the Netherlands, risk adjustment does not just redistribute insurer spending from high-risk to low-risk people but also reduces mean insurer spending across the market. The reason is that the risk adjustment payments to insurers are partly financed with external resources (and partly with contributions by insurers for low-risk enrollees). As expected, risk adjustment in both countries reduces the difference in mean insurer spending between the (relatively low risk) enrollees with *mandatory coverage only* and the (relatively high risk) enrollees with *mandatory coverage* ++. This is in line with the 'rotation of the marginal cost of mandatory coverage' shown in the bottom diagram of Figure 1.

The results in Figure 4 might raise the question "To what extent *should* risk adjustment compensate for differences in mean insurer spending across plan types?". Although this is a normative question, our EFC extension suggests that risk adjustment should at least compensate for the correlation between the demand for additional coverage and the cost of mandatory coverage. When risk adjustment fully and exclusively compensates for this correlation, differences in mean insurer spending net of risk adjustment will reflect the causal effects of *mandatory coverage* ++ and *mandatory coverage* + on insurer spending. Since the data available for our study does not allow isolating these causal effects, we cannot indicate whether risk adjustment is sufficient or not. Recent evaluations of the Dutch and Swiss risk adjustment formulas, however, suggest that these models do not perfectly compensate insurers for predictable spending variation (Van Kleef, Eijkenaar & Van Vliet, 2019; Beck et al., 2020).

The next interesting question is what premiums look like for the three plan types. Economic theory predicts that competition forces insurers to align premiums with insurer spending *net of* risk adjustment rather than insurer spending per se.[18] The white bars in Figure 4 indicate that this is indeed the case: for each plan type the mean premium is much closer to the mean insurer spending *net of risk adjustment* than to the mean insurer spending per se. Another interesting observation in Figure 4 is that – at least in relative terms – the overall mean premium in the two schemes does not far exceed the overall mean insurer spending after risk adjustment. In the Netherlands the overall mean premium equals 1,429 euros per adult per year, which is just 56 euros above the overall mean insurer spending net of risk adjustment (1,373 euros). In Switzerland, the overall mean premium equals CHF 4,365 per adult per year, which is CHF 66 above the overall mean insurer spending net of risk adjustment (CHF 4,299). These findings indicate that the average loading fee (and profit margin) in these schemes is relatively small.

[18] For several reasons, it cannot be expected that premiums 'perfectly' align with insurer spending net of risk adjustment. First, insurers typically charge a loading fee on top of the actuarially faire premium. This loading fee might differ across plan types. For example, administrative costs might be higher for mandatory coverage ++ and mandatory coverage + than for mandatory coverage only, which could lead insurers to charge higher loading fees for the more comprehensive plans (Douven & Kauer, 2023; Douven et al., 2022). Second, mean insurer spending and risk adjustment payments for plan-type populations will not be (fully) known to insurers when calculating their premiums. Mean insurer spending and mean risk adjustment payments for plan-type populations depend on the sorting of consumers across plan types, which typically takes place *after* insurers calculated and published their premiums. In the Swiss and Dutch insurance schemes, however, insurers will be able to reasonably approximate mean insurer spending and mean risk adjustment payment for plan-type populations based on historical sorting patterns. Third, the premium for an insurance plan may be affected by the financial result (i.e. the difference between insurer spending and revenue) for enrollees below 18 which are not included in our calculations here. Fourth, in case of the Netherlands, we applied the risk adjustment model of 2022 while premiums correspond to 2019. In terms of risk adjusters, the Dutch model of 2022 is somewhat richer than that of 2019.

Figure 4. Mean insurer spending (before and after risk adjustment) and mean premium in year t per plan type (population 18+) [a,b,c]



[a] See Table 1 for the definition of plan types.
[b] On June 1st, 2025, CHF 1.00 is equivalent to 1.07 euros and 1.22 U.S. dollar.
[c] For the Netherlands, year t corresponds to 2019. For Switzerland, year t corresponds to 2021.

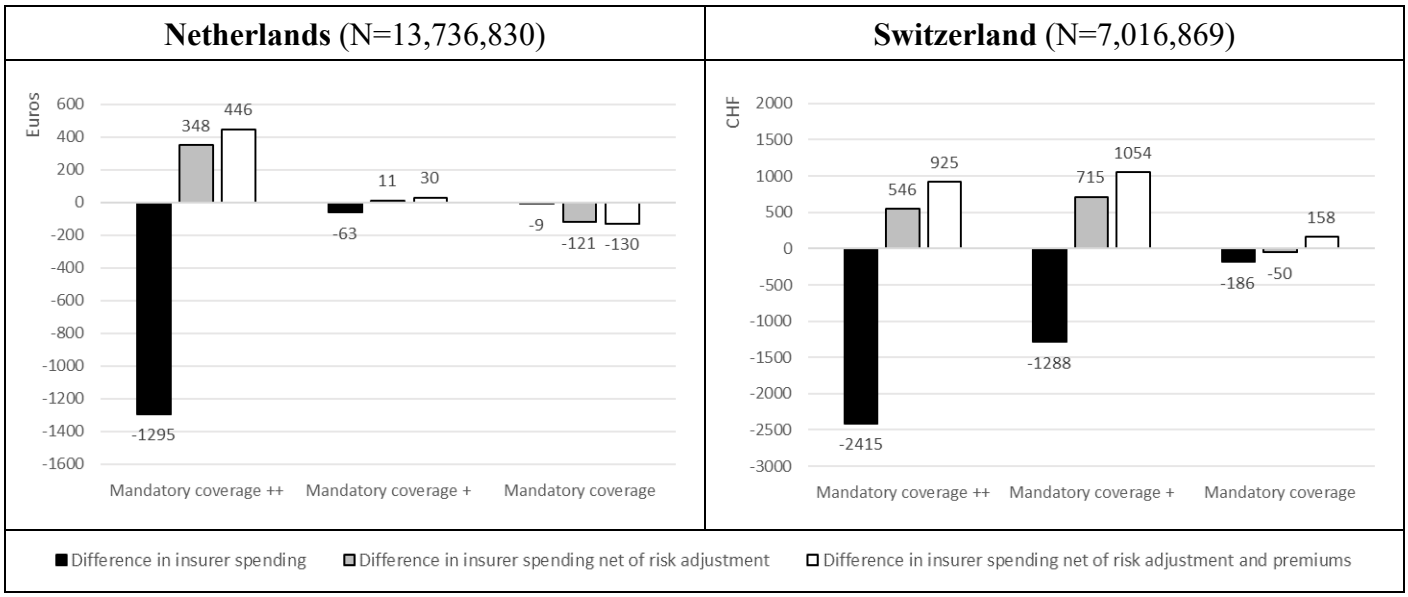
In our analysis of switchers, we made an interesting observation: for some plan types, consumers who switched to that plan type in year t (newcomers) substantially differ from consumers who were already having that plan type in year t-1 (stayers). We believe that – in the light of adverse selection – this observation is worth sharing here (as a by-product of our analysis). Figure 5 shows the difference in mean insurer spending between newcomers and stayers in year t for each plan type. The bars indicate the incremental spending in year t of newcomers compared to stayers. In both countries, newcomers in *mandatory coverage* ++ have lower insurer spending than stayers. Net of risk adjustment and premiums, however, newcomers in *mandatory coverage* ++ are more expensive for insurers than stayers. A potential explanation for this finding is that newcomers might select into *mandatory coverage* ++ because they expect (higher) healthcare spending in year t but are not (yet) recognized as 'high risk' because the morbidity indicators in the risk adjustment system are based on year t-1 (when many consumers in this group were still

relatively healthy). For *mandatory coverage +*, the bars are smaller – particularly in case of the Netherlands – but have the same pattern as for *mandatory coverage ++*.

For *mandatory coverage only*, mean insurer spending is just slightly lower for newcomers than for stayers. In the Netherlands, however, newcomers in *mandatory coverage only* become cheaper for insurers when considering risk adjustment and premiums. A potential explanation for this finding is that newcomers might select into *mandatory coverage only* because they expect no or low healthcare spending in year t. Some of these newcomers, however, might not (yet) be recognized as 'low risk' because the morbidity indicators in the risk adjustment system are based on year t-1 (in which some individuals in this group might have been less healthy than in year t, due to a temporary health problem). For Switzerland, a different pattern can be observed: when considering risk adjustment and premiums, newcomers in *mandatory coverage only* become more expensive than stayers. A potential explanation for this different pattern may be that the Dutch risk adjustment model contains a richer set of 'morbidity' indicators that might flag people with temporary health problems than the Swiss risk adjustment model.

The sorting pattern in Figure 5 can be seen as selection-in-selection: consumers sorting into a plan type differ from the consumers that already were in that plan type, who – on their turn – differ from the consumers in other plan types. Due to their prospective nature, the impact of the risk adjustment schemes in the two countries is ambiguous: risk adjustment can reduce, exacerbate or reverse the profits/losses of newcomers compared to stayers.

Figure 5. Difference in mean insurer spending (before and after risk adjustment and premiums) in year t between newcomers and stayers per plan type (population 18+) [a,b,c,d]



[a] See Table 1 for the definition of plan types.
[b] On June 1st, 2025, CHF 1.00 is equivalent to 1.07 euros and 1.22 U.S. dollar.
[c] For the Netherlands, year t corresponds to 2019. For Switzerland, year t corresponds to 2021.
[d] The bars indicate the incremental insurer spending in year t for consumers who switch into the plan type in year t (newcomers) compared to consumers who already had that plan type in year t-1 (stayers). For example: in the Netherlands, mean insurer spending for newcomers in *mandatory coverage ++* is 1,295 Euros lower than for stayers in mandatory coverage ++. After risk adjustment, however, mean insurer spending is 348 Euros higher for newcomers than for stayers in this plan type. After risk adjustment and premiums, mean insurer spending is 446 Euros higher for newcomers than for stayers, which implies that newcomers are less profitable than stayers.

IV. Discussion

This paper explored selection in insurance markets with a strong mandate and consumer choice. As a first step, we customized the graphical framework introduced by Einav, Finkelstein & Cullen (2010) to our setting of interest and demonstrated that the competitive equilibrium price of choice attribute A (e.g., an additional loss event covered on top of mandatory coverage) does not just depend on the *demand and marginal cost of A*, but also on the *correlation between the demand for A and the cost of mandatory coverage*. When this correlation is positive (adverse selection), it can *exacerbate* the unravelling of the market for A. When this correlation is

negative (advantageous selection), it can *mitigate* the unraveling of the market for A. By redistributing insurer spending from high-risk to low-risk consumers, risk adjustment corrects for this correlation and potentially improves consumer sorting between yes/no A.

In the second part of the paper, we empirically explored selection patterns in two markets with a strong mandate, community rating, and consumer choice: the Swiss and Dutch basic health insurance schemes. For both countries we grouped insurance plans into three categories: *mandatory coverage only* (i.e., plans with the highest deductible option and access restrictions), *mandatory coverage* ++ (i.e., plans with the lowest deductible option and no or little access restrictions) and *mandatory coverage* + (i.e., plans in between the other two categories). Our descriptive findings show that in the Netherlands mean insurer spending is about 7 times higher for *mandatory coverage* ++ than for *mandatory coverage only*. For Switzerland, this ratio is even higher (>13). By exploiting information on plan switching, we found evidence of the existence of a positive correlation between the demand for choice attributes (in the form of a lower deductible and fewer access restrictions) and the cost of mandatory coverage. The good news is that our findings suggest that this correlation (adverse selection) is largely addressed by the risk adjustment formulas that are currently in place in the two countries.

Our findings have several policy implications. First, it is important for regulators to think carefully about the (potential) welfare gains of choice attributes. When the potential welfare gains are considered limited, they might not outweigh the (potential) cost of adverse selection. Recent work by Marone & Sabety (2022) suggests that in the case of 'vertical' choice (e.g., high versus low deductible) the gains in terms of social welfare might indeed be limited. In situations

where the potential welfare gains of choice attributes are considered substantial, it is important to think about policy measures for mitigating adverse selection. When – for whatever reason – adverse selection with respect to a coverage attribute cannot be sufficiently mitigated, regulators could consider moving that attribute to the *mandatory* benefits package.

In the mandatory health insurance schemes of the Netherlands and Switzerland, the motivation for having consumer choice goes beyond the direct effects on social welfare (in terms of addressing heterogenous preferences). In the case of access restrictions an important motive for having consumer choice is that 'selective contracting' of healthcare providers can help incentivize providers to use resources wisely (Enthoven, 1980; Enthoven 1993; Van de Ven et al., 2003). Since consumer preferences for specific providers of care can be strongly correlated with the cost of mandatory coverage, risk adjustment is extremely important in the two schemes. Without adequate risk adjustment, adverse selection (with respect to coverage of specific providers) might hinder these countries from reaping the fruits of selective contracting. For example, in case of a strong positive correlation between the demand for high-quality providers and the marginal cost of mandatory coverage, adverse selection might lead insurers to not contract these providers at all (Shepard, 2022; Van de Ven, Van Kleef & Van Vliet, 2015).

The empirical analysis in this paper has some specific strengths and weaknesses. A strength is that we were able to apply our framework to two different settings. The outcomes for the two settings show some very similar patterns, e.g., regarding the presence of a correlation between the demand for additional coverage and the cost of mandatory coverage. Such similarities underline the general relevance of our arguments. A second strength is the richness of the data.

Not only did the available data allow for quantifying differences in insurer spending, risk adjustment payments and premiums across plan types; they also allowed us to test the existence of a correlation between the demand for additional coverage and the cost of mandatory coverage by exploiting information on switchers between plan types from one year to the next. A third strength is that we were able to connect insurer spending, risk adjustment payments and premiums. This led us to the observation that – in both schemes – premiums follow insurer spending *net of* risk adjustment rather than insurer spending per se. This adds to the rather scarce literature that insurers (or the market in general) strongly respond to risk adjustment.

A weakness of our analysis is that the data from the Netherlands do not perfectly reflect 'insurer spending' in the years of interest. Although the spending data originates from 2018 and 2019, it has been made representative for the years 2021 and 2022 respectively (e.g., by correcting for changes in the benefits package). The reason is that the data were originally used for calibrating the Dutch risk adjustment formulas of 2021 and 2022. We expect, however, that possible deviations from actual spending will not change our *general* findings and conclusions. Another limitation of the Dutch data is that it did not allow for replicating the risk adjustment formula of 2019, which would have been preferred since we focused on plan populations and premiums in 2019. Instead, we applied the Dutch risk adjustment model of 2022 which contains a slightly richer set of risk adjusters than the model of 2019. Moreover, we ignored the fact that plan premiums and switching decisions might be affected by people below 18 (who automatically enroll in the insurance plan of one of their parents). Also for these limitations, however, we expect little impact on our *general* findings. Finally, our data did not allow for decomposing

variation in insurer spending across plan types (Figure 2) into selection and causal effects. Instead, we used a pragmatic approach to test the *existence* of selection (Figures 3a, 3b and 3c).

In our empirical analysis, we focused on plan types that are actually offered. Apparently, these plan types are viable in the settings of interest, probably thanks to risk adjustment. Policymakers and researchers should be aware, however, that in practice some choice attributes might not be offered at all, e.g., due to prior unravelling of the market or due to expectations of insurers about the adverse selection that might be triggered by these attributes. In addition to research on the correlation between *revealed* preferences and the cost of mandatory coverage (e.g., this paper), it might be interesting to also study the correlation between *stated* preferences and the cost of mandatory coverage, especially for additional coverage that is not offered by insurers despite their potential welfare gains (e.g., Van den Berg et al. 2008).

As a by-product of our empirical analysis, we found that consumers sorting into a plan type differ from the consumers that already were in that plan type, who – on their turn – differ from the consumers in other plan types. We also found that prospective risk adjustment can reduce, exacerbate or even reverse the profits and losses of newcomers compared to stayers. We believe it is interesting for future research to delve deeper into this phenomenon. For example, this type of selection could potentially contribute to product proliferation: when switchers to a plan type tend to be relatively (un)profitable compared to stayers, competition might incentivize insurers to enroll these newcomers into a 'new' plan, thereby separating them from the stayers.

Overall, it can be concluded that – in regulated insurance markets with a strong mandate and consumer choice – the correlation between the demand for choice attributes and the cost of mandatory coverage can be very substantial. This observed correlation is the outcome of a complex interaction between 1) actions by insurers (in terms of which choice attributes to offer), 2) actions by consumers (in terms of which attributes to choose) and 3) the level of unpriced/uncompensated risk heterogeneity regarding mandatory coverage (which depends on the breadth and depth of mandatory coverage, characteristics of the population, and regulatory features such as rate-restrictions and risk adjustment). To the extent the observed correlation is considered problematic, regulators can look for solutions along these dimensions. More specifically, they can consider reducing the scope of actions by insurers and consumers (e.g., by limiting the menu of choice attributes) and/or reducing the level of unpriced/uncompensated risk heterogeneity (e.g., by improving risk adjustment, weakening rate restrictions and/or applying risk sharing features such as carve-outs). Further research on the impact of these interventions is needed to guide policymakers in finding the optimal strategy in a setting of interest.

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